

Hereleb

04.23





List of Components

OBJECTS, EXHIBITS, AND INTERACTIVES

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ORIGINAL OBJECTS AND ARTIFACTS

03



SEAT RUSSIAN SOYUZ ROCKET

This is the seat of the Soviet Soyuz rocket. In this tiny cabin astronauts have to spend 2 days before arriving at the international space station. Over the years since the 1970s, the shape and the anchoring systems of the seats of the Soyuz spacecraft have not changed much. To carry it out, a study is made of the astronaut's back, making the molds that later create the impression of the chair. Each astronaut has his own place.

ORIGINAL

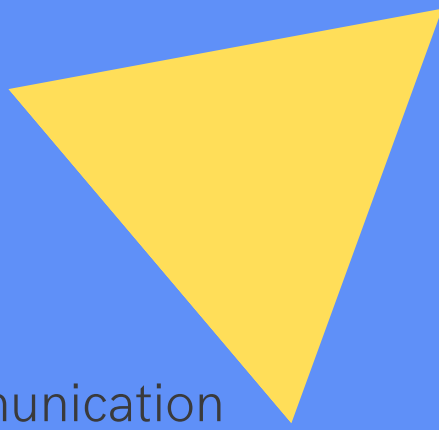
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COMMUNICATION CAP - TITOV

It belonged to Gherman Stepanovich Titov, who was the second man to go to space and the first to spend 24 hours inside the capsule. Gagarin and he disputed the first seat to space losing it in favor of Yuri Gagarin.

ORIGINAL



SNOOPY CAP - Alan Bean

One of the problems that arose when preparing space travel was the communication of astronauts while they were wearing their space suits. Within the helmet, they needed communication devices with which to communicate both with the mission control and with each other. The solution that was found and is still used today is to wear a hat in which microphones and headphones that allow communication are installed.

ORIGINAL

04

LIFE JACKET APOLLO JIM IRWIN

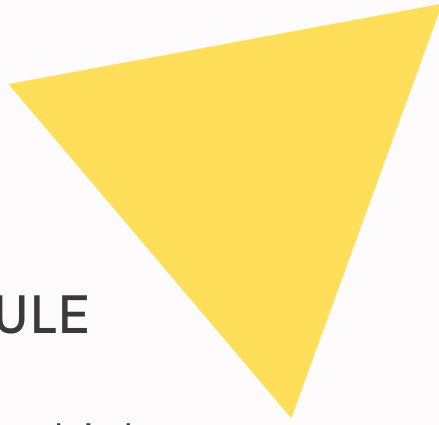


Russian Soyuz capsules do not fall on the sea but land on the Siberian steppes, where they impact like bullets on the ground. On occasion, contact with cosmonauts has been lost. In the event that the loss of contact will last for hours, even days, cosmonauts are endowed with various objects in order to survive in the immensity of the steppe. A set of flares with which to mark the position, a life jacket in the event that the capsule deviated and fell into the sea, as well as a survival kit with food rations and other basic utensils such as flashlights, Swiss army knives, etc...

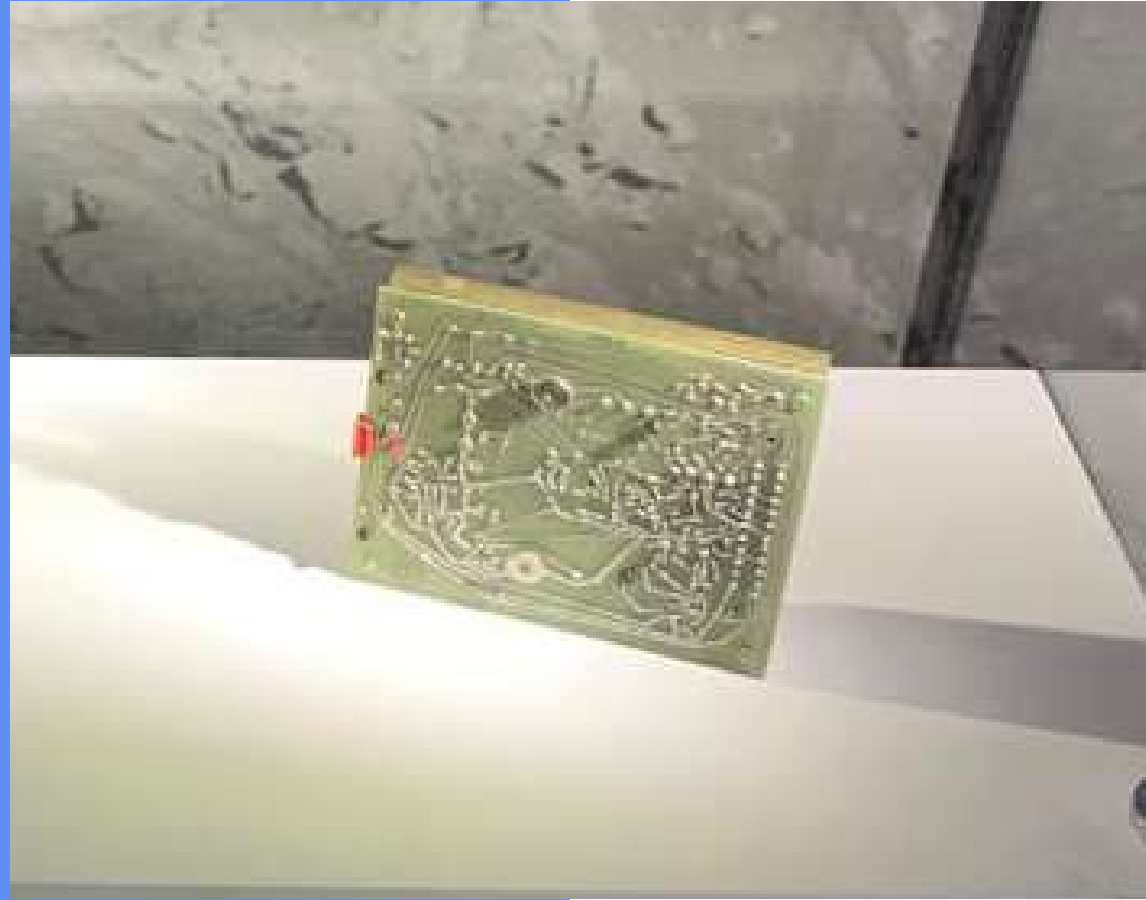
In this situation this American Life Jacket was always present inside the kit because the command module always landed on the sea.

ORIGINAL

04.23



05



NASA APOLLO / SPACE SHUTTLE, KENNEDY SPACE CENTER, LAUNCH CONTROL ROOM, DATA RECORDER FM PLAYBACK MODULE

This Sangamo coaxial reel data tape Circuit Board was designed to allow high fidelity playback and filtering of the Frequency Modulated Signals from the launch vehicle and spacecraft telemetry before and during launch from the Kennedy Space Center Launch Facilities for the Apollo program, and later, for the earliest Space Shuttle flights.

It is constructed from high-quality space rated components for reliable functioning during the critical operations of the KSC launch procedures.

This artifact was originally part of the Charles H. Bell space hardware collection, a NASA Apollo Engineer who lived in Merritt Island Florida from 1965 until the year 2000.

ORIGINAL

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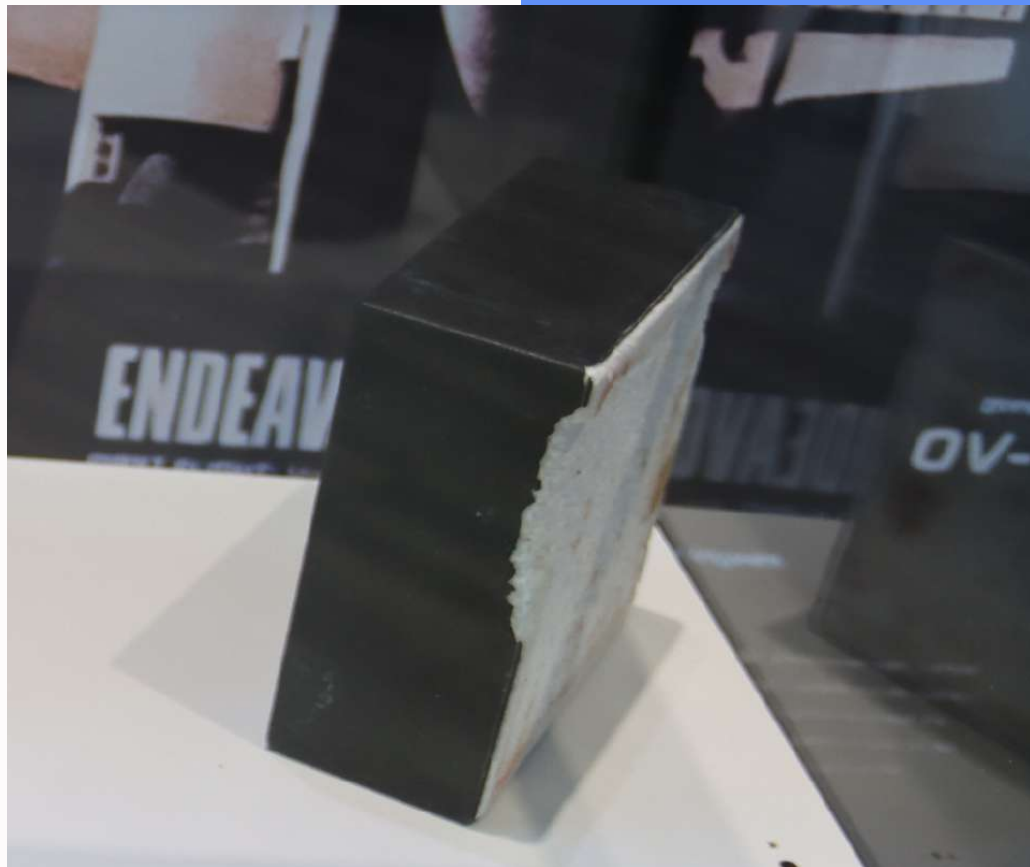


NASA APOLLO / SPACE SHUTTLE KSC LAUNCH CONTROL ROOM DATA RECORDER FM MODULE

This Sangamo coaxial reel data tape Circuit Board was designed to condition and amplify the Frequency Modulated Signal from the launch vehicle and spacecraft telemetry before and during launch from the Kennedy Space Center Launch Facilities for the Apollo program, and later, for the earliest Space Shuttle flights.

It is constructed from high-quality space rated components for reliable functioning during the critical operations of the KSC launch procedures.

ORIGINAL



THERMAL PROTECTION TILE FROM THE BURAN SPACECRAFT. THE 1980S

It was used on the Buran ship as a thermal protection. This is a ceramic tile made for the Soviet space shuttle Buran. The Buran was a Soviet effort to replicate the American space shuttle program. The spacecraft had one voyage, without a crew in November 1988. After that, the program was cancelled. For years, there has been speculation as to how close a replica the Buran was to its American analogs. Like the American shuttle, the Soviets used three kinds of materials to protect the craft from the extreme temperatures of reentry. The leading edges of the nose and wing were protected with carbon fiber reinforcement. The underside of the craft was protected by black tiles and the upper side by white ceramic tiles. And also similar to the American case, each Soviet tile was marked with a serial number so that its location and performance would be documented over time. It can withstand temperatures up to 1500 degrees Celsius. The tile is very light, made of a special quartz material. The cost of making such tiles in the 1980s was 500 rubles, which was 2-2.5 salaries of an engineer.

ORIGINAL



BOUYANCY BELT - NEVA-KV



It is the original bag with the initials WCW was included in portable survival kit of the Russian Cosmonaut Sharipov during his space mission (Expedition 10) onboard spacecraft Soyuz TMA-5 (He was the commander). The Soyuz TMA-5 was a mission directed to the International Space Station between 14 Oct 2004 - 24 Apr 2005. It serves as the life preserver in case of a splashdown of the lander and it emergency escape, keeping positive buoyancy of the cosmonaut with the help of inflatable floats.

ORIGINAL

07

EARLY SOVIET SPACE STATION SALYUT WATER AND JUICE DRINKER FOR COSMONAUTS



The Cosmonauts drinker made for the first orbital space station Salyut. The device has 2 sockets marked "WATER" and "JUICE" closed by special valves. When cosmonauts connect to this drinker with their personal space flasks - they push the valve what let the liquid (water or juice) go into the flasks. The also also has ON/OFF switch and the indication light.

The drinker has a built-in design to be integrated with the space station interior. It's front cover can be opened. There is a manual rubber pump with a hose attached to it under the cover of the drinker. In addition to the pump, there is a cylindrical adapter for connection to personal cosmonauts flasks with several valves inside the drinker.

The drinker was made for on-Earth training copy of the space station, so, cosmonauts had study its functionality prior the mission.

ORIGINAL



RUSSIAN SPACE CAMERA

Soviet engineers pioneered the use of cameras on spacecraft, obtaining the first images of the far side of the Moon and the first images from the surface of the Moon and Venus. Soviet planetary spacecraft used cycloramic and swept linear photometers rather than vidicon television cameras. On later American missions, the Viking lander's panoramic camera and the Mars Odyssey linear pushbroom camera hark back to Soviet camera designs.

This one it's a External Chrysolite Video Camera for the Mir Station first and installed on ISS afterwards.

