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CONSTRUCTION PLAN OF ASTRAX LUNAR CITY SIMULATION FACILITY IN JAPAN 2023

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Abstract

Since 2007, ASTRAX has been operating a business community for doing business on lunar lands, in which has sold by Lunar Embassy Inc. of the United States, along with a residence club for enjoying the products and services created there. To date, more than 380 businesses (companies, stores, cafes, restaurants, hospitals, schools, hotels, etc.) have become members, creating a variety of products and services that will be necessary for people to reach the Moon again and build a city in the near future. In order to manage the addresses on the Moon and promote business activities conducted there, ASTRAX has been working on a variety of platforms and dedicated applications to promote economic activities on the Moon, such as bi-monthly citizen meetings, 3D mapping to build a virtual lunar city, system development to match supply and demand, and development of dedicated applications. Furthermore, we have decided to build a lunar city simulation facility on Earth that simulates an actual lunar city. In this paper, we introduce our plan to build the ASTRAX LUNAR CITY Simulation Facility in Japan.

Keywords: ASTRAX LUNAR CITY, SIMULATION FACILITY, MOON

Nomenclature

ASTRAX LAB: ASTRAX Commercial Space Research and Development Center

1. Introduction

Since 2007, ASTRAX has been promoting a lunar land-based city construction project called ASTRAX LUNAR CITY, and has published various international papers related to ASTRAX LUNAR CITY. On the other hand, countries such as the United States, Russia, and China have built stay-and-learn research facilities that simulate a lunar or Mars base, where long-term stay, training and research are conducted, but such facilities do not exist in Japan at the present moment. Therefore, ASTRAX has been studying the possibility of building such a stay-and-learn type facility in Japan. At the IAC in Paris in 2022, we presented an outline of our plan to build such a lunar city simulation facility in Japan.

In this paper, we will present the more concrete plan for the construction of the ASTRAX LUNAR CITY Simulation Facility and its future plans.

ASTARX has merged the existing Private Space Business Development Education and Training Center and the Private Space Business Research and Development Center in Sakaimachi, Ibaraki Prefecture, and are building a new facility called ASTRAX SPACE CENTER (Private Space Business Creation Research and Development Education and Training Center) at a place called HEAVY DUTY Secret Base in Chiba Prefecture, Japan, from January 2023. There, many camping trailers are set up to serve as living spaces.



Fig. 1 Overview of HEAVY DUTY

2. Candidate site and current status

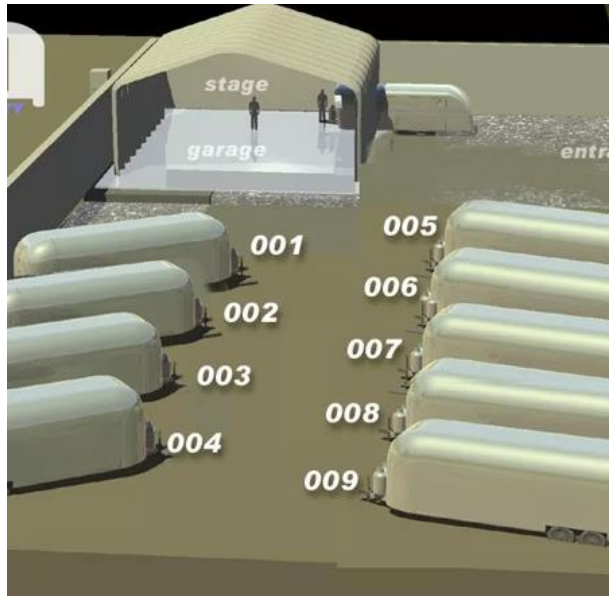


Fig. 2 Overview of the HEAVY DUTY secret base

ASTRAX has education and training simulators that simulate the interior of a commercial spacecrafts, a zero gravity aircraft education and training simulator, a commercial Space Mission Support Control Center, and a civilian space station habitation training facility at its location.

