UAE Astronaut Program:
Mission 1

مركز محمد بن راشد للفضاء
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طموح زايد
هزاع المنصوري
UAE mission 1

Introduction

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The UAE Astronaut Programme aims to develop scientific cadres and prepare future generations of astronauts.

Strategic Objectives

The UAE Astronaut Programme aims to prepare cadres of astronauts according to the highest international standards.

- Support the UAE's vision of a prosperous future based on knowledge and scientific research
- Strengthen the UAE's position in the international space sector by contributing to manned space missions.
- The UAE Astronaut Programme aims to develop national scientific corps and prepare a national team of astronauts.
- Encourage and inspire young generations to be successful in STEM subjects.
- Contribute to scientific exploration missions by developing a corps of Emirati astronauts.
- Promote a culture of research and passion for exploration and innovation.

Astronaut Selection

Announcement

The UAE Astronaut Programme was initiated in April 2017 by HH Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, and HH Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, to prepare an Emirati astronaut corps for scientific space exploration missions, creating a culture of scientific endeavor and motivating the youth to pursue space science and technology.

Astronaut Selection

In 2018, the first two Emirati astronauts, Hazzaa AlMansoori and Sultan AlNeyadi, were selected from over 4000 candidates aged between 17 to 67. 37% of these applicants were females.

587 candidates were shortlisted for the online psychometric tests. The top 95 candidates were selected for the basic medical and psychometrics tests. 39 out of the 95 candidates qualified, passing the initial interview conducted by qualified specialists from MBRSC. A total of 18 passed securing a spot in the final interview stage with specialists from NASA. After that, 9 were selected to undergo assessments in Russia.

In September 2018, the selection of Hazzaa Al Mansoori and Sultan Al Neyadi were announced.

Hazzaa Al Mansoori

The first UAE astronaut on the ISS. Hazzaa was born on the 13th of December 1983 in the Al Wathba area of Abu Dhabi. AlMansoori graduated from Khalifa bin Zayed Air College from where he made his way to become an F16 pilot. After 14 years experience in military aviation, AlMansoori made history as the first Emirati to be deployed on a space mission to the International Space Station on 25 September 2019.

Sultan Al Neyadi

Sultan AlNeyadi is a member of the back-up team for the 2019 mission to ISS.

Sultan Al Neyadi was born in Umm Ghafa, a city in Al Ain on May 23, 1981. AlNeyadi holds a PhD in Information Technology and a Masters degree of Information and Network Security from Griffith University. Previously a UAE military network security engineer

Training

Training Process

The trainings were conducted under partnership agreements with major space agencies, NASA, ESA, JAXA, and Roscosmos. The astronauts underwent more than 90 courses and over 1,400 hours of training.

Training Program

Physical and medical training included:

- Parabolic flight training on an airplane at the Yuri Gagarin Center in Russia.
- Pressure Chamber Test
- Centrifuges test
- Winter survival training in case they land in an unexpected location.

Training Program

Technical training includes:

- Foundation learning in space engineering and scientific research
- Training in various aspects of the Soyuz spacecraft including launch & docking.
- Sokol spacesuit training.
- Training on devices and equipment in the Russian, European, American and Japanese sections on the ISS.
- Emergency Response Training including low air pressure and ammonia gas leaks at the station.
- Training on how to communication with the ground station.
- Russian Language.

Training Program

Scientific experiment training includes:

- Training on a number of scientific experiments that the astronaut will conduct before, during and after his trip to the space station.
- Training on the Japanese robotic camera ‘Int-ball’ for educational activities in collaboration with the Japan Space Exploration Agency (JAXA).

Quarantine Period

The two astronauts stayed in quarantine Baikonur, Kazakhstan for 15 days before the launch.

The preflight quarantine period is an essential safety precaution to avoid infections or any diseases prior to the launch to the International Space Station.

Flight Surgeon

It is crucial that astronauts are kept as healthy as possible. As a result, a flight surgeon is assigned for a space mission.

Flight surgeons oversee the health care and medical training of the astronaut while they are preparing for their mission, as well as, take care of any medical issues that arise before, during or after spaceflight.

Launch

Launch

Hazzaa AlMansoori launched for the International Space Station (ISS) in a Russian Spacecraft, Soyuz MS-15, at Baikonur in Kazakhstan on the 25th of September 2019.

Also abroad were Jessica Meir of NASA and commander Oleg Skripochka of Roscosmos. The hatch took around 2 hours to open. After extensive leaks checks, the three astronauts were welcomed aboard by their fellow ISS crewmembers.