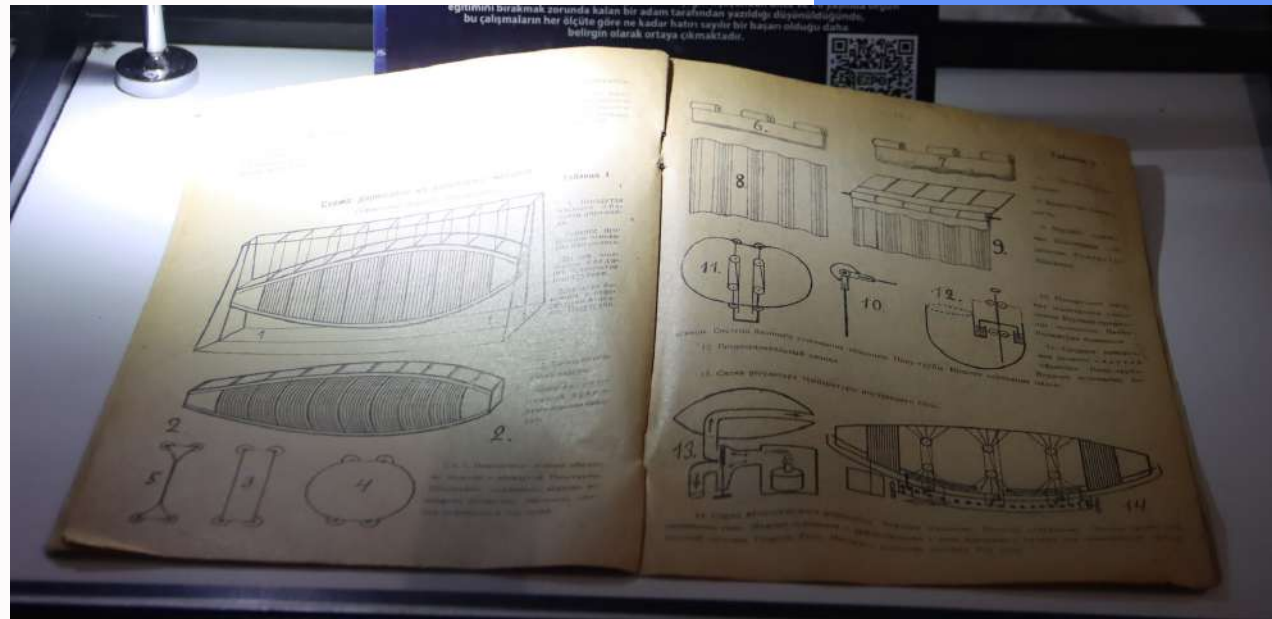
ORIGINAL

08

AIRSHIP OF WAVY STEEL

1928 Russian Book by K. Tsiolkovsky, 1st Ed., Kaluga

Earth is the cradle of humanity but one cannot live in the cradle forever taken from a letter written by Konstantin Tsiolkovsky in 1911



Russian-born scientist and mathematician Konstantin Tsiolkovsky is often referred to as the father of astronautics and human spaceflight. His visionary ideas for the future of humanity in space were far ahead of his time.

It is Tsiolkovsky who first determined that the escape velocity from the Earth into orbit was 8 km/second and that this could be achieved by using a multi-stage rocket fueled by liquid oxygen and liquid hydrogen. During his lifetime he published over 500 works on space travel and related subjects, including science fiction novels.

Among his works are designs for the construction of space rockets and ideas for steerable rocket engines, multi-stage boosters, space stations, airlocks for exiting a spaceship into the vacuum of space, and closed cycle biological systems to provide food and oxygen for space colonies. This is a remarkable achievement by any standards, but particularly as many of these documents were written before the first aeroplane flight and, by a man who had had to abandon his formal education at the age of 10.

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ORIGINAL

SOVIET COSMONAUT SURVIVAL RADIO-BEACON-BEEPER *KOMAR*



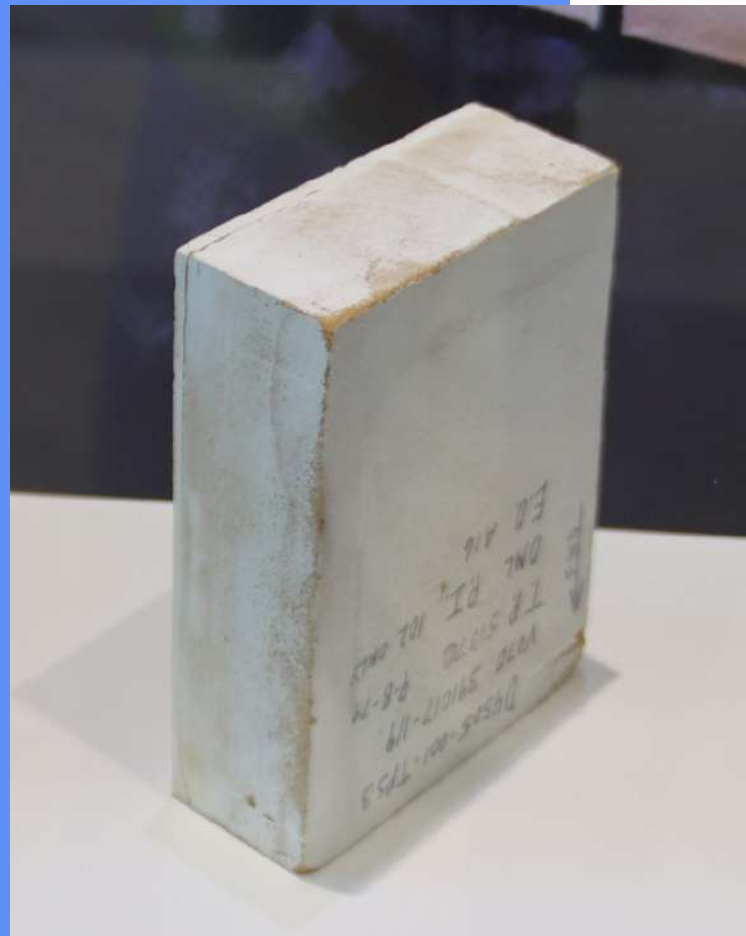
The Soviet radio-beacon "KOMAR" what means "mosquito" in Russian. This device helps the rescuers to find the cosmonauts after landing. The name of the radio transmitter reminds the signal what this beacon-beeper sends out when turned on. The orange inflatable cone is visible from the long distance after the beacon coordinates are determined by radio-radars. Such radio-beacons were used by the early Soviet spacecraft cosmonauts to be easy found if they land far from the expected area.

The beacon-beeper has interesting design - its body is quite heavy and its orange cone is inflatable by pressurized air what is containing in a special ballon. When the ballon trigger is pulled by a cosmonaut, the air inflates the orange cone what stands vertically after this procedure. The antenna is in the cone, so it stands vertically too, what is the best position for radio signal transmitting.

ORIGINAL

09

NASA SPACE SHUTTLE COLUMBIA OV-102 ORBITER EXTERNAL FIT CHECK REFERENCE TILE



The Orbiter's Thermal Protection System (TPS) was a major innovation in the space age with the project of creating the first reusable space vehicle, the Columbia Space Shuttle, depending on its success.

The TPS consists of various materials applied to the outer surface of the orbiter for protection in extreme temperatures, primarily during re-entry into the Earth's atmosphere. The orbiter's vulnerable aluminum structure could not withstand temperatures above 350 degrees F, and TPS materials were the only defense against its exposure. During re-entry the TPS materials performed in temperature ranges from minus 250 degrees F, in the cold soak of space, to atmospheric re-entry temperatures that reach 3,000 degrees F. Installing the re-entry enabling TPS tiles onto each Space Shuttle was not only one of the most critical stages involved in the orbiter assembly, it was incredibly complex as well. This artifact was used by technicians as a reference to aid with those rigorous calculations on the OV-102 Columbia. Fit Check Tiles, such as this one, were each custom designed and fabricated to be temporarily installed on the Columbia Orbiter's body, as a reference in testing size/shape within the Orbiter's tile configuration.

ORIGINAL

04.23



V-2 ROCKET INJECTION VALVE FOR COMBUSTION CHAMBER - FIRST HUMAN OBJECT IN SPACE

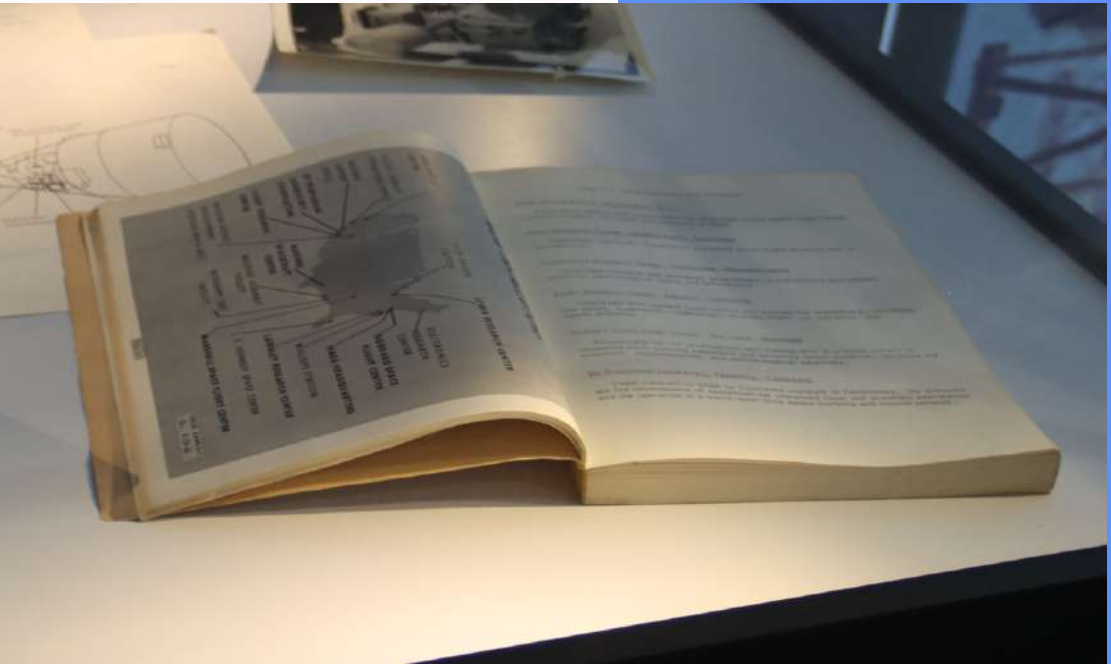


German World War II V-2 rocket injection valve used in the combustion chamber. The valve measures 0.75" by 0.75", in very good condition with minor rust accumulation. The V-2 rocket was the world's first long-range ballistic missile that was developed by Wernher von Braun and his team during the Second World War in Nazi Germany, specifically targeted at London and later Antwerp. Commonly referred to as the V-2 rocket, the liquid-propellant rocket was a combat-ballistic missile and the first known human object to enter outer space. It was the predecessor of all modern rockets, including those used by the United States and Soviet Union's space programs.

ORIGINAL

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04.23



MANUAL INDUSTRIAL ARTS AND SPACE TECHNOLOGY: Gemini - October 1966

Prepared for the National Aeronautics and Space Administration (NASA) by a committee of industrial arts educators under the direction of John L. Feirer, Western Michigan University, in connection with a conference conducted by the university of south florida, with the cooperation of the Florida Department of Education and NASA's John F. Kennedy Space Center.

ORIGINAL

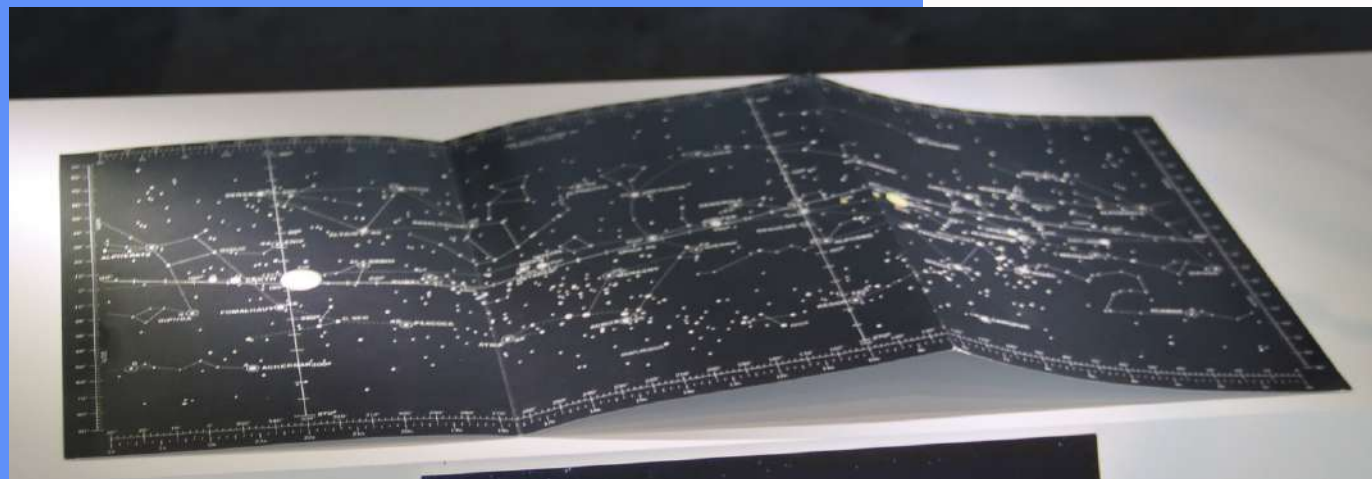


11

APOLLO 11 MISSION PATCH

The historical mission patch contains an error in its rendering of the shadow cast by the moon on the earth (here the correct view). National prestige is at stake. The enormity of the task is reflected in the mission patch chosen by the crew: a picture of an eagle, the national symbol, landing on the moon. In its talons is a cluster of olive branches, an international symbol for peace. Unlike most mission patches that have flown before or since, the names of the crew are purposely left off. Everything that anyone has ever done for the space program has reached a culmination. Apollo 11 represent the efforts of a nation.