For more information, please refer to another paper. [78]



Fig.3 Facility and Simulators of ASTRAX

ASTRAX is also trying to build at this location, the functionality of the ASTRAX LUNAR CITY Simulation Facility, which is presented in this paper. The overall outline of this project was presented in a separate paper at last year's International Astronautical Conference, so please refer to that paper. [53]

In this paper, based on the experience of building and using the ASTRAX SPACE CENTER during the past

year, we introduce the plan for the complex ASTRAX LUNAR CITY Simulation Facility, which will also utilize those facilities. The current ASTRAX SPACE CENTER is located in the HEAVY DUTY Secret Base, but if the entire ASTRAX LUNAR CITY Simulation Facility is to be built, there is not enough space, so we are planning to expand it to the surrounding land and so on.

ASTRAX plans to operate this facility so that anyone can experience it, but basically, it will be operated by ASTRAX LUNAR CITY members, and members of the ASTRAX LUNAR CITY business community will provide services to ASTRAX LUNAR CITY Residence Club members. The goal is to operate with a stance of providing services to the members of the ASTRAX LUNAR CITY Residence Club, and to make the club a place for research, development, education and training for the operation of an actual Lunar City on the land of the Moon.

See separate paper for details. [53]

Therefore, rather than being a place for entertainment like a space experience attraction facility, the goal is to make it function practically as a place for education, training, research and development for the creation of new private space businesses, as well as a place for disaster prevention training (shelter life training) and experience.

The activities during the stay are not for rest and leisure like camping or glamping facilities, but for learning about life on the Moon and space life in the form of a stay-and-experience space learning program, following a programmed curriculum and plan, while at the same time serving as a disaster prevention training on Earth. The program will be open to the general public who are not experts in the field.

Participants are not limited to adults or children, and anyone can participate, but we are planning to make it a basic requirement that participants be members of ASTRAX LUNAR CITY (anyone can participate if only for a short-term temporary experience).

3. Status of facility and equipment selection

ASTRAX is currently in the process of selecting the facilities and equipment needed to implement the plan outlined in section 2. Some of which are described below.

3.1 Dome for common space

Among the pressurized stagnant areas in the ASTRAX LUNAR CITY Simulation Facility, we plan to use the EZDOME550 dome house, sold and supplied by TCL

Corporation of Japan, as a dome that simulates a common space. We will then connect four of these domes to create a cooking and eating space, a work/living space, a food growing space, and a bath toilet/relaxation space.

In order to conduct group living at a lunar base, it is important to have not only private rooms but also common spaces for sharing common infrastructure.



製品仕様	
製品名	E2DOME HOUSE DOMANI 550
全高	3,500mm
直径	5,500mm (内径5,300mm)
床面積	23.7㎡ (内側22.5㎡) (約7坪)
本体重量	約800kg
材質	高密度ポリエチレン (HDPE)
パネル厚	5mm×2
空気層	90mm
パネル外壁厚	100mm



Fig. 4 E2DOME 550 schematic diagram

3.2 Dome for Private Room

Around the domes for the common space shown in 3.1, domes for private rooms using a small dome house (E2DOME HOUSE 300) will be placed for the number of guests. In the initial stage, six domes will be placed and connected to the common space by a pressurized passageway to provide a total of six private rooms for each person to stay.