Three Main Pillars of Mission 1

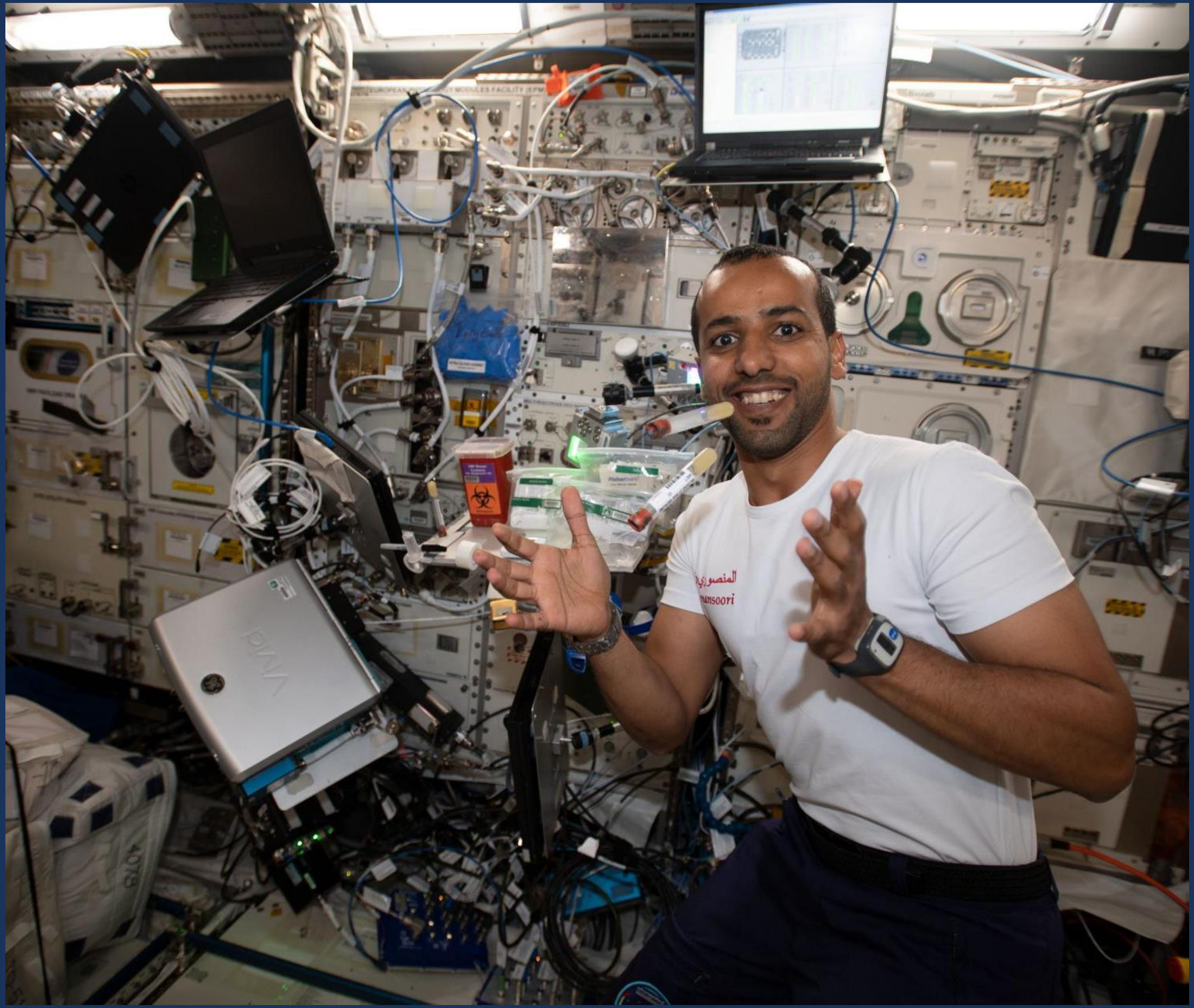
Three Main Pillars of Mission 1

Hazzaa's scientific mission is divided across three areas:

- **Scientific experiments** to study the impact of space mission on the human body in cooperation with global partners, including NASA, Roscosmos, ESA and JAXA.
- **‘Science in Space’ Initiative:** Scientific experiments based on the UAE’s school curriculum.
- **Educational Initiatives** in coordination with JAXA and ESA.

Pillar 1: Scientific Experiments on the ISS

Hazzaa Al Mansoori conducted 16 scientific experiments including six that took place on the ISS to study the interaction of human body biomarkers in space compared to those on Earth.



Scientific Experiments on the ISS:

- **Countermeasures:**

Study of mechanisms of action and efficiency of different countermeasures against disturbances in the cosmonaut's motor activity under space flight conditions.

Scientific Experiments on the ISS:

- **Time Perception:**

To study the time perception in space. The experiments include estimating the length of a minute in space and the reaction to stimuli in microgravity environment.

Scientific Experiments on the ISS:

- **Cardiovector:**

To study the autonomic regulation of cardiovascular system, central hymodynamics, influence of space flight factors on the spatial distribution of the energy of heart contractions.

Scientific Experiments on the ISS:

- **Standard Measures:**

MBRSC collaborated with NASA, to study the reaction of vital indicators of the human body in microgravity.