ORIGINAL



04.23

STARS CHARTS

Forty-five minutes after the launch, the astronauts tried to get comfortable, sounding rather like friends settling in for a long car ride. Collins attempted to find a star named Menkent to help the spacecraft's guidance systems figure out their orientation in space. Each start that the computer using for alignment is given a number. After aligning on Menkent, which is star number 30, Collins repeats the process on a second star, Nunki, number 37. The computer afterwards was able to check the spacecraft alignment.

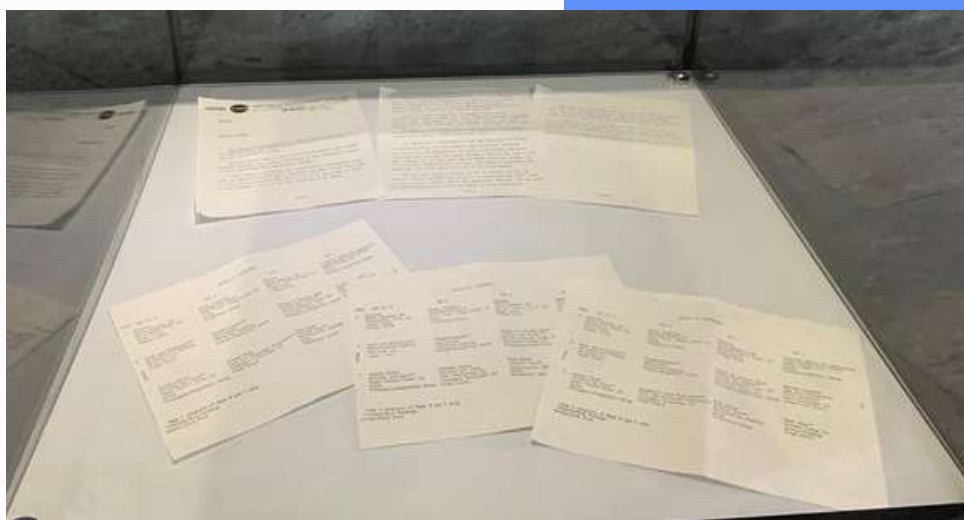
ORIGINAL



LUNAR MODULE'S CHECKLIST

Getting EAGLE (Lunar Module) ready for descent to the surface. Flight Director Gene Kranz writes an entry in the log, "this team is not too red hot". In the meantime, Buzz Aldrin and Neil Armstrong being to prepare the Lunar Module (LM) for Landing using this checklist.

ORIGINAL



APOLLO MENU PRESS RELEASE

The food selection on Apollo 11 is greater than on any previous mission. NASA has attempted to tailor meals around the tastes of the individual crew members. Apollo crews have a limited list of 60 or 70 foods they can choose from. Some are delicious by any standards, and other are quite tasteless.

ORIGINAL

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LUNAR'S CHART

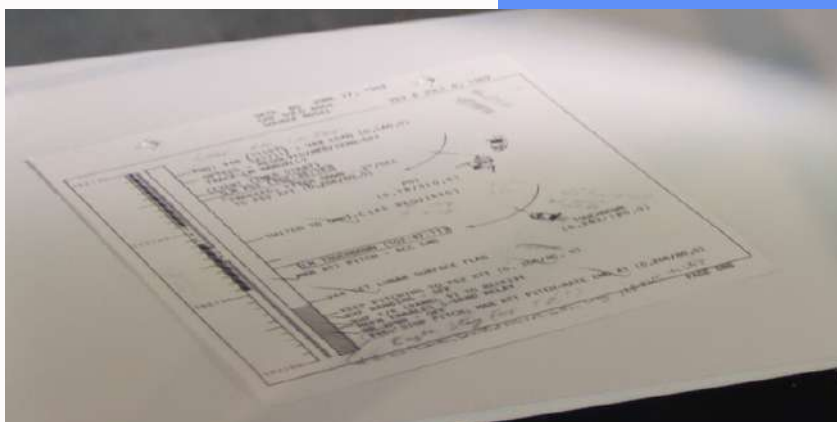
One of Collins's tasks was locating EAGLE on the lunar surface. Collins checks off squares on LAM-2 (Lunar Area Map - 2) as he searches for EAGLE from Orbit. The actual landing site was never accurately determined until after the men returned to Earth, although Collins was quite close at one point.

ORIGINAL

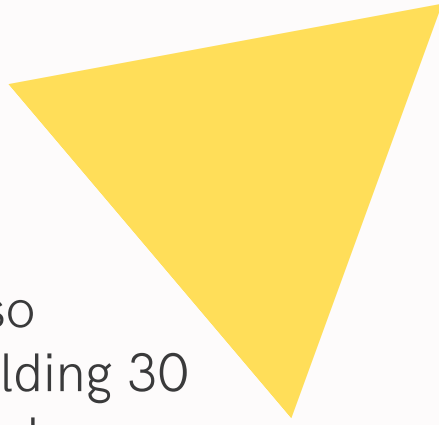
SOLO BOOK (Notes)

While Collins's crewmates are away, he has an array of duties to perform. If something goes wrong, then he must be prepared to rescue the LM if possible or even return to Earth without the other Astronauts. Both his nominal duties and contingency flight plan are kept in a special "SOLO BOOK", which he gets ready to use. Here display Collins monitors Eagle's descent over the radio and makes notes in his SOLO BOOK.

ORIGINAL

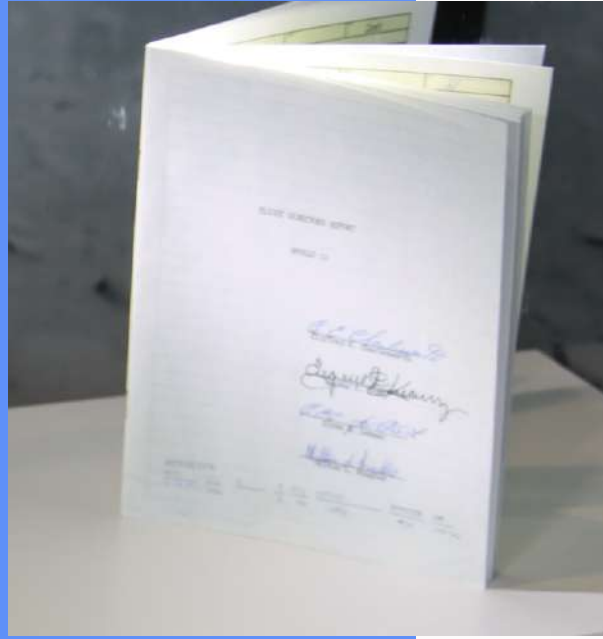


04.23



FLIGHT DIRECTORS REPORT

Since opening in 1963, the Manned Spaceflight Center (now called the Johnson Space Center) had been the hub of the agency's operations - not just during missions, but also through much of the technology development and astronaut training programmes. Building 30 was the centre of it all. Its control room, with its four rows of grey IBM computer consoles, gauges, dials and meters, monitored some 1,500 items of constantly changing information. Within the control room, teams of mission experts worked round the clock during missions, overlapping with each other in four eight-hour shifts codenamed green, white, black and maroon. These controllers' average age was only 32, and most had degrees in engineering, mathematics or physics. Each team was responsible to a flight director; maroon team was led by Milt Windier, black by Glynn Lunney, white by Gene Kranz and green by Cliff Charlesworth, who was in overall charge of the Apollo 11 mission.



ORIGINAL

FRONT PAGE OF THE WASHINGTON POST

The historical spaceflight makes headlines in most of the world's newspapers the next day.

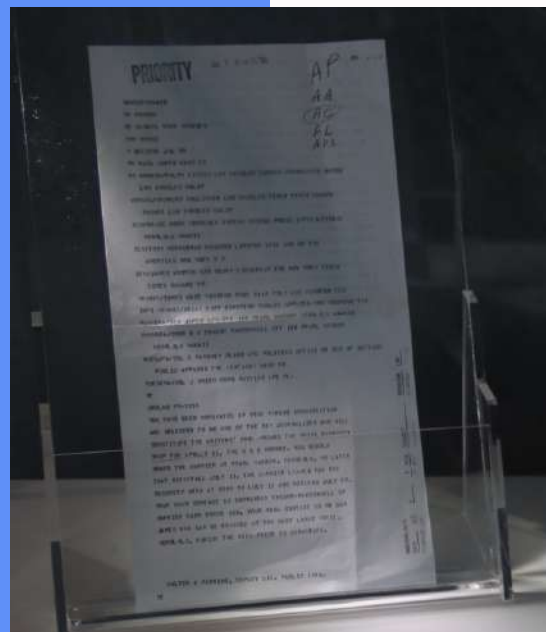
ORIGINAL



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NASA'S COMMUNICATION

Six Journalist are chosen to be represent the world's press corps aboard the prime recovery ship, U.S.S. Hornet, in the Pacific Ocean. All dispatches they file also must be sent to NASA's News Center in Houston where they are made available to news agencies around the world.



ORIGINAL

04.23



FLIGHT SUIT

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SLEEPING BAG SPACE SHUTTLE

You are ready for your bed now, but there are no beds on space. A sleeping bag is attached to one of the walls of your cabin with bungee cords instead. With no need to support your body and head against gravity, you sleep vertically in Space, not horizontally. You poke your arms through the holes, and as you relax, your hands float out in front of you, making you look a little like a marauding zombie. Some astronauts find it difficult to sleep like this, so they fold their arms or tuck them inside the sleeping bag. You can shorten the cords so you're more tightly bound to the wall. Others enjoy the freedom of floating around the cabin during their slumber, although you might just bump into things and startle yourself awake. Being trussed up also mean it takes a longer to free yourself if you need to make a trip the bathroom in the night

Extra image: Mission Specialist Fabian sleeps in zippered sleeping bag fastened to the middeck starboard wall on a 1983 mission.

ORIGINAL



RUSSIAN COSMONAUT'S WATER-COOLING UNDERGARMENT FOR EVA IN ORLAN SPACESUIT

This is a undergarment for cooling the Orlan D space suit that used in 1979 by Valery Rjumin (Валерий Рюмин) who entered the space on the space station Saljut-6 during the 175 days orbital flight. Unique case in history when the suit was actually brought back from space in order to check the condition of the wires and additional testing. The undergarment can be used with spacesuits with both manual and automatic thermal control systems. The suit is a meshy garment made of a knitted net-looking fabric through which elastic pipes of a cooling system are woven. The garment fits tightly to the body, pressing the pipes of the cooling system close to a cosmonaut body. The mesh structure of the fabric facilitates access of ventilating air to the surface of a human body. The suit can be used with spacesuits equipped with both manual and automatic thermal control systems. The principles of operation and its basic design solutions are the same as in the earlier version of the suit.

Made individually for every single cosmonaut.

ORIGINAL

FLIGHT SUIT

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FLIGHT SUIT OF ALEXEI LEONOV

Alekséi Arjípovich Leónov is a Russian cosmonaut who made the first spacewalk on 18th March 1965. Leonov was one of twenty pilots of the Soviet Air Force selected to be part of the first group of cosmonauts in 1960. Like all Soviet cosmonauts, Leonov was a member of the Communist Party of the Soviet Union. Another of his greatest achievements was to be the Russian commander of the first joint Apollo-Soyuz mission. This was the costume design for that mission. Leonov defeated astronaut Ed White for three months, being the first man to go into space. The Voskhod capsule carried two men into space, just like the American Gemini capsule.

There were moments of tension when Leonov once in space tried to return to the capsule. The swollen suit did not allow him to penetrate the capsule. He had to deflate him losing pressure and putting his life at risk.

ORIGINAL

FLIGHT SUIT

04.23



FLIGHT SUIT



GERMAN AIR FORCE FLIGHT SUIT BY EDGAR BURCHARD

Officer of the German Air Force, specializing in aerospace medical science, he worked for two years at NASA, at the Johnson Space Center, between the Apollos and Skylab, together with scientists from the Skylab project.

Experience of 18,000 hours of flight (by plane). Specialist in topics related to hyperbaric oxygenation and spatial disorientation. Together with Von Braun, he was one of the Germans re-fished by NASA after the Second World War.

ORIGINAL

16

FLIGHT SUIT



HIGH ALTITUDE FLIGHT SUIT VKK-6

The VKK-6M is the most common flight suit in Soviet times, as well as in the Russian Air Force. It is designed for long flights at high altitude. VKK stands for "vysočno-kompensiruyushchi kostyum" or altitude compensation suit. These suits served as a test of future spacesuits. The suit connects through the hoses to the connectors in the cockpit. There is no pressure control valve in the suit itself because everything is controlled from inside the cabin. This suit was used in the MIG-25R in 1965.