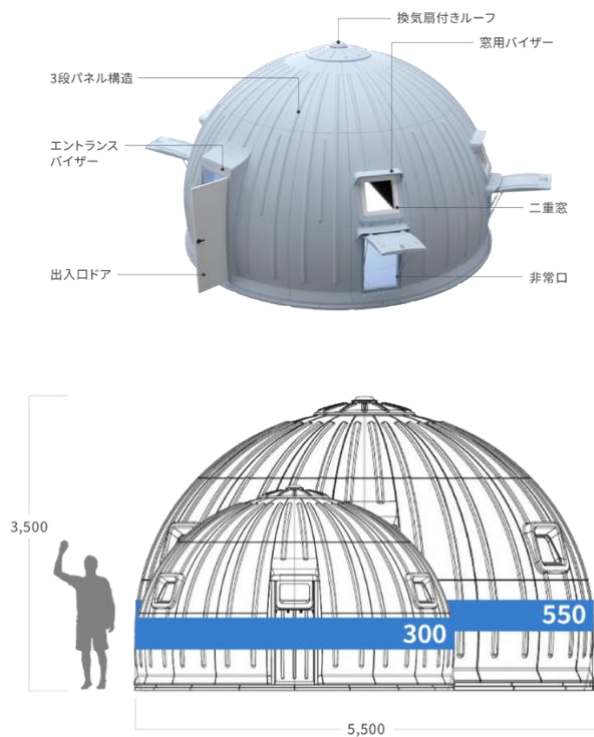


Fig. 5 E2DOME HOUSE 300

The facilities in each dome are envisioned to provide beds, desks, simple toilets, simple showers, simple kitchens, and other amenities that will basically allow each person to live independently. This is because the purpose is to secure private living space on the Lunar City as well as for education and training for life on a small spacecraft. The purpose is to allow people to experience living in a small space like SpaceX's Crew Dragon in a private dome.

Section 4 summarizes how efficiently these domes can be connected, including the four domes for shared space shown in 3.1. It is envisioned that the domes will be

reconfigured to the appropriate way of connection, if necessary, while actually connecting and using (staying in) the domes.

Then, we are considering operational policies on how to use the various facilities in the common space and private rooms, depending on the theme and purpose (space base stay experience, the Moon base stay experience, Mars base stay experience, evacuation shelter life experience on the ground, etc.).

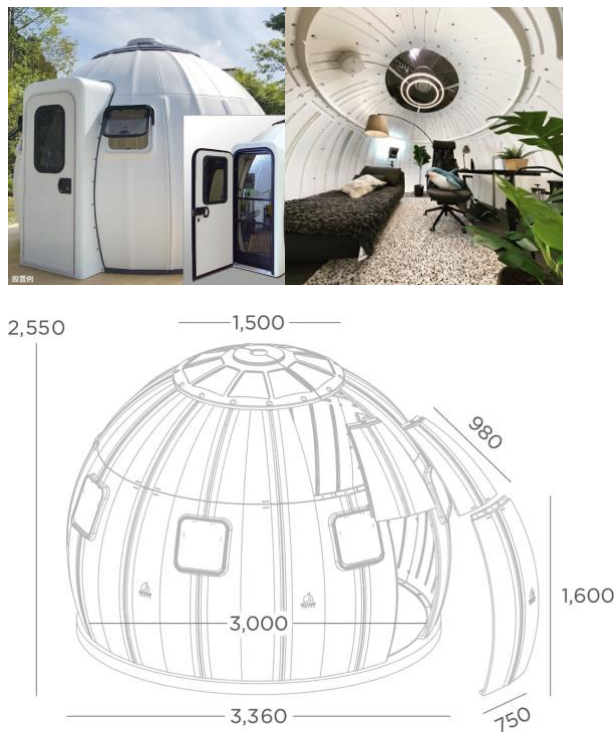


Fig. 6 EZDOME HOUSE 300 Overview

3.3 Power Supply and Hot Water Facilities

For power supply, solar panels and energy storage devices will be installed in each of the shared and private domes, and it is envisioned that power will be distributed and secured. The reason for this is to ensure that each person can use the power they use at their own risk, while keeping a close eye on their own power usage. This will not only enable them to acquire expertise in the use of limited power, but also to distribute power in a fair manner. If there is a shortage of power, we envision providing power from the ground power infrastructure (such as Tokyo Electric Power Company) for a fee, rather than from the shared space.

As for how many solar panels and energy storage devices will be needed, we envision that we will install only what is truly necessary as we actually install the domes and equipment.