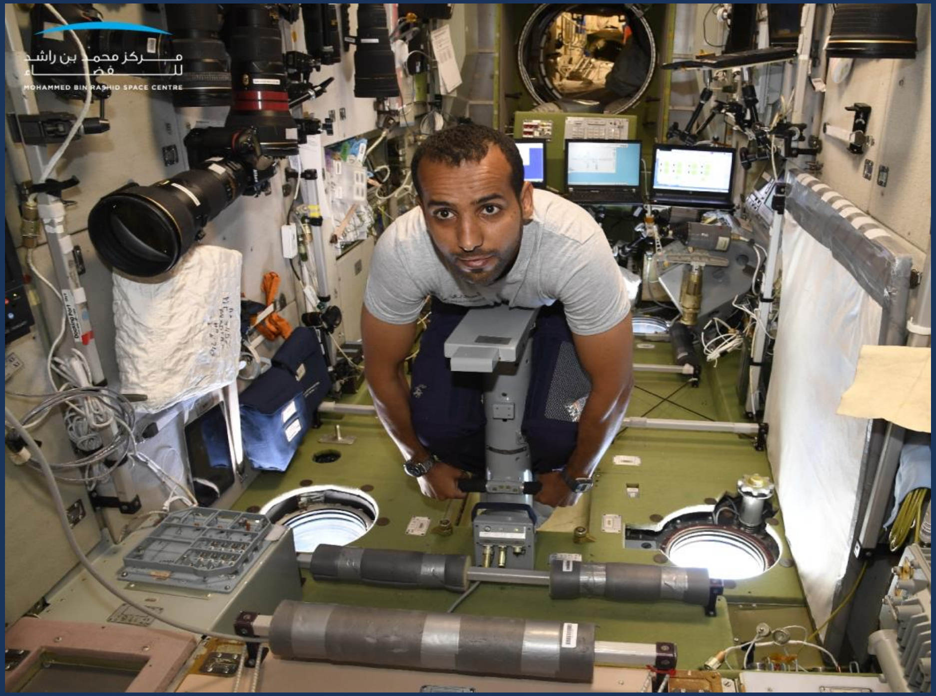
Scientific Experiments on the ISS:

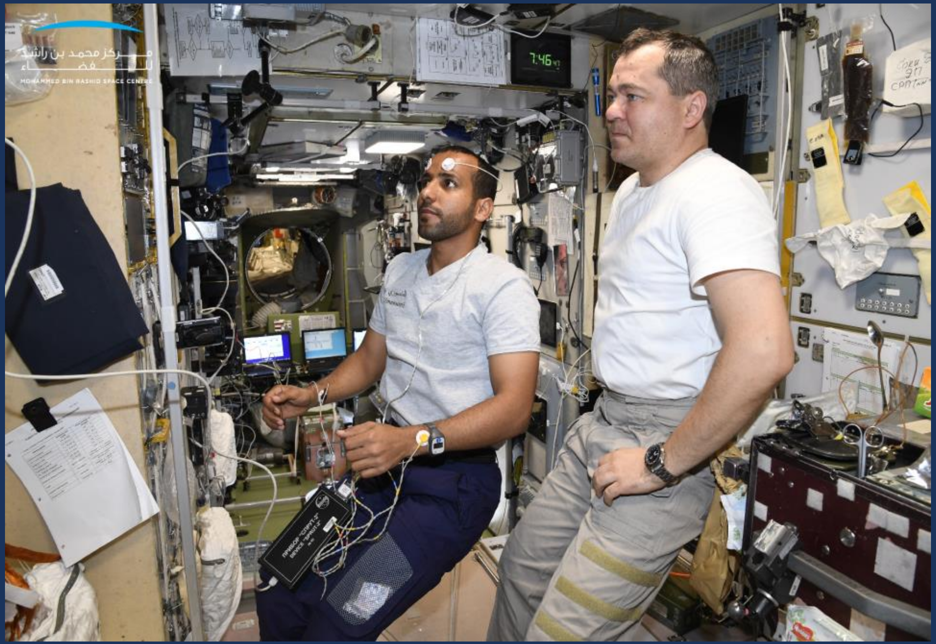
- **Fluidics (Fluid Dynamics In Space):**

To study the validation of fluid behaviour under gravity.

The first part of the experiment addresses technological issues relative to the slosh of fluids during satellite manoeuvres.

The second part will help to report the observation of capillary wave turbulence on the surface of a fluid layer in a low gravity environment.





Scientific Experiments on the ISS:

- **Osteology:**

To study bone condition, body composition and the endocrine system in space flight and weighing his body mass as part of the experiment.

Pillar 2: Science in Space

MBRSC hosted its 'Science in Space' initiative for students as part of the UAE Astronaut Programme.

16 teams were selected from different schools across the UAE. Each team consisted of four students and a teacher.

The experiments were derived from the curricula in schools across the UAE. Students were given the opportunity to conduct ground sample experiments that Hazzaa conducted in microgravity aboard on the ISS. The results of these studies will be compared, documented and available to schools.

Pillar 3: Educational Initiatives

For the first time, educational initiatives were recorded in Arabic on the ISS.

MBRSC also collaborated with the Japan Aerospace Exploration Agency (JAXA) to perform an educational project that uses JAXA’s “Int-Ball”, a camera robot for the International Space Station.

The purpose of this initiative was to demonstrate the attitude control of a spacecraft by using the Int-Ball on the Kibo, the Japanese module on the ISS

Hazzaa al Mansoori explained live from the ISS the characteristics of the Int-ball robot and asked the students to choose a command to be demonstrated.