ORIGINAL

04.23



FLIGHT SUIT ISS

Sharipov has flown two missions and has logged over 422 hours in space, including 9 hours and 58 minutes of EVA. He served as a mission specialist on the crew of STS-89 (January 22-31, 1998), the eighth Shuttle-Mir docking mission during which the crew transferred more than 8,000 pounds of scientific equipment, logistical hardware and water from Space Shuttle Endeavour to Mir. In the fifth and last exchange of a U.S. astronaut, STS-89 delivered Andy Thomas to Mir and returned with David Wolf. Mission duration was 8 days, 19 hours and 47 seconds, traveling 3.6 million miles in 138 orbits of the Earth.

ORIGINAL

FLIGHT SUIT

17



RUSSIAN HIGH-ALTITUDE FLIGHT SUIT VMSK-4

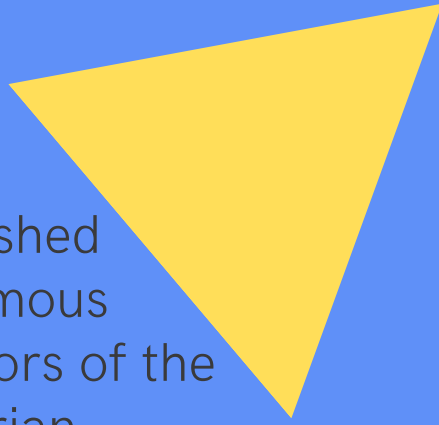
Russian high-altitude flight suit VMSK-4 it is similar to the SK-1, which Gagarin wore, with underwear. The SK-1 spacesuit was a type of emergency and rescue suit, which cosmonauts put on for launch and re-entry. Interestingly, even the first spacesuits had a waste collection system, so they didn't have to be taken off when a cosmonaut needed to answer the call of nature. In the event of cabin depressurization, for example, the spacesuits would have supported the cosmonauts for five hours

The VMSK-4, it is the model developed in the following years, designed to provide individual life support to spacecraft crews operating over ground and sea at high altitudes. Suit has its rubberized neck drape, as well as its original tag sewn into the inside shoulder, numerous pockets on the front side and two pockets on the back with GP- 2M-1 gloves inside, which are tethered to the suit. As the SK-1 this suit has a waste collection system.

ORIGINAL

FLIGHT SUIT

04.23



HIGH ALTITUDE FLIGHT SUIT BAKLAN

Prior to space flights, high-altitude flights were developed in which experimental airplanes brushed the stratosphere. It was military flights among which the spy planes stood out. Given the enormous altitude at which they flew, pressure maintenance suits were developed that were the precursors of the modern astronaut suit. As you can see, the Backan suit is very similar to the suit worn by Austrian adventurer Felix Baumgartner, who was the current parachute jump recordman. Despite the aesthetic difference, its construction principles are very similar.

The Baklan full-pressure suit was developed by Zvezda for the crew of high altitude strategic aviation aircraft since 1970. Derived from Baklan full pressure suit is the Strizh that is a space suit that was originally developed for the crew of the Russian Buran space shuttle and resembled the Sokol space suit worn by Soyuz crew members. It was designed to protect cosmonauts during a possible ejection from the spacecraft at altitudes of up to 30 km and speeds of up to Mach 3 that is a dimensionless quantity representing the ratio of flow velocity past a boundary to the local speed of sound: $M = u/c$ where: M is the Mach number, u is the local flow velocity with respect to the boundaries (either internal, such as an object immersed in the flow, or external, like a channel), and c is the speed of sound in the medium.

ORIGINAL

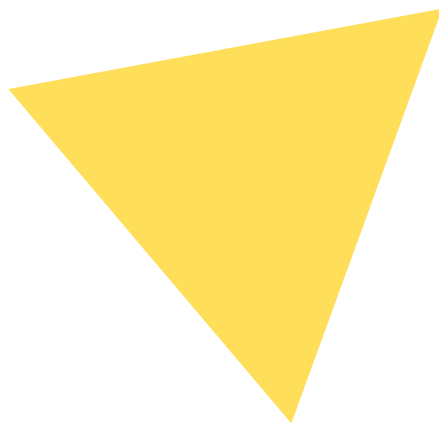
FLIGHT SUIT



TOUCH THE MOON [NWA 7834]

Specimens of the Moon and Mars are among the rarest substances on Earth. Apollo astronauts brought back to Earth some pieces of the Moon while others arrive on Earth as a result of asteroids slamming into the lunar surface. These impacts launch chunks of the Moon into outer space. Some of these pieces have Earth-intersecting orbits and become the most rare type of Lunar meteorite. This specimen was intercepted falling in the Sahara Desert. Its scientific name is NWA 7834. It is the 7834th Lunar rock recovered from the North West African corridor of the Sahara Desert that has been scientifically analyzed and classified.

ORIGINAL



ORIGINAL

RKA Standard Space Food

1. Scrambled eggs
2. Dry multigrain breakfast cheerios
3. Cashew chicken curry
4. Moscow Rye Bread
5. Borsch with meat
6. Hawaiian Macadamia Nuts
7. Tea with sugar
8. Natural canned Salmon
9. Corn
10. Borscht in a tube



NASA Standard Space Food

11. Cherry Blueberry Cobbler
12. Chicken with Corn & Black Beans
13. Chicken Noodle Soup
14. Tortillas
15. Mango-Peach Smoothie
16. Kona Coffee with Cream & Sugar
17. Green tea with sugar
18. StarKist Chunk Light Tuna in Water
19. Cheddar Cheese Spread
20. Nuts & fruit Granola bar



ORIGINAL

SPACE FOOD

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SPACE FOOD

04.23

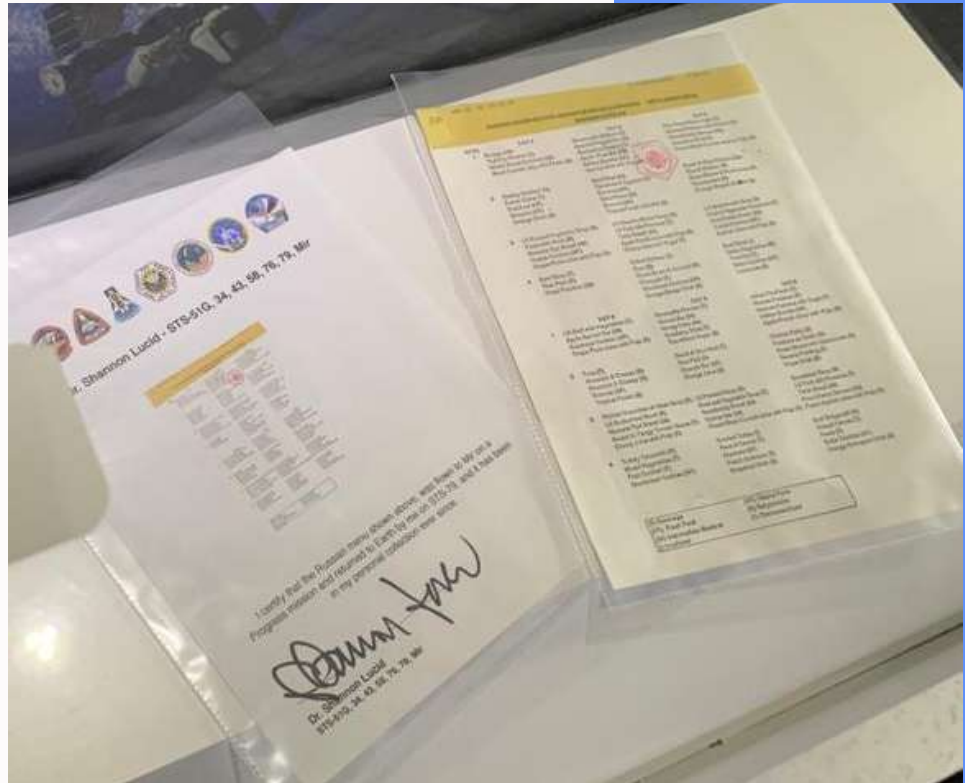


ESA Bonus Space Food (Luca Parmitano - Mission VOLARE 2013)

- 31. Taralli mignon with Extravergin Olive Oil
- 32. Sundried Tomato Patè
- 33. Green Olives Patè
- 34. Space Chocolate with Coffee Beans
- 35. Fregola Pasta with Bellpepper
- 36. Gobino Coffee Dragees with Dark Chocolate
- 37. Blended 75% Gobino Dark Chocolate
- 38. Blended 83% Gobino Dark Chocolate

ORIGINAL

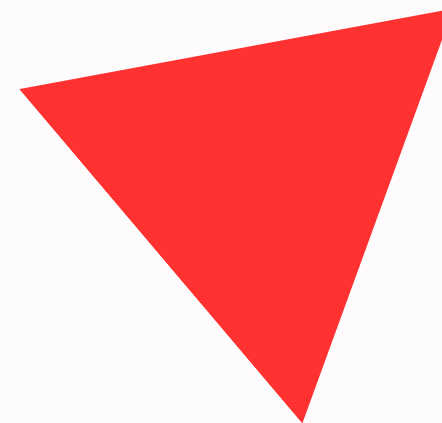
SPACE FOOD



List of Russian-American food rations for MIR-NASA program flown in space to MIR and returned on STS-79 (from the personal Collection of Shannon Lucid).

ORIGINAL

OBJECTS RECREATIONS AND MODELS



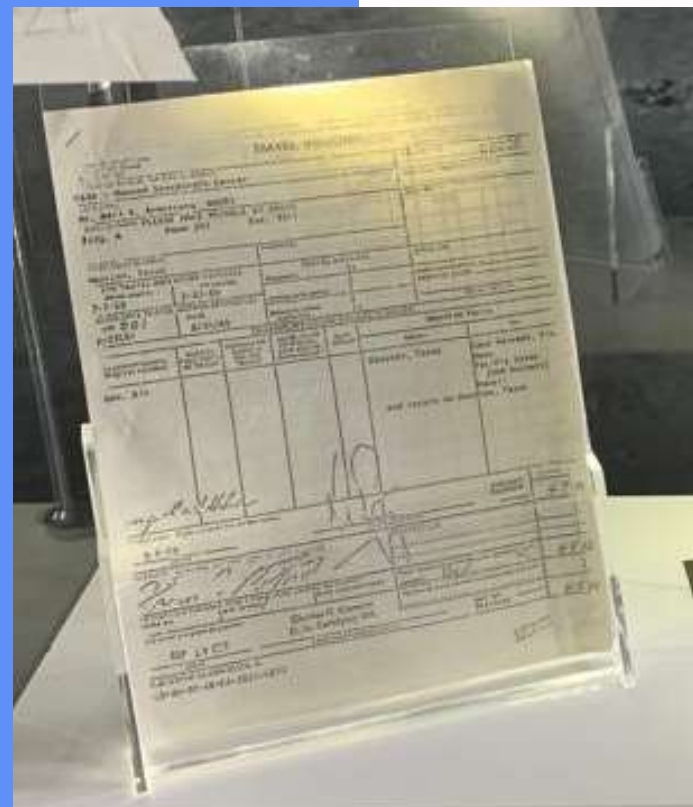
21



CUSTOMS DECLARATION

As the Customs Declaration notes, any condition onboard that might lead to the spread of disease have yet to be determinate. The returning astronauts are isolated first in a trailer (far right) and then in a suite of rooms at the manned Spacecraft Center, Houston for 21 days following possible exposure. While still in quarantine aboard the U.S.S. Hornet, the astronauts retrieve their logs and gear from Columbia through a connecting tunnel; Mike Collins takes the opportunity to write a thank you on the wall above the sextant mount (top Right)to the trusty space capsule that flew them to the Moon and Safely home again. By the third lunar landing it is conclusively determined that the moon is sterile and further crews do not have to endure quarantine.

RECREATION

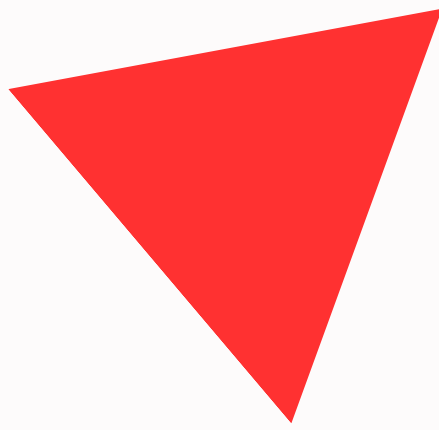


NEIL ARMSTRONG'S TRAVEL VOUCHER

The voucher itemizes each detail of Armstrong's travel arrangements, with a "government spacecraft" noted among government aircraft and automobiles used on the trip. "Government meals and quarters furnished for all above dates," the voucher states. Arriving in Honolulu, Hawaii, on 24 July 1969, Aldrin, Neil Armstrong and Michael Collins declared they had brought back "moon rock and moon dust samples". Taking into account inflation, astronaut declared an average expenses of \$33.31 in 1969 would be worth around \$217 today.

RECREATION

04.23



WERNHER VON BRAUN'S TELESCOPE

In 1925 his mother gave him his first telescope and he soon decided to devote his life to rocketry and the exploration of space.

