SAMPLE

Cosmic Explorers: Space Architecture

Designing Homes Beyond Earth

Aira Astralis

Free sample: Introduction & Chapter 1

putrabooks.github.io

Buy the full book:

Carousell carousell.sg/p/cosmic-explorers-space-architecture-ebook-pdf-1468083423

Ko-fi

Payhip

Contents

Introduction

Chapter 01: The Discovery of Space Architecture

Chapter 02: Understanding Space Architecture

Chapter 03: Key Characteristics of Space Architecture

Chapter 04: The Science Behind Space Architecture

Chapter 05: Observation and Measurement of Space Architecture

Chapter 06: Important Features of Space Architecture

Chapter 07: Space Architecture in Context

Chapter 08: Modern Understanding of Space Architecture

Chapter 09: Research and Exploration of Space Architecture

Chapter 10: Significant Discoveries About Space Architecture

Chapter 11: Challenges and Mysteries of Space Architecture

Chapter 12: Future Directions in Space Architecture Research

Chapter 13: Fun Facts and Trivia About Space Architecture

Chapter 14: Conclusion: The Significance of Space Architecture

Conclusion

This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

Space architecture is the theory and practice of designing and building inhabited environments in outer space. It borrows from multiple forms of niche architecture to accomplish the task of ensuring human beings can live and work in space. The architectural approach to spacecraft design addresses the total built environment. It combines the fields of architecture and engineering (especially aerospace engineering), and also involves diverse disciplines such as industrial design, physiology, psychology, and sociology.

This mission statement for space architecture was developed in 2002 by participants in the 1st Space Architecture Symposium, organized at the World

Space Congress in Houston, by the Aerospace Architecture Subcommittee, Design Engineering Technical Committee (DETC), American Institute of Aeronautics and Astronautics (AIAA).The subcommittee rose to the status of an independent Space Architecture Technical Committee (SATC) of the AIAA in 2008.

The SATC routinely organizes technical sessions at several conferences, including AIAA ASCEND, the International Conference on Environmental Systems (ICES), the International Astronautical Congress (IAC), and the American Society of Civil Engineers (ASCE) Earth & Space conference. There is some debate over the terminology of space architecture. Some consider the field to be a specialty within architecture that applies architectural principles to space applications. Others such as Theodore W.

Hall of the University of Michigan see space architects as generalists, with what is traditionally considered architecture (Earth-bound or terrestrial architecture) being a subset of a broader space architecture. Any structures that fly in space will likely remain for some time highly dependent on Earth-based infrastructure and personnel for financing, development, construction, launch, and operation. Therefore, it is a matter of discussion how much of these earthly assets are to be considered part of space architecture.

Chapter 01: The Discovery of Space Architecture

The projectile was shaped like a bullet because it was gun-launched from the ground, a method infeasible for transporting man to space due to the high acceleration forces produced. It would take rocketry to get humans to the cosmos. The first serious theoretical work published on space travel by means of rocket power was by Konstantin Tsiolkovsky in 1903.

Besides being the father of astronautics he conceived such ideas as the space elevator (inspired by the Eiffel Tower), a rotating space station that created artificial gravity along the outer circumference, airlocks, space suits for extra-vehicular activity (EVA), closed ecosystems to provide food and oxygen, and solar power in space. Tsiolkovsky believed human occupation of space was the inevitable path for our species. In 1952 Wernher von Braun published his own inhabited space station concept in a series of magazine articles.

His design was an upgrade of earlier concepts, but he took the unique step in going directly to the public with it. The spinning space station would have three decks and was to function as a navigational aid, meteorological station, Earth observatory, military platform, and way point for further exploration missions to outer space. It is said that the space station depicted in the 1968 film 2001: A Space Odyssey traces its design heritage to Von Braun's work.

Wernher von Braun went on to devise mission schemes to the Moon and Mars, each time publishing his grand plans in Collier's Weekly. The flight of Yuri Gagarin on April 12, 1961, was humanity's maiden spaceflight. While the mission was a necessary first step, Gagarin was more or less confined to a chair with a small view port from which to observe the cosmos - a far cry from the possibilities of life in space.

Following space missions gradually improved living conditions and quality of life in low Earth orbit. Expanding room for movement, physical exercise regimens, sanitation facilities, improved food quality, and recreational activities all accompanied longer mission durations. Architectural involvement in space was realized in 1968 when a group of architects and industrial designers led by Raymond Loewy, over objections from engineers, prevailed in convincing NASA to include an observation window in the Skylab orbital laboratory.

This milestone represents the introduction of the human psychological dimension to spacecraft design. Space architecture was born. The practice of involving architects in the space program grew out of the Space Race,

although its origins can be seen much earlier. The need for their involvement stemmed from the push to extend space mission durations and address the needs of astronauts beyond minimum survival needs.

Much space architecture work has focused on design concepts for orbital space stations and lunar and Martian exploration ships and surface bases for the world's space agencies, including NASA, ESA, JAXA, CSA, Roscosmos, and CNSA. The subject of architectural theory has much application in space architecture. Some considerations, though are uniquely applicable in the space context.

A starting point for space architecture theory is the search for extreme environments in terrestrial settings for the formation of analogs between these environments and space.Many of these analogs can actively define design references for space systems. Space station life support systems and astronaut survival gear for emergency landings are similarity to submarine life support systems and military pilot survival kits, respectively.

Human spaceflight require extensive preparation,where a well defined ECLSS can serve as testbeds to further develop technologies for space applications and train astronaut crews. Contemporary examples included Mars 500 and the Flashline Mars Arctic Research Station is a simulated Mars base. To train for EVAs in microgravity, space agencies make broad use of underwater and simulator training. The Neutral Buoyancy Laboratory, NASA's underwater training facility, contains full-scale mockups of the Space Shuttle cargo bay and International Space Station modules.

Technology development and astronaut training in space-analogous environments are essential to making living in space possible. Fundamental to space architecture is designing for physical and psychological wellness in space. Rigorous exercise regimens are required to alleviate muscular atrophy and other effects of space on the body. Space missions are often fixed in duration that can lead to stress from isolation.

This problem is not unlike that faced in remote research stations or military tours of duty, although non-standard gravity conditions can exacerbate feelings of unfamiliarity and homesickness. Furthermore, confinement in limited and unchanging physical spaces appears to magnify interpersonal tensions in small crews and contribute to other negative psychological effects. These stresses can be mitigated by establishing regular contact with family and friends on Earth, maintaining health, incorporating recreational activities, and bringing along familiar items such as photographs and green plants.

The importance of these psychological measures were most noticeably seen in

the 1968 Soviet 'DLB Lunar Base' design:...it was planned that the units on the Moon would have a false window, showing scenes of the Earth countryside that would change to correspond with the season back in Moscow. The exercise bicycle was equipped with a synchronized film projector, that allowed the cosmonaut to take a 'ride' out of Moscow with return.

End of free sample. The full book is available at putrabooks.github.io

ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.