Pre-flight and Post-flight Experiments

Hazzaa's scientific mission included experiments that were conducted before his flight to the ISS and after his return to earth.

Pre-flight and Post-flight Experiments

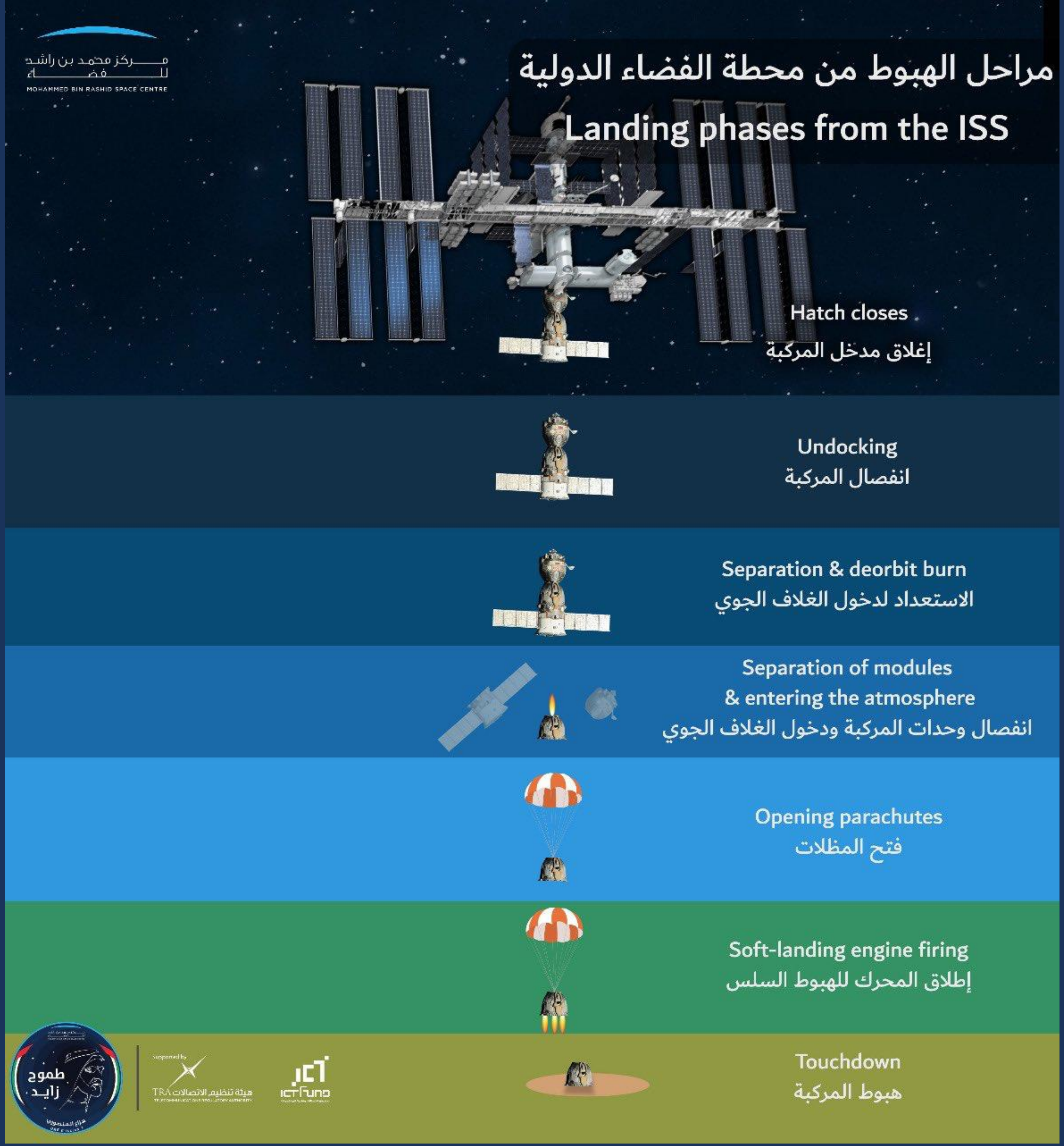
- **Locomotions:** Comparative study of kinematic, dynamic, and electromyographic characteristics of locomotions before and after space flight
- **Motor Controls:** Assessment of the state of mechanisms of human sensor and motor functions.
- **Accelerations:** The study of the acceptability of accelerations by ISS astronauts during their flights on transport vehicles of the Soyuz and Shuttle types.
- **Architecture:** The purpose of this study is, firstly, to quantitatively describe the relationship between the articular angle and muscle architecture (length and angle of inclination of the fibres) of the triceps muscle in humans in conditions in vivo and discuss their functional consequences, and, secondly, to quantify the degree of change in the functional characteristics of the triceps muscle after long-duration space flight.