The same applies to hot water supply, and we plan to install solar water heaters in each dome so that each will have access to water and hot water.



Fig. 7 Electricity storage devices, solar panels, and solar water heaters

3.4 Toilet and Bath Facilities

Regarding bathroom and toilet facilities, one of the domes for shared space is planned to be used as a shared bathroom and toilet, but it is also envisioned that a simple toilet (space toilet (Space Benking)) will be installed in each private dome as well.

It is envisioned that both practical and demonstration experiments will be conducted at the same time, with both newly developed experimental facilities envisioning toilets and showers for space use and existing toilets and showers for Earth use.

For more information on the development of space toilet Space Benking and space showers, please refer to a separate paper by ASTRAX. [49,56,77]



Fig. 8 Toilet booth and simple toilet BENKING

3.5 Kitchen and Eating Space

The kitchen and food and beverage space in the common space dome is where all participants cook and eat together. There will also be a simple kitchen in the private room dome to allow simple self-catering. On top of that, we plan to allow cooking and eating/drinking in the shared space as needed, so that participants can appropriately switch between team activities and private activities.

Equipment to be installed in the kitchen and eating area of the common space will include an induction stove, cooking utensils, a refrigerator, and a table for cooking. Since none of these items have yet been developed for space use (i.e., adapted to an environment with different gravity), we plan to study their development at ASTRAX in the future.

For the time being, existing equipment (that we normally use on Earth) will be installed and made available for use.



Fig. 9 Image of furniture for kitchen and common space under consideration

3.6 Beds

The beds will be installed only in each private dome, and we will consider whether to make them an optional bed exclusively for EZDOME HOUSE 300 or to put in a different bed.



Fig. 10 Image of beds under consideration for installation

3.7 Communication Equipment

The presence of the Internet is very important in both shared and individual spaces. Therefore, WiFi equipment will be installed to allow access from anywhere in the facility.

4. Proposed installation configuration (layout)

First, assuming that six people will be staying in the facility, we are considering the five proposed arrangements of the shared domes (four domes) and individual domes (six domes) and the method of combining them, as shown in Figure 11.

Here, we are only considering how to combine and arrange the domes, and have not yet considered the number and location of entrances.
We will first consider the convenience and privacy of the guests while actually connecting and utilizing the domes to determine the appropriate placement of the domes.

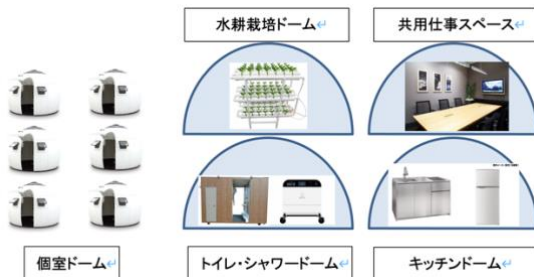


Fig. 11 Outline of necessary domes

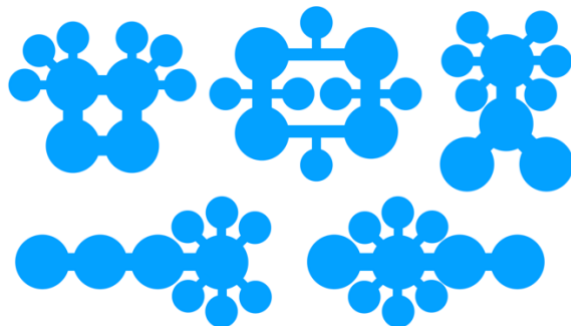


Fig. 12 Five proposed dome layouts

5. Trial operation

Prior to implementing the plan outlined in section 4, ASTRAX is renovating an existing camping trailer to build a stay-and-learn facility. In addition, those facilities are being used to test and operate the power supply system, solar water heating system, communications equipment, toilet/bath, and kitchen to be used in ASTRAX LUNAR CITY Simulation Facility.