RECREATION

22



SPACE SUIT LES - Space Shuttle

The Launch Entry Suit (LES), known as the "pumpkin suit", is a partial-pressure suit that was worn by all Space Shuttle crews for the ascent and entry portions of flight from STS-26 (1988) to STS-65 (1994). It was completely phased out by STS-88 (late 1998) and replaced by the ACES suit. The suit was manufactured by the David Clark Company of Worcester, Massachusetts.

The LES was first worn by U.S. Air Force pilots replacing a similar suit worn by SR-71 and U-2 pilots, and was identical to the suits worn by X-15 pilots and Gemini astronauts.

Each suit was sized individually, although most suits could be worn by astronauts of different heights. It included a parachute and flotation device.

RECREATION

FLIGHT SUIT

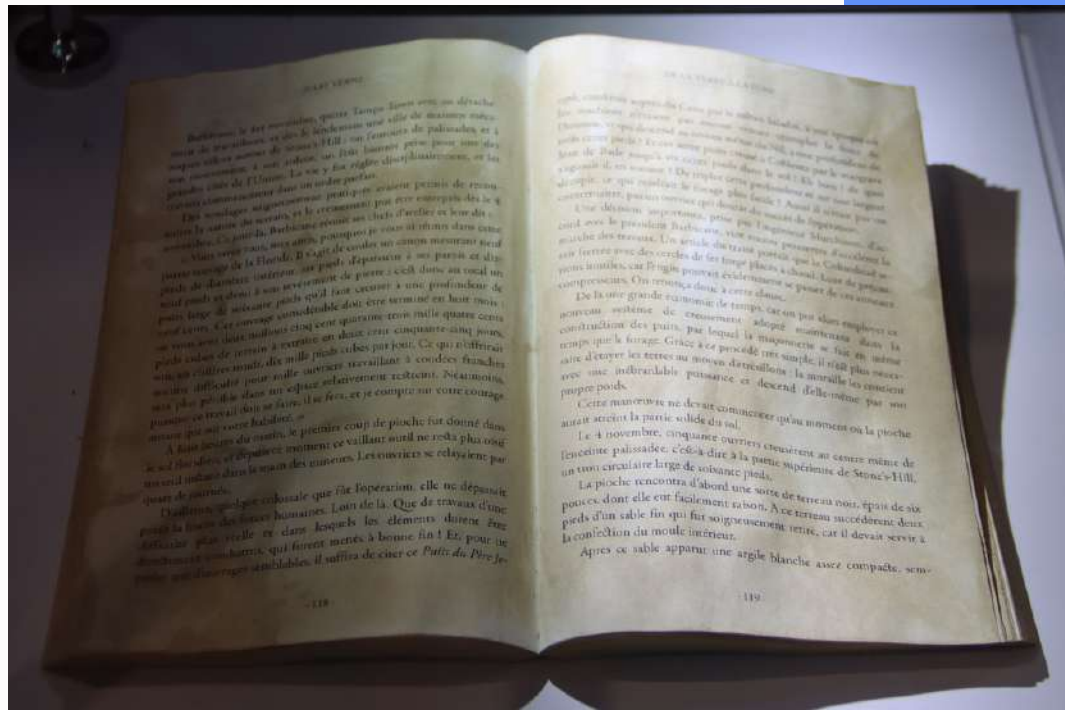
04.23



FROM THE EARTH TO THE MOON - THE INFLUENCE OF FICTION

From the Earth to the Moon or (De la Terre à la Lune) by Jules Verne inspired generations, including many pioneers of early spaceflight. Published in 1865, the members of the book's Baltimore Gun Club believe that a cannon could launch people in a projectile to the Moon. Verne's story of the mission comes eerily close to real life. While the capsule launches successfully, what happens next is in the sequel Autour de la Lune or Around the Moon. This book is a first edition printed in the original French.

RECREATION



23



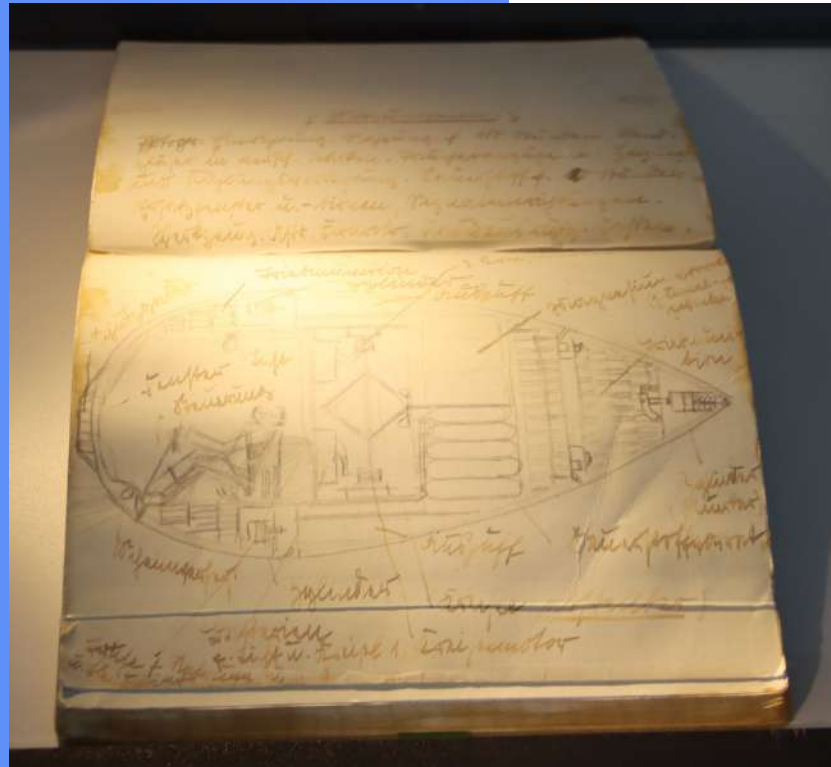
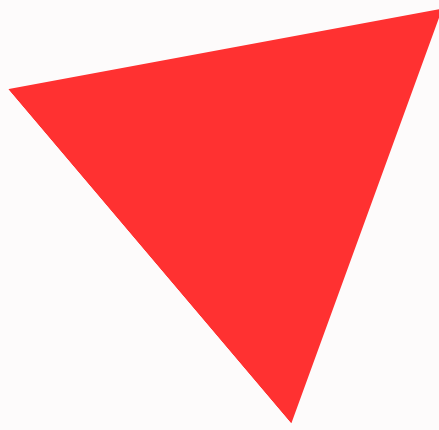
PIONEERS

Dr. Goddard with Historic Rocket "Nell"

Dr. Robert H. Goddard launched his historic rocket "Nell" on March 16, 1926, from what was then the Asa Ward Farm (Aunt Effie's farm) in Auburn, Massachusetts. Its 10-foot (3.0 m) cylinder reached an altitude of 41 feet (12 m), flew for two-and-a-half seconds, and fell to the ground 184 feet (56 m) from the launching frame.

RECREATION

04.23



WERNHER VON BRAUN'S CHILDHOOD NOTEBOOK

Inspiration changes lives. This replica of Wernher von Braun's childhood notebook circa 1924 is filled with sketches, calculations for fuel, supplies and materials needed for a space journey. The illustrations with Russian notes are excerpts from a book by physicist Konstantin Tsiolkovsky. Considered the father of modern rocket science and astronautics, Tsiolkovsky, born in 1857, was the first to propose multi-stage rockets and liquid propellants. Notice the remarkable similarities between the two drawings.

RECREATION



THE VON BRAUN ROCKET WAGON

This little red wagon represents the dreams of a young missile pioneer. At age 12, Wernher von Braun, designer of the V-2 rocket, the propulsion genius behind the American moon-landing program, began his rocket experiments. Strapping six large fireworks to the sides of a wooden wagon, von Braun set off down a crowded Berlin Street. The young scientist started pedestrian on Tiergarten Strasse and knocked over fruit carts. Ultimately, the wagon was destroyed and the police took the young Wernher home.

RECREATION



LAIKA

Sputnik 2 was the second spacecraft launched into Earth orbit and was the first such biological spacecraft. It was a 4 meter high cone-shaped capsule with a base diameter of 2 meters.

A separate sealed cabin contained the experimental dog Laika.

The first being to orbit the Earth was a female part-Samoyed terrier originally named Kudryavka (Little Curly) but later renamed Laika (Barker). She weighed about 6 kg. The pressurized cabin on Sputnik 2 allowed enough room for her to lie down or stand and was padded. An air regeneration system provided oxygen; food and water were dispensed in a gelatinized form. Laika was fitted with a harness, a bag to collect waste, and electrodes to monitor vital signs. The early telemetry indicated Laika was agitated but eating her food. There was no capability of returning a payload safely to Earth at this time, so it was planned that Laika would run out of oxygen after about 10 days of orbiting the Earth. The mission provided scientists with the first data on the behavior of a living organism orbiting in the space environment.

RECREATION



ABLE

This is Able, a preserved female rhesus monkey. Born in Independence, Kansas, she flew inside a Jupiter nose cone with Baker, a female squirrel monkey on May 28, 1959, in an Army experiment designed to test the biomedical effects of space travel. Launched from Cape Canaveral, they reached a maximum altitude of 300 miles and travelled downrange 2,000 miles at speeds reaching 10,000 mph before reentering the Earth's atmosphere and being recovered by Navy ships. Both monkeys survived the trip well, but Able died from the anesthesia during a routine post-flight operation.

RECREATION



DARTH VADER

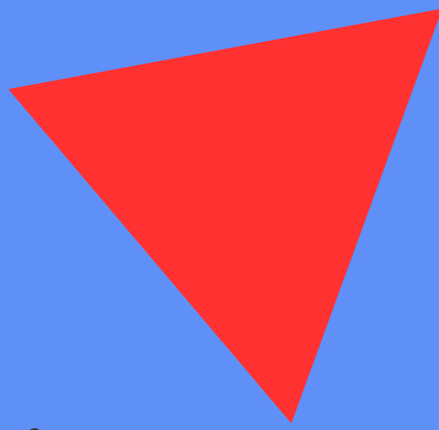
Darth Vader is a main character of the Star Wars saga written by George Lucas. This limited edition prop replica as seen in Star Wars: The Empire Strikes Back stands at a towering 2.02 meters. As science fiction inspired the minds of Oberth, von Braun, Tsiolkovsky and others, modern science fiction has already inspired the technology of today. Although the Star Wars series is science fiction, it expands the human imagination and inspires hopeful visions of the future.

RECREATION

YODA

Yoda, a Force-sensitive male being belonging to a mysterious species, was a legendary Jedi Master who witnessed the rise and fall of the Galactic Republic, followed by the rise of the Galactic Empire. Small in stature but revered for his wisdom and power, Yoda trained generations of Jedi, ultimately serving as the Grand Master of the Jedi Order. Having lived through nine centuries of galactic history, he played integral roles in the Clone Wars, the rebirth of the Jedi through Luke Skywalker, and unlocking the path to immortality.

RECREATION



ROSETTA & PHILAE

Philae scale 1: 2

Rosetta - Philae 2014

European mission that studied the composition of comet Churyumov-Gerasimenko, 67P, after a journey that lasted over 10 years, chasing it for a long stretch of its orbit and landing the Philae automatic laboratory which provided information on the nature and composition of the solar system to the his birth, which is the same age, but above all on the possibility that comets are the carriers of life in the universe.

One of the main scientists involved in this mission was Amalia Ercoli Finzi of the Politecnico di Milano and a member of our scientific committee.

RECREATION



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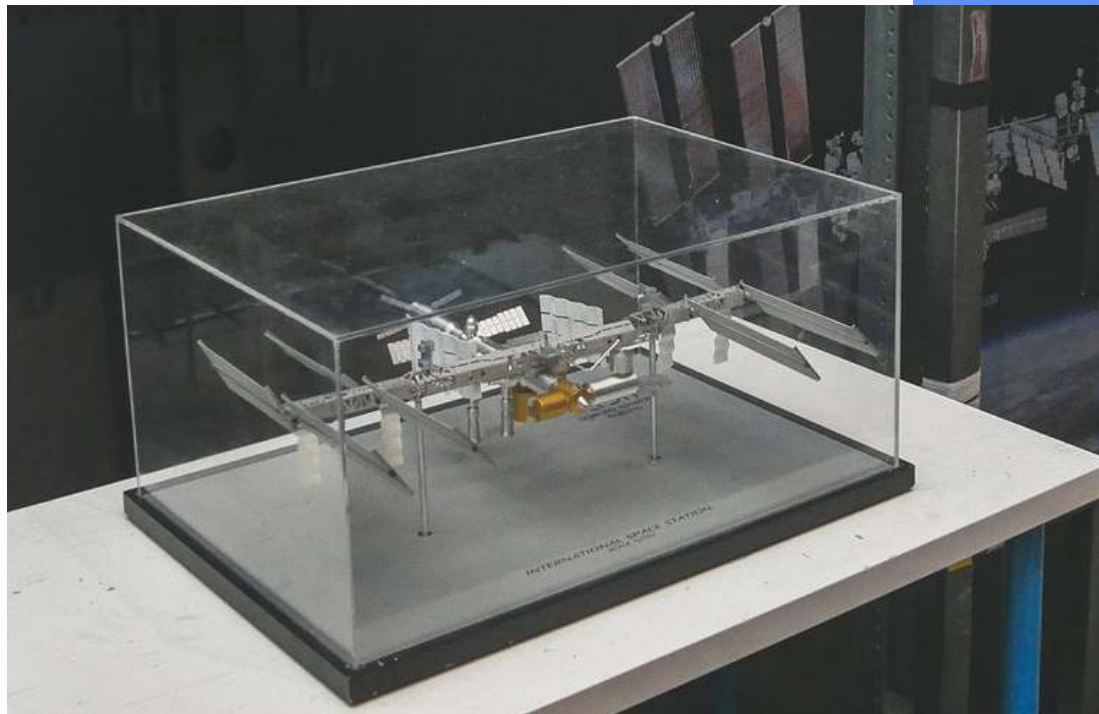
THE INTERNATIONAL SPACE STATION

The International Space Station serves as a floating science laboratory, deep space observatory and high tech Earth observation station. With 15 partner nations and five space agencies, the ISS is the largest international peacetime project in history. The first module, Zarya (Dawn), was launched by the Russians in November of 1998. The last construction flight was the delivery of the alpha magnetic spectrometer onboard the Space Shuttle Endeavour, mission STS-134. The station consists of 15 pressurized modules, the integrated truss structure and the solar arrays. The Russians will launch two more modules, the Nauka (Science) and Uzlovoy (Nodal) in 2014. The ISS expected lifetime ends in 2020.