Pre-flight and Post-flight Experiments

- **Tendometry:** The study of the effects of weightlessness on characteristics of induced contractions of muscles-extensors of the human footstep.
- **Sensory Adaptation:** The development of the methodology of prognosis and diagnostics of vestibular, intercessor disorders and disorders of tracking function of eyes at adaptation –re-adaptation to the conditions of changed gravity, and the development of the theory of intercessor interactions and adaptation of sensory systems.
- **Brain DTI:** The experiment studies the effect of microgravity on the human brain through pre- and post-flight MRI scans. So far, the scanned subjects have stayed between 2 weeks to one year in the ISS. Studying short-duration mission subjects is very relevant for a better understanding of the impact of microgravity on the human brain. Moreover, it seems that first-time flyers have different responses than frequent flyers

Pre-flight and Post-flight Experiments

- **DNAm-Age:** To gain insight into how an epigenetic biomarker of ageing is affected by radiation exposure during prolonged spaceflight and test the hypothesis that DNA methylation age progression is associated with DNA damage. This will help to unravel the relationship between epigenetic changes and the ageing process in humans.
- **Balance:** Identifying the roles of central and peripheral mechanisms in the reorganisation of control of the vertical posture, in particular, the determination of the specific contribution of changes in the state of various sensory and motor mechanisms after time spent in weightlessness.
- **Soyuz Occupant Risk:** investigation analyses the true number and types of injuries experienced by crew members during Soyuz landings, and determines the factors that contribute to those injuries.



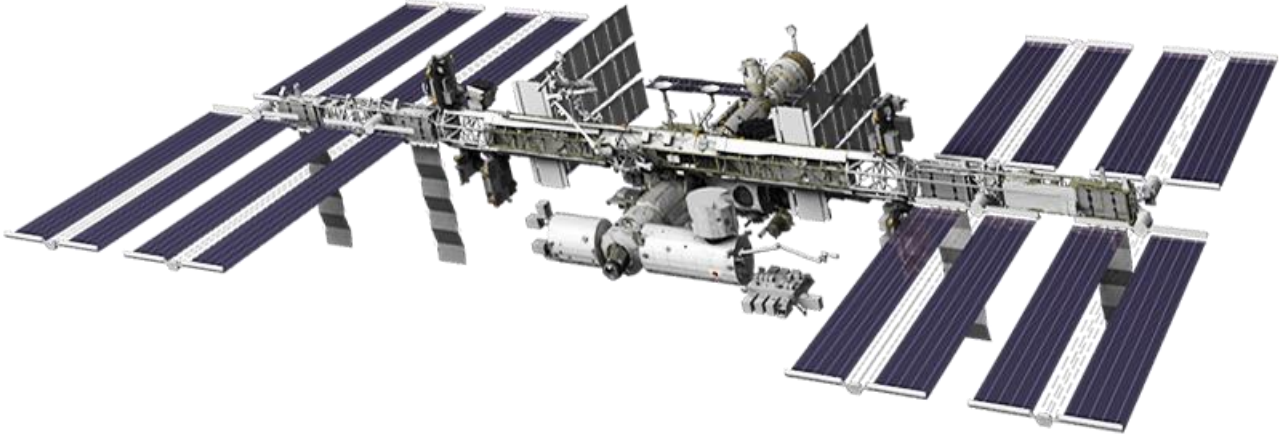
Hazzaa's Return to Earth

Hazzaa returned to Earth on the 3rd of October 2019 after eight days in space.

It took around 3.5 hours for Hazzaa and other crewmembers to land on Earth. The return trip is faster due to the Earth's gravitational pull (4.3 g-force). The Descent Module is the only part of the spacecraft that returns to Earth. The Orbital and Instrument Modules burn up in the atmosphere. The Descent has a heat shield at the bottom that protects the crew as it lands on Earth.

International Space Station

Why ISS?



- NASA uses the International Space Station to learn about living and working in space.
- The space station is a home in orbit. People have lived in space every day since the year 2000. The space station's labs are where crew members do research. This research could not be done on Earth.
- Scientists study what happens to people when they live in space.
- NASA has learned how to keep a spacecraft working for a long time.
- NASA has a plan to send humans deeper into space than ever before. The space station is one of the first steps. NASA will use lessons from the space station to get astronauts ready for the journey ahead.

Information about the ISS

What is the ISS?

- The International Space Station (ISS) is a habitable space station in low earth orbit.
- The first component was launched into orbit in 1998.
- The International Space Station is visible to the naked eye.
- The station orbits Earth every 92 minutes.

Participants

The ISS was a joint program split among five space agencies.