5.1 Testing with a Houseboat or Camping Trailer

Life on the space station is very similar to life on the ground in a houseboat or camping trailer. Therefore, ASTRAX has gained experience staying in houseboats for several years in the past, and is currently conducting

verification using camping trailers. Until the dome-shaped simulated lunar city facility shown in section 4 is built, the verification will be conducted using camping trailers as well.



Fig. 13 Houseboat and Camping Trailer for testing for living in Lunar Base

5.2 ASTRAX Space Center Infrastructure Facilities

The infrastructure facilities (toilets, buses, power supply, workshop, cars, water, gas) of the entire HEAVY DUTY secret base where the ASTRAX SPACE CENTER is located are being used for verification as well. The ASTRAX SPACE CENTER will be used not only by scientists, researchers, and astronauts, but also by the general public as a facility where they can experience and train to live in space, on the Moon, and on Mars, etc. The functions will be improved and expanded while using the facility.

6. Future plans

In order to actually construct the ASTRAX LUNAR CITY Simulation Facility, we plan to procure and construct a dome house for common space and private domes. At the same time, we need to install various facilities and equipment such as lighting fixtures, air conditioners, refrigerators, toilets, bathrooms, power equipment and water heater equipment.

To do so, we will also need to secure a larger site than we currently have, as well as secure operators, users, and services. It is necessary to make it a real thing while providing various subsidies and self-investment. It is also important to use existing products, technologies, and

services as much as possible to lower development costs and materialize them quickly.

ASTRAX plans to shape the construction of the ASTRAX LUNAR CITY Simulation Facility in Japan one by one with the cooperation of ASTRAX LUNAR CITY members, business collaboration partners, and the world's Moon Base Simulation Facilities and Mars Base Simulation Facilities.

7. Conclusion

In this paper, we have presented our plans for the construction of the ASTRAX LUNAR CITY Simulation Facility in Japan. We hope to present further progress at the next International Astronautical Congress.

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CONSTRUCTION PLAN OF ASTRAX LUNAR CITY SIMULATION FACILITY IN JAPAN 2023

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Abstract

Since 2007, ASTRAX has been operating a business community for doing business on lunar lands, has sold by Lunar Embassy Inc. of the United States, along with a residence club for enjoying the products and services created there. To date, more than 380 businesses (companies, stores, cafes, restaurants, hospitals, schools, hotels, etc.) have become members, creating a variety of products and services that will be necessary for people to reach the Moon again and build a city in the near future. In order to manage the addresses on the Moon and promote business activities conducted there, ASTRAX has been working on a variety of platforms and dedicated applications to promote economic activities on the Moon, such as bi-monthly citizen meetings, 3D mapping to build a virtual lunar city, system development to match supply and demand, and development of dedicated applications. Furthermore, we have decided to build a lunar city simulation facility on Earth that simulates an actual lunar city.

In this paper, we introduce our plan to build the ASTRAX LUNAR CITY Simulation Facility in Japan.

Keywords: ASTRAX LUNAR CITY, SIMULATION FACILITY, MOON

アブストラクト

ASTRAX では 2007 年より、米国のルナエンバシー社が発売している月の土地を利用してビジネスを行うビジネスコミュニティと、そこで生み出された商品やサービスを享受するレジデンスクラブを運営しており、ASTRAX 月面シティと呼ばれる仮想的な月面の街づくりを行なっています。これまで 380 以上の事業者（会社、お店、カフェ、レストラン、病院、学校、ホテル、など）がメンバーとなり、近い将来月に人が再び到達し、街を作っていくために必要となるさまざまな商品やサービスを生み出してきました。また ASTRAX では、月の住所を管理し、そこで行われる事業活動を促進させるために、2 ヶ月に 1 回の市民会議の開催、仮想的な月面シティの構築のための 3D マッピング、需要と供給をマッチングさせるためのシステム開発、専用アプリケーションの開発など、月面における経済活動を促進させるためのさまざまなプラットフォームやサービスを提供しています。さらに、私たちはいよいよ、実際の月面シティを模擬した月面シティ模擬施設を地球上に構築することにしました。本論文では、日本における ASTRAX 月面模擬施設の構築計画について紹介します。