Length: 356 ft /108.5 m

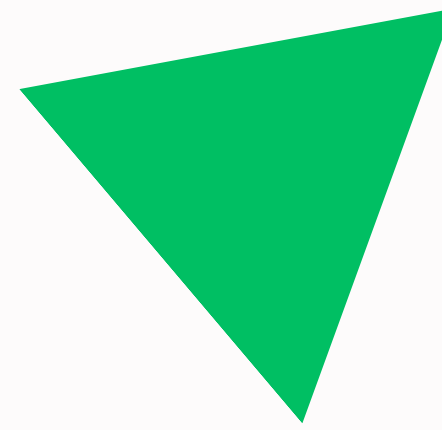
Width: 240 ft /73 m

Mass: 925.059 lb /419.600 Kg



RECREATION

EXHIBIT RECREATIONS



29



THE SPACE SHUTTLE'S COCKPIT

The space shuttle orbiter flight deck serves as the cockpit of the vehicle. With controls for electrical, life support and propulsion systems, as well as joysticks for steering during landing, the forward flight deck is the heart of the vehicle. Throughout the entire mission, the pilot and commander use this area to monitor and maintain the health of the vehicle. The commander sits on the left, with the pilot on the right. Both crew members are trained in all of the orbiter's systems and are fully capable of flying the vehicle.

RECREATION

04.23



SPACE SHUTTLE PAYLOAD CONTROLS

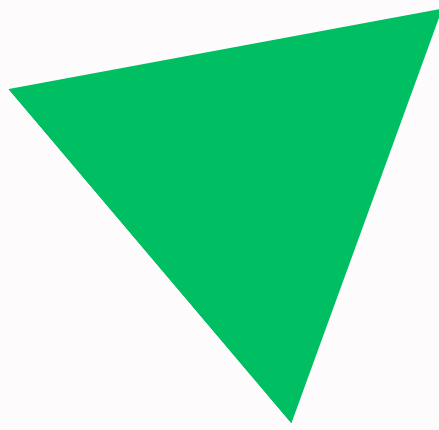
The aft flight deck seats additional crew members, known as mission specialists, during launch and landing. Once on-orbit, the aft panels and controls focus on the cargo in the payload bay. In this area are controls to open and close the payload bay doors, and joysticks to operate the mechanical arm or Canadarm. Customized control panels designed specifically for a particular mission are installed in aft panels. There are also two sets of windows, one on the back wall used to monitor ongoing spacewalks, and two overhead windows to monitor docking procedures.

RECREATION



APOLLO CAPSULE

The Apollo command module was the launch and reentry vehicle for United States astronauts in the Apollo program. Three astronauts sat atop the massive Saturn V rocket. After ferrying the crew to the Moon, the Apollo capsule remained in lunar orbit with one crew member, while two crew members went to the Moon's surface. The command module pilot remained on board the capsule throughout the entire flight in order to better ensure ready transportation home at the end of the mission. This 1:1 scale model, based on an early design, shows the final proportions and interior layout.



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THE SPACECRAFT VOSTOK 1

Vostok 1 was the first spacecraft to carry a human, Yuri A. Gagarin, into space, occurring 25 days prior to the first U.S. suborbital flight. Because of concerns of adverse reactions due to experiencing weightlessness, the manual controls on the spacecraft were locked prior to launch and the entire flight was under the control of ground personnel.

The spacecraft consisted of a nearly spherical cabin covered with ablative material. There were three small portholes and external radio antennas. Radios, a life support system, instrumentation, and an ejection seat were contained in the manned cabin. This cabin was attached to a service module that carried chemical batteries, orientation rockets, the main retro system, and added support equipment for the total system. This module was separated from the manned cabin on reentry. After one orbit, the spacecraft reentered the atmosphere and landed in Kazakhstan (about 26 km southwest of Engels) 1 hour 48 minutes after launch.

The Vostok spacecraft was designed to eject the cosmonaut at approximately 7 km and allow him to return to earth by parachute. Although initial reports made it unclear whether Gagarin landed in this manner or returned in the spacecraft, subsequent reports confirmed that he did indeed eject from the capsule. Radio communications with earth were continuous during the flight, and television transmissions were also made from space.

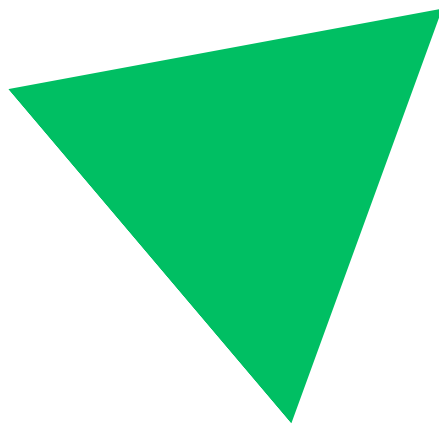
04.23

RECREATION



SPUTNIK : STARTING LINE OF THE SPACE RACE

With Sputnik, the "beep heard all over the world", the Soviets launched both the first space satellite and the space race with the United States. Carried aboard a Vostok-K rocket, Sputnik was able to teach scientists about the density of the atmosphere in the low earth orbit, as well as information on the ionosphere. The Sputnik was a polished sphere, 23 inches / 58 centimeters in diameter, with four external radio antennas to transmit radio pulses. Sputnik sent radio signals for 22 days and orbited around the Earth for three months after the October 4, 1957 Launch. The Americans reacted to Sputnik with curiosity and fear. This historical event accelerated the development of American space technology. One of the models used in the tests is displayed here.



ORION

Boeing CEV/CST-100

This Boeing Company concept for the crew exploration vehicle was designed to take crews to low Earth orbit. However, on August 31, 2006, NASA awarded Lockheed Martin the contract for next generation crew vehicle. The shape of the CEV resembles America's Apollo space capsule.

FLIGHT TESTED

FIRST LAUNCH

On Dec. 5, 2014, Orion launched atop a Delta IV Heavy rocket from Cape Canaveral Air Force Station's Space Launch Complex 37.

ORION FLIGHT TEST

Loaded with almost 1,200 sensors, Orion completed a two-orbit, 4.5-hour flight to test many of the systems most critical to safety before it carries astronauts.

IN THE FUTURE

Orion will launch on NASA's new heavy-lift rocket, the Space Launch System. More powerful than any other rocket ever built, SLS will be capable of sending humans to an asteroid and eventually to Mars.

Maximum diameter: 16,5 ft /5m

Habitable Volume: 691 cu.ft /8,95 m³

Mass: 46.848 lb /21.250 kg



FIRST AMERICAN SATELLITE - Explorer

In response to the soviet's Sputnik satellite achievement, the United States returned the launch volley with Explorer 1. Explorer 1, carried by a Jupiter-C rocket on January 31, 1958, provided groundbreaking evidence of the existence of the Van Allen radiation belt which protects the Earth from harmful solar radiation. All three upper stages were housed within the barrel dizzying 750 revolution per minute. The success of Explorer 1 by the United States Army led to the formation of the National Aeronautics and Space Administration (NASA), a civilian organization dedicated to the exploration of space.

Height: 69.55 ft/21.2m
 Mass: 64.200 lb/29.180 Kg
 Maximum diameter: 5,84 in/1,78m
 Thrust at launch: 83.000 lb/37.648 Kg

RECREATION

AMERICA'S FIRST SPACECRAFT - MERCURY

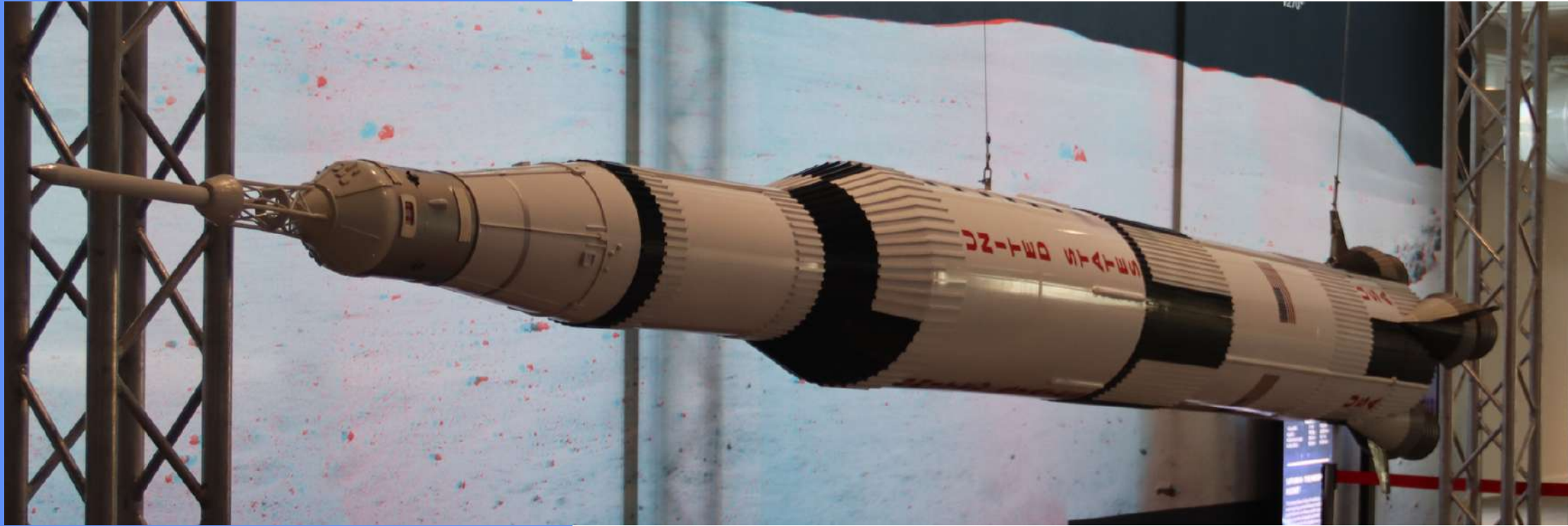
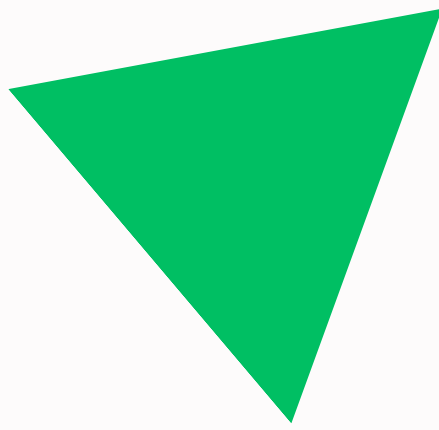
The Mercury spacecraft is the United States' first human space flight vehicle. Mercury launched in 1959 and continued in use until 1963. With no computers, all on-board systems were operated by mechanical timers or by the single astronaut pilot. Both Mercury-Redstone and Mercury-Atlas rockets launched this capsule, carrying astronauts to suborbital and orbital flights. Astronauts could be no taller than 5 feet 11 inches (1.8 meters). Space was so restricted, designers had to mold seats to fit astronauts' bodies.

Height: 11 ft, 4 in/345.4 cm
 Mass: 3,000 lb /1360.8 kg
 Maximum diameter: 74 in /188 cm

Mercury-Redstone 3, or Freedom 7, was the first United States human spaceflight, on May 5, 1961, piloted by astronaut Alan Shepard. It was the first crewed flight of Project Mercury. The project had the ultimate objective of putting an astronaut into orbit around the Earth and return him safely.