- NASA (USA)
- Roscosmos (Russia)
- JAXA (Japan)
- ESA (Europe)
- CSA (Canada)

Information about the ISS

Research

The ISS is being used as a testing ground to further research in many different fields, these include:

- Astrobiology
- Astronomy
- Human research in space medicine and biology
- Physical sciences
- Material sciences
- Meteorology

Health

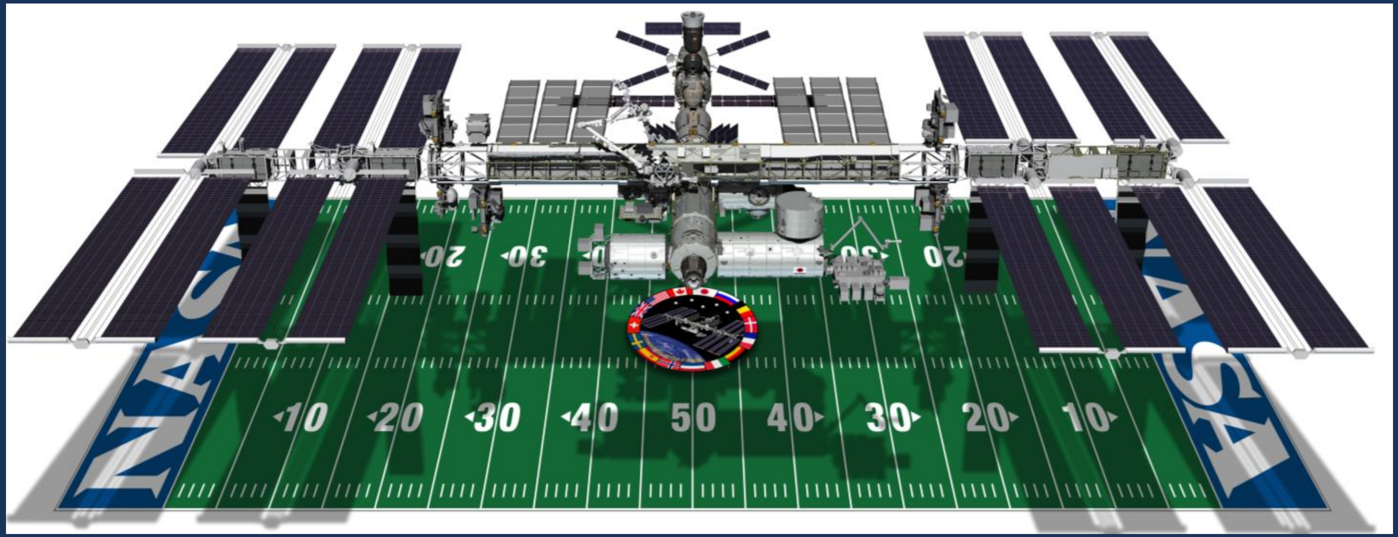
- Astronauts are exposed to 200 times more radiation on the International Space Station than an airline pilot.
- NASA has found that the height of astronauts increases approximately 3% over the first 3 to 4 days of weightlessness in space.
- Many astronauts experience stress from being on board the space station.
- Medical effects of long-term weightlessness include muscle atrophy. osteoporosis, deterioration of the skeleton, fluid redistribution, a slowing of the cardiovascular system, decreased production of red blood cells, balance disorders, and a weakening of the immune system.
- To combat the muscle and bone loss astronauts exercise at least 2 hours per day, strapping themselves to the treadmills with bungee cords.

Information about the ISS

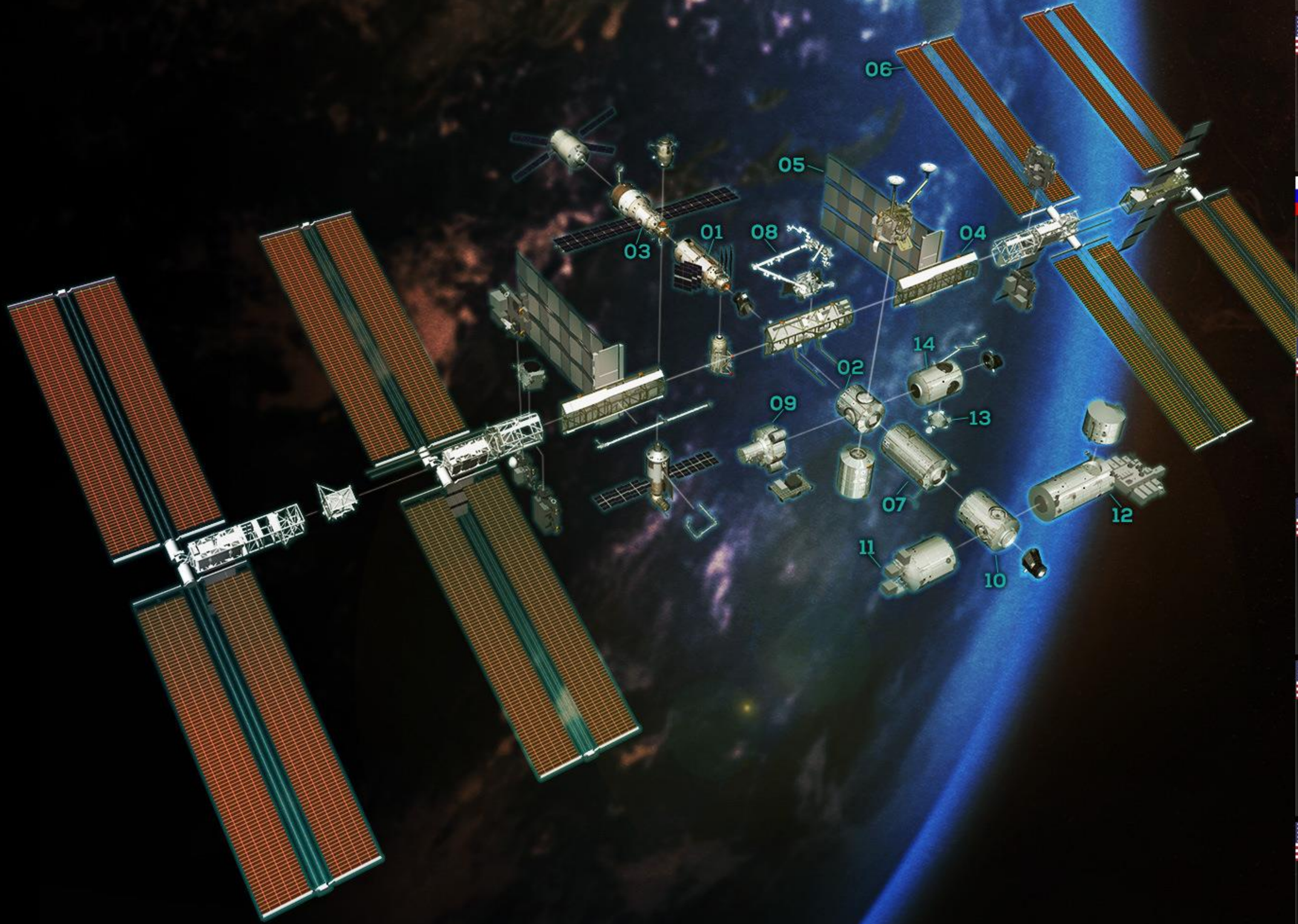
Size:

The International Space Station is as big as the American football field. Approximately the size of a 6 bedroom house. Most of the area is occupied by solar panels that are very long about 110 meters in length. The station completes a full orbit around the Earth every 90 minutes. So the astronauts at the station see 16 sunrises and sunsets per day.

- The ISS revolves around the Earth at about 28,000 km/h
- Station weight : 420,000 kilograms
- The ISS is orbiting the Earth at a distance of 407 kilometers.



International Space Station Parts



01. ZARYA
Added by Roscosmos Nov 1998

Commissioned and funded by the U.S. and built in Russia, Zarya was the first piece of the International Space Station ever put into orbit. It was designed to provide the station's initial propulsion and power.

02. UNITY (NODE 1)
Added by NASA Dec 1998

The Unity node was the first U.S. piece of the International Space Station. It connects the Quest airlock, the Destiny laboratory, the Zarya module, the Tranquility node and the Permanent Multipurpose Module.

03. ZVEZDA
Added by Roscosmos July 2000

Zvezda served as the early cornerstone for the first human habitation of the station. It serves as a docking port for Russian cargo and crew vehicles as well as the ATV cargo craft.

04. TRUSS STRUCTURE
Added by NASA 2000-2009

Composed of multiple elements delivered by the space shuttle, the Integrated Truss Structure forms the backbone of the station.

05. RADIATORS
First Added by NASA Dec 2000

Most of the space station's systems produce heat, which needs to be transferred from the station to space to maintain acceptable temperatures and keep the systems running.

06. SOLAR ARRAYS
Added by NASA 2000-2009

The International Space Station's enormous solar arrays provide renewable energy to the laboratory by converting solar energy into electricity.

07. DESTINY LAB
Added by NASA Feb 2001

Destiny is the primary research laboratory for U.S. payloads, supporting a wide range of experiments that contribute to health, safety and quality of life for people all over the world.

08. CANADARM2
Added by CSA Apr 2001

The space station's robot arm, Canadarm2, was a key part of the construction of the station and continues to play a vital role in day-to-day operations.

09. QUEST AIRLOCK
Added by NASA July 2001

The U.S. Quest airlock is directly across from the Tranquility node and is attached to Unity. It enables crew members to perform spacewalks in U.S. or Russian spacesuits.

10. HARMONY (NODE 2)
Added by NASA Oct 2007

Harmony is a node on the station that is used to connect Kibo, Columbus and Destiny. It is also the docking port for the Cygnus, Dragon and HTV cargo vehicles.

11. COLUMBUS LAB
Added by ESA Feb 2008

As the European Space Agency's largest single contribution to the station, the Columbus laboratory supports scientific and technological research.

12. KIBO LAB (JEM)
Added by JAXA 2008-2009

The Kibo Laboratory is Japan's first human space facility and enhances the unique research capabilities of the International Space Station. It is has an airlock and robotic arm attached to it.

13. CUPOLA MODULE
Added by NASA Feb 2010

The Cupola is a panoramic control tower for the International Space Station, with windows through which operations on the outside of the station can be observed and controlled.

14. TRANQUILITY (NODE 3)
Added by NASA Feb 2010

The Tranquility node was one of the last U.S. components added to the International Space Station. Some of the crew's exercise equipment is located in it as well as some of the environmental systems.