RECREATION





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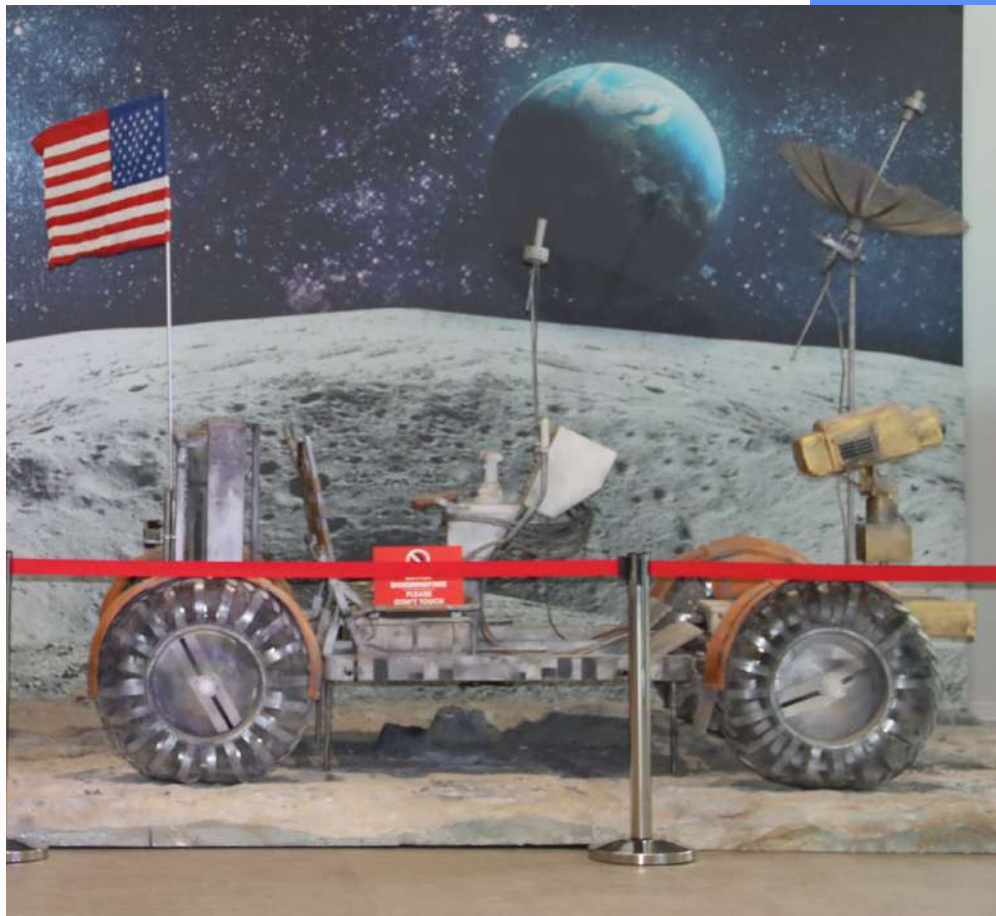
SATURN V - THE MOON ROCKET

The United States Saturn V rocket is the most awe-inspiring, powerful launch vehicle ever built. Wernher von Braun and his team of rocket scientists designed and built the Saturn V rocket for the Apollo lunar program. It remains the only vehicle to have carried astronauts beyond low Earth orbit. Steve Eves launched this 1:10 scale model in Maryland, United States on April 25, 2009. It flew to heights of over 1,000 feet, and safely parachuted to land on its tail.

	Saturn 1:10	Saturn 1:1
Height:	36 ft/11 m	363 ft/110,6 m
Mass:	1648 lb/748 kg	6.200.000 lb/2.800.000 kg
Maximum diameter:	3ft/100cm	33 ft/10,1 m
Thrust at launch:	367.000 lb /166.468 kg	7.648.000 lb/3.469.000 kg

04.23

RECREATION



LUNAR ROVER MODEL

This is a full-size model of the Lunar Roving Vehicle prototype. The LRV is a battery-operated, space exploration vehicle designed to move across the surface of the Moon. Three LRVs were deployed with Apollo 15, 16 and 17 (1971-1972) and are still on the lunar surface. It is popularly called the Moon buggy, a play on the term dune buggy.

Built by Boeing in 17 months, each LRV has a mass of 460 pounds (210 kg) without payload. It could carry a maximum payload of 1,080 pounds (490 kg), including two astronauts, equipment, and lunar samples, and was designed for a top speed of 8 miles per hour (13 km/h), although it achieved a top speed of 11.2 miles per hour (18.0 km/h) on its last mission, Apollo 17.

Each LRV was carried to the Moon folded up in the Lunar Module's Quadrant 1 Bay. After being unpacked, each was driven an average of 30 km, without major incident.

RECREATION

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APOLLO A7L LUNAR SURFACE SUIT

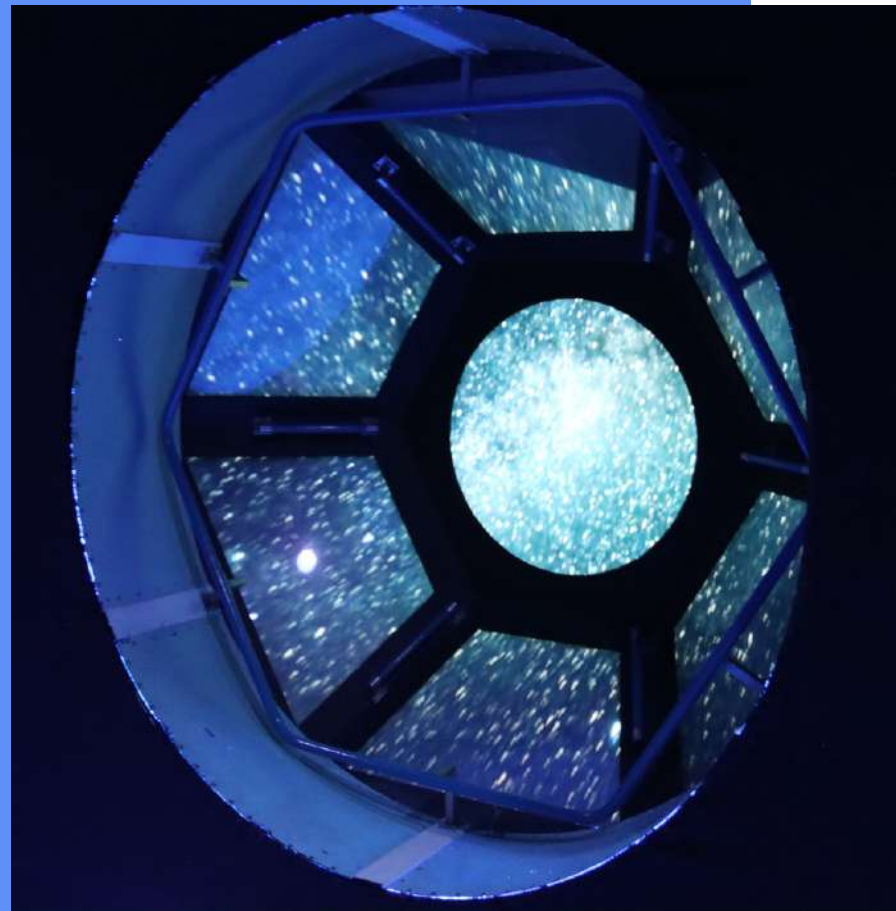
An evolved version of Gemini suits, the Apollo spacesuit had two models: The A7L for missions 7 through 14 and A7LB for missions 15 through 17 (modified for ease of use with the Lunar Roving Vehicle).

Designed for the harsh environment of the lunar surface, safety and mobility were key factors.

All previous American suits received life support from the spacecraft via long umbilical hoses that were not conducive to free movement. The Apollo suits added a self-contained life support backpack and a pair of lunar overshoes to provide traction on the lunar surface. This training A7LB spacesuit also features the red stripe on each arm and leg, indicating it was for the EVA Commander. Use of the red stripe began with the Apollo 13 mission and allows for easy identification of astronauts in photos and videos.

RECREATION

04.23



ISS WINDOW

The Cupola is an ESA-built observatory module of the International Space Station (ISS), was built in Turin, Italy. Its name derives from the Italian word cupola, which means "dome". It was launched aboard Space Shuttle mission STS-130 on 8 February 2010 and attached to the Tranquility (Node 3) module. With the Cupola attached, ISS assembly reached 85 percent completion.

The cupola is a small module designed for the observation of operations outside the station such as robotic activities, the approach of vehicles, and spacewalks. Its six side windows and a direct nadir viewing window provide spectacular views of Earth and celestial objects. The windows are equipped with shutters to protect them from contamination and collisions with orbital debris or micrometeorites.

RECREATION

37

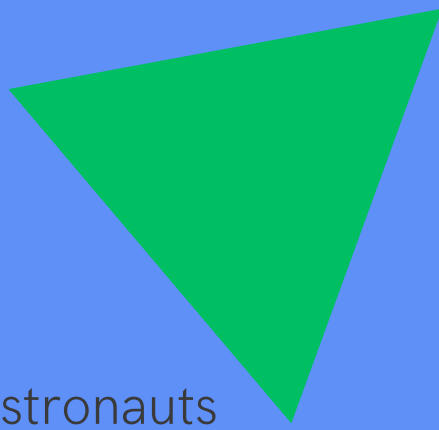


JULES VERNE'S COLUMBIAD

Jules Verne, a popular science fiction writer, provided inspiration for many early rocketeers. From the Earth to the Moon, written in 1865, told the story of three men who launched from Earth in a cannon-like vehicle with the goal of landing on the Moon. Despite writing the book almost 100 years before humans accomplished this feat, many of Verne's details appeared to foreshadow the future. Some of the book's mission scenarios are similar to NASA's Apollo program activities. The location of the launch, the size of the capsule to carry the crew, as well as approximate time to reach the Moon proved to be very close to reality.

RECREATION

04.23



THE SPACE SHUTTLE SPACE SUIT (SELFIE POINT)

Well-known as an extravehicular mobility unit (EMU), this suit is used for space walks by astronauts on the Space Shuttle and the International Space Station. The suit incorporates fully autonomous life support (survival pack) and a communication system. It is like an individual spaceship. The EMU consists of several modular components, the rigid upper torso part (including the portable life support system), the lower torso part and gloves. Each individual element is available in different sizes and can be combined with others to achieve a tailored fit. The red stripes on the EMU are used by the mission control team to distinguish one space 'walker' from another. On the International Space Station the EMU and the Russian Orlan (sea eagle) suit are used for outdoor exits.

RECREATION

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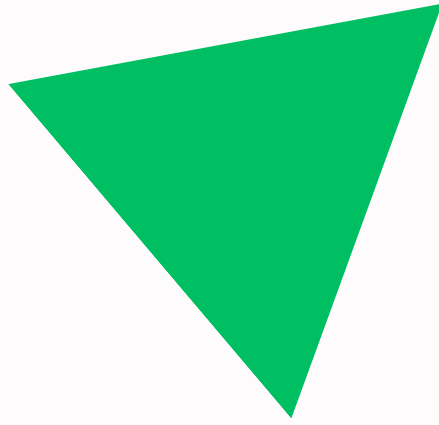
BIKE ON ISS

Just as your leg muscles could deteriorate if you lie on the couch all day, the same thing could happen to astronauts on the International Space Station. Despite the fact that the astronauts work practically non-stop, the absence of gravity slowly shows its worth. And while the average adult is advised to exercise about 30 minutes a day for several days of the week, ISS people exercise 90-120 minutes every day, just to keep their bone and muscle mass in a healthy condition.

They currently use the CEVIS system, the cycle ergometer with vibration isolation and stabilization. It is basically a stationary bike, fixed on one side of the ISS to make sure it does not float away. Astronauts wear heart rate monitors while riding the bike, then send the data to Earth so their instructors can analyze it and optimize their training routine.

RECREATION

04.23



TRACE GAS ORBITER (TGO)

TRACE GAS ORBITER (TGO)

ExoMars is a double mission of the Italian-led ESA carried out in collaboration with Roscosmos.

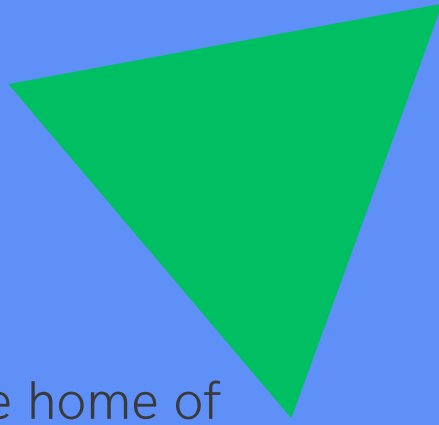
Mars exploration subject line

ESA / ROSCOSMOS Mission Responsibility

Launch Date 14 March 2016- September / October 2022

Italy, through ASI, is the main supporter of the double EXOMARS mission with 40% of the total investment.

The mission is divided into two phases. In the first, launched on 14 March 2016, the probe (TGO) reached the orbit of Mars after almost seven months of travel, to begin a long phase of investigations on the presence of methane and other gases in the atmosphere, but also for look for clues of an active life presence. This phase also included the landing on the red planet - at the point called Meridiani Planum - of a descent module (EDM), called Schiaparelli in honor of the Italian astronomer Giovanni V. Schiaparelli who was the first to draw an accurate map. EDM actually disconnected from the probe on October 16, 2016, performing nominally all the operations planned up to the last phase of the descent - October 19 - when due to an anomaly in one of the control systems the module crashed to Mars . ExoMars was conceived and built with the main objective of acquiring and demonstrating the autonomous European ability to perform a controlled landing on the surface of Mars, operate on the planet's soil by moving with an equipped rover and, moreover, access the subsoil to take samples from analyze in situ. Specifically, the mission has the task of investigating the traces of past and present life on Mars and the geochemical characterization of the planet.