SOURCE: NASA

Spinoffs from Human Flight to ISS

Spinoffs from Human Spaceflight Missions

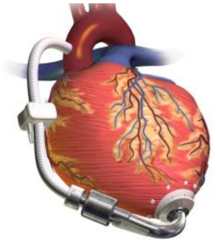
Extensive research in the field of space has led to the creation of space science. New technologies emerged from spaceflight missions which provided societal benefits that improve the quality of life on planet Earth in different fields including technology and communications.

Spinoffs from Human Spaceflight Missions

Health and Medicine

Thermometer: A company named Diatek teamed up with NASA and developed an infrared thermometer based on NASA's infrared technology.

Prosthesis Material: NASA’s foam insulation used to protect the shuttle’s external tank is now available to produce master molds for prosthetics. NASA’s innovation has become a source of inspiration and empowerment for the private sector to create better solutions for animal and human prostheses



Cardiac Pump: Hundreds of people in need of a heart transplant have been kept alive because of the cardiac pump that was developed with the assistance of NASA expertise in simulating fluid flow through rocket engines.

Magnetic Resonance Imaging (MRI): NASA has contributed to the development of magnetic resonance imaging technology. MRI is used to create images of organs in the human body for diagnostic purposes.

Spinoffs from Human Spaceflight Missions

Communications

Mobile phone camera: Mobile phones are equipped with the same camera that a team from NASA's Jet Propulsion Laboratory invented in order to reduce the size of the cameras for space missions.

Global Positioning System (GPS): NASA’s Jet Propulsion Laboratory (JPL) developed a software in the 1990s to correct errors in the data from their global network of receivers. As a result, the satellite navigation system called GPS has an accuracy of up to five centimeters.

Spinoffs from Human Spaceflight Missions

Public Safety

Fire-fighting equipment: NASA helped develop a line of polymer textiles for use in spacesuits and vehicles. The heat and flame-resistant fiber is now used in numerous firefighting application.

Search & Rescue System: NASA's technology development lead to the development of the international Cospas-Sarsat program, an international satellite-based search and rescue system.

Shock absorbers for buildings and bridges: Shock absorbers that were originally used to protect spacecraft and launch platforms are now used for hundreds of buildings and bridges in earthquake-prone areas around the world.

Spinoffs from Human Spaceflight Missions

Consumer Goods

Memory foam was developed under a NASA contract in the 1970s that set out to improve seat cushioning and crash protection for airline pilots and passengers. Memory foam has widespread commercial applications, in addition to the popular mattresses and pillows.

Athletic Shoes: Incorporating materials used for constructing NASA's spacesuit improved the quality of athletic shoes. The NASA technique allowed for the creation of shock absorbers in the bottom of the shoe.

Bicycle helmet: The idea of a bicycle helmet came from the helmets that astronauts wear to protect their heads. The helmet has air holes to keep the astronauts cool.

Activities

Activities:

[UAE Astronaut Program Crossword.]

[UAEAP Math Challenge.]

[Spinoffs From Human Spaceflight Missions'.]

Note : To access the activities please click on the hyperlinks.

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Media Gallery

The First Emirati astronauts Hazzaa Almansoori and Sultan AlNeyadi during the winter survival training in Russia.

Astro Hazzaa and Astro Sultan were trained at the European Space Agency (ESA) on the some of the scientific experiments that conducted onboard the ISS.

Emirati food on board the International Space Station

Madrooba

Balaleet and Saloona

The Emirati astronauts spent up to two hours a day for a week tasting 200 different types of halal food. The astronaut's meals are prepared according to specific requirements to provide balanced nutrition, ensuring that they are easily carried, stored and used in a low gravity environment.

The final stage of UAE Astronaut training

Hazzaa conducting pre-flight experiments



The main and backup crews during the first fit-check of the Soyuz MS-15.

The Launch 25.9.2019

The Soyuz booster rocket FG with Soyuz MS-15 spacecraft is mounted on the launch pad.

The Soyuz MS-15 spacecraft blasts off to the ISS from the launch pad at the Baikonur.

Astronaut Hazzaa favorite books during his journey:
1- My story by His Highness Sheikh Mohammed bin Rashid Al Maktoum
2- Race to Space, a book chronicling the journey of Mohammed Bin Rashid Space Centre.
3- Children's Book "Khalifa and Amal Go To Space"

Astronaut Hazzaa in his traditional attire, sharing Emirati food with other astronauts aboard the International Space Station.

Astronaut Hazzaa in the Cupola on the ISS.

Student using the HAM Radio to contact with Hazzaa.

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President, Prime Minister and Ruler of Dubai during a call with UAE's first astronaut, Hazzaa Al Mansoori, while on the ISS.

Astronaut Hazzaa landing in Kazakhstan

Hazzaa Al Mansouri underwent medical tests at the Yuri Gagarin Astronaut Training Center in Moscow after his return to Earth.

Zayed's ambition was achieved with the arrival of the first Emirati astronaut Hazzaa to the UAE.

Astronauts Hazzaa Almansoori and Sultan AlNeyadi visited schools in UAE to speak about their journey of becoming the UAE's first astronauts and encouraging the students to follow their dreams.

"Yesterday, today and tomorrow, the ambitions of our late father will continue to drive and inspire generations to come"

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