CREW QUARTER - ISS

The International Space Station (ISS) Node 2 United States On-orbit Segment (USOS) is the home of four Crew Quarters (CQs) designed as the sleeping quarters for crew members during the duration in orbit. Each CQ provides a personal, private location for crew members to sleep, relax, and call home during their stay on the ISS. The CQ was designed with an individual ventilation system, acoustical mitigation materials, laptop connections, and internet connection to allow crew members personal communication with family and friends. Since their deployment in 2008, the CQ performance has been closely monitored to validate that the design continues to meet requirements. Throughout the last 4 years, minor issues were discovered due to on-orbit environments, and modifications were made to the existing CQ outfitting to provide additional crew safety and comfort.

RECREATION

40



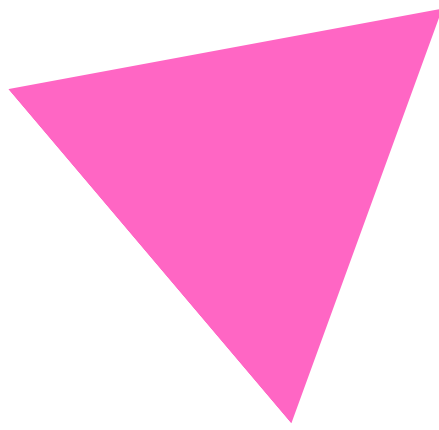
SPACE TOILET - ISS

A space toilet or zero-gravity toilet is a toilet that can be used in a weightless environment. In the absence of weight, the collection and retention of liquid and solid waste is directed by use of airflow. Since the air used to direct the waste is returned to the cabin, it is filtered beforehand to control odor and cleanse bacteria. More modern systems expose solid waste to vacuum pressures to kill bacteria, which prevents odor problems and kills pathogens. The crew use a specially shaped funnel and hose for urine and the seat for bowel movements. The funnel and seat can be used simultaneously, reflecting feedback from female astronauts. The space toilet seat may look uncomfortably small and pointy, but in microgravity, it is ideal. It provides ideal body contact to make sure that everything goes where it should.

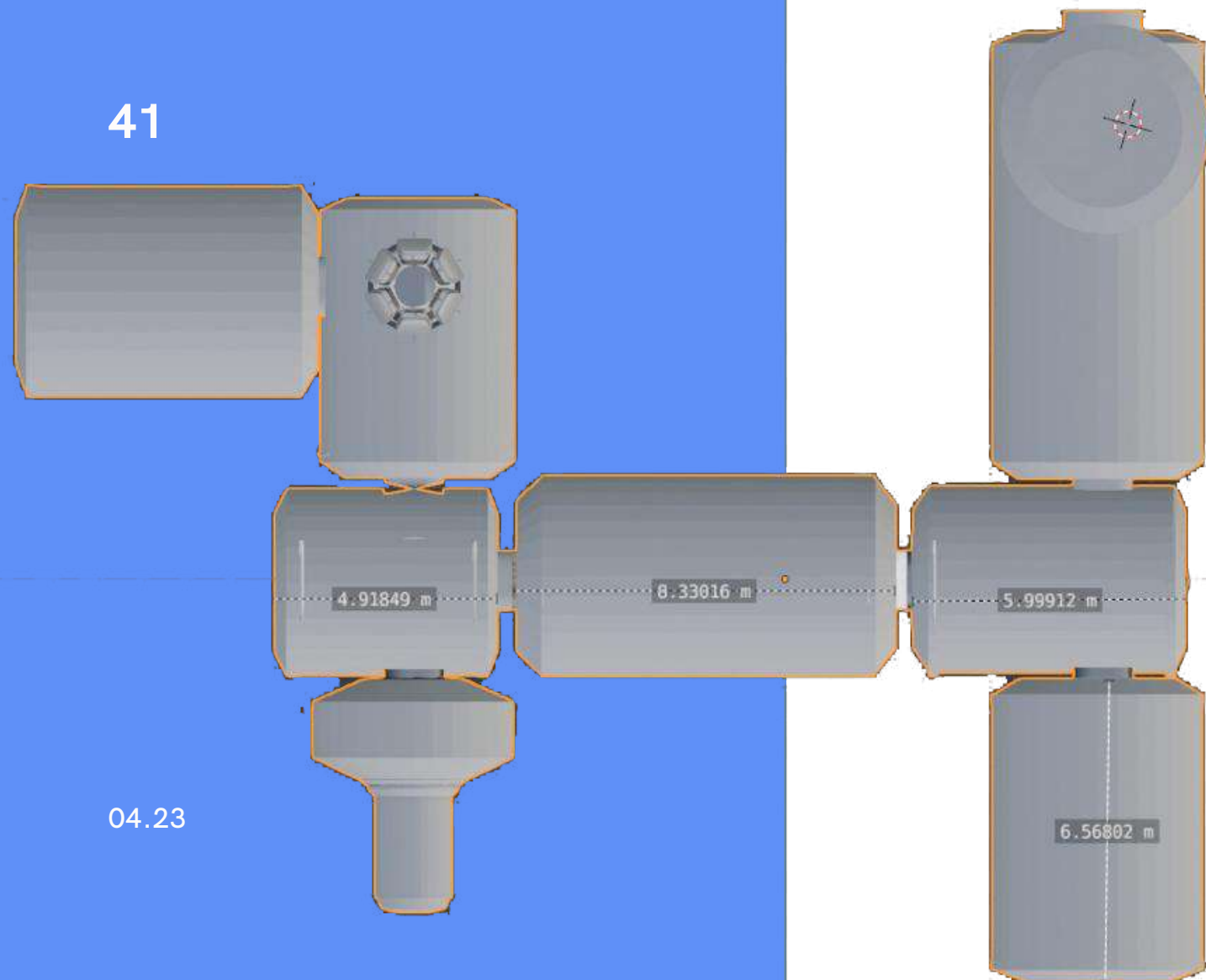
RECREATION

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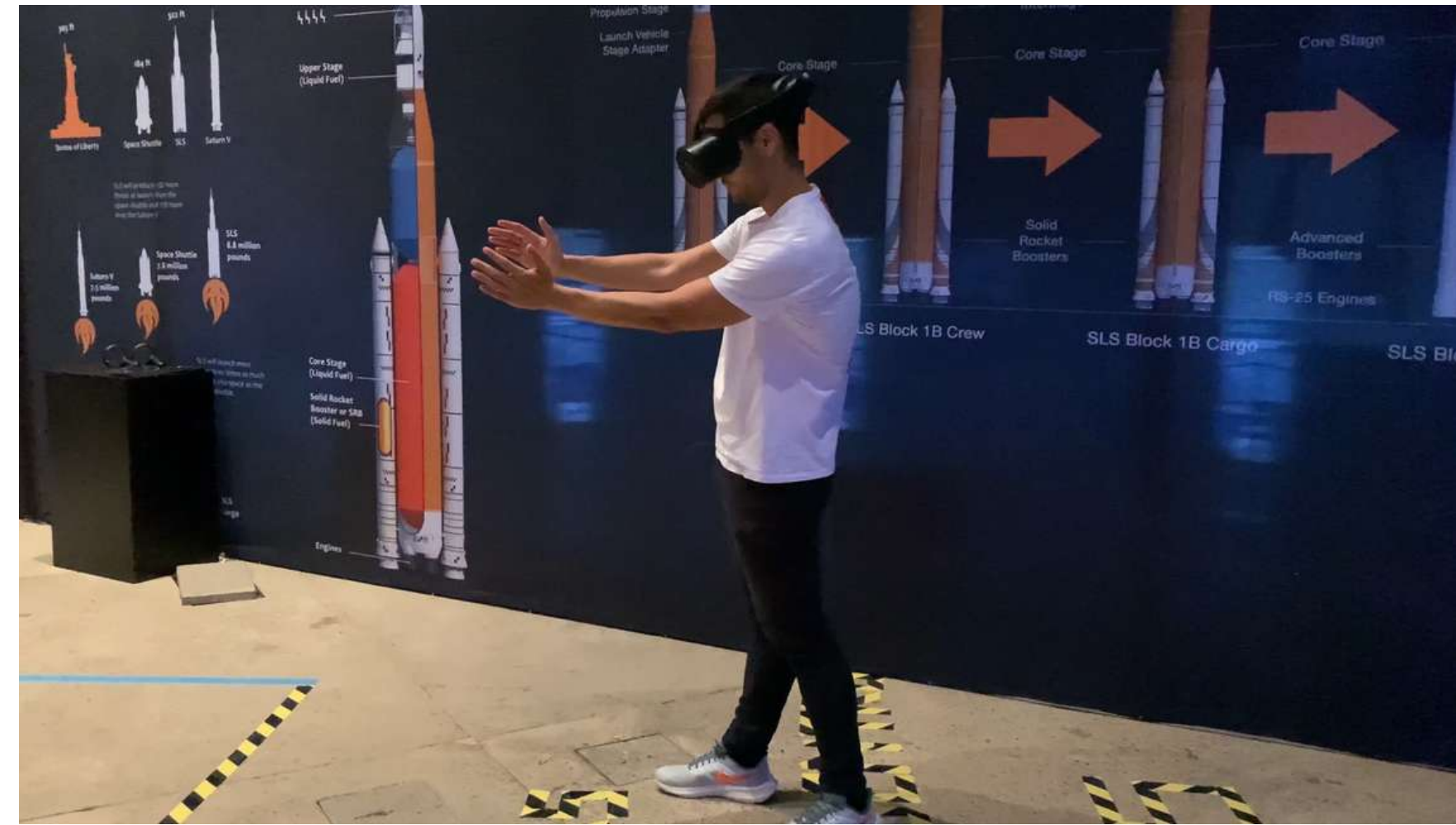
SIMULATORS



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04.23



360° VIRTUAL STATION - INTERNATIONAL SPACE STATION

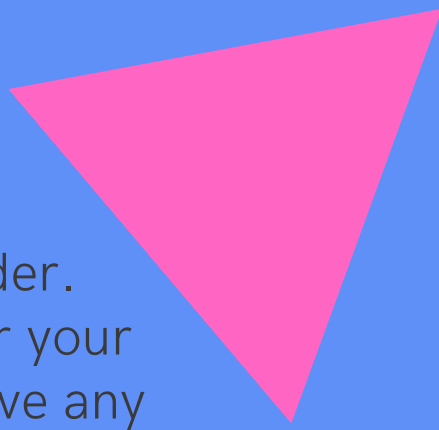
An adventure in space as an astronaut discovering the International Space Station (ISS).

ISS VR experience floor plan adaptable to every venue from 25 to 500 sqm



LAND THE SPACE SHUTTLE ORBITER

This simulator gives you the chance to try your hand at being a shuttle commander. Follow the display on the screen in front of you and use the joystick to maneuver your orbiter. Beware! You have only one chance to land since the orbiter does not have any engines to take you around for another try.



42



F18 PILOT SIMULATOR | VIRTUAL REALITY

It is a flight simulator in 3D graphics, which offers a realistic piloting experience of the F18.

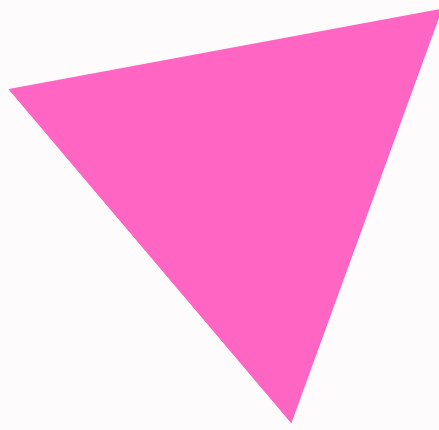
Being a pilot of military aircraft is a requirement much appreciated by space agencies, especially when it comes to test aircraft (test experimental aircraft and generally are able to cope with emergencies and unforeseen). The first American astronaut candidates were selected by NASA in 1959, for the Mercury project, with the aim of orbiting astronauts around the Earth in single-seater capsules.



DUBLE CHAIR | VIRTUAL REALITY

Housed inside an enveloping seat that simulates the movements and displacement of the air, you will experience a very real simulation of a walk on Mars.

04.23



THE FIVE DEGREES OF FREEDOM SIMULATOR

This simulator imitates moving within the frictionless environment of space with the use of five of the six degrees of freedom: forward and backward, side to side, roll, pitch and yaw. As the chair glides above the surface on a layer of air, it demonstrates Newton's third law of motion: for every action there is an equal and opposite reaction. This means, if you push off an object, you will not stop unless interrupted by another object or force, just as you would in space.

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THE MULTI AXIS TRAINER

The Multi Axis Trainer used at Space Camp simulates a tumble spin one might experience in space. Based on the Multiple Axis Space Test Inertia Facility used during the Mercury program, the MAT provides the feeling of disorientation experienced during an out-of-control spin. The MASTIF had a full set of controls that would allow the astronaut to practice regaining control of the vehicle, whereas the MAT has no controls. In flight, only one American mission experienced a tumble spin on board: Gemini VIII piloted by Neil Armstrong and Dave Scott.

04.23



Hereleb



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Life in Space is a traveling exhibition produced by Hereleb in collaboration with the U.S. Space & Rocket Center, the Official Visitor Center for NASA's Marshall Space Flight Center, Space Camp and the European Space Agency.