Keywords: ASTRAX LUNAR CITY, SIMULATION FACILITY, MOON

Acronyms/Abbreviations

1. Introduction

ASTRAX では 2007 年から、ASTRAX 月面シティと呼ばれる月の土地を利用した月面シティ構築計画を進めており、これまでも、ASTRAX 月面シティに関わる様々な国際論文を発表してきました。一方、アメリカ、ロシア、中国などの国々で月面基地や火星基地を模擬した滞在型研究施設が作られていて、長期滞在の訓練や研究などが行われていますが、現在日本にはそういう施設が存在しません。そこで、ASTRAX では、日本国内にそのような滞在型の月面基地模擬施設を作るべく、検討を行ってきました。

そして、2022 年のパリでの IAC において、その月面シティの模擬施設を日本に構築する計画の概要について紹介しました。

本論文では、さらに具体的に進行中の ASTRAX 月面シティ模擬施設の構築計画と、今後の予定について紹介します。

2. 候補地と現状

ASTARX では、これまで茨城県境町にあった民間宇宙事業創造教育訓練センターと民間宇宙事業研究開発センターを合併させ、2023 年 1 月より、日本の千葉県の某所にある HEAVY DUTY 秘密基地という場所に新しい

ASTRAX 宇宙センター(民間宇宙事業創造研究開発教育訓練センター)という施設を構築しています。そこにはたくさんさんのキャンピングトレーラーが配置されており、居住することができるスペースとなっています。



図 1 HEAVY DUTY 概要紹介

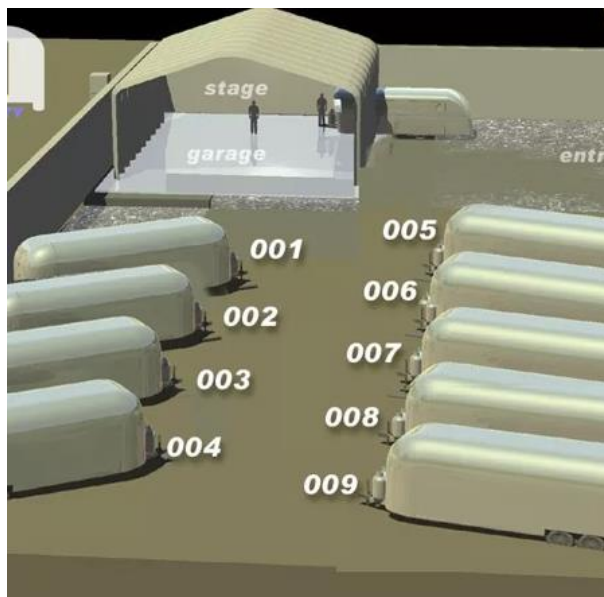


図 2 HEAVY DUTY 秘密基地概要図

ASTRAX はその場所に、民間宇宙船の内装を模擬した教育訓練シミュレーターや、無重力飛行機教育訓練シミュレーター、民間宇宙船運用支援管制センター、宇宙滞在訓練施設などを有しています。
詳しくは別の論文[78]を参照してください。



図 3 ASTRAX のシミュレーターなどの設備

そして ASTRAX では、この場所に、本論文で紹介する ASTRAX 月面シティ模擬施設の機能も構築しようとしています。その全体的な概要については、昨年の国際宇宙会議において、別論文で発表しましたのでそちらを参照ください。

本論文では、この 1 年間の ASTRAX 宇宙センター構築経験・利用経験を踏まえ、それらの設備も利用した、複合的な ASTRAX 月面シティ模擬施設の計画について紹介します。なお、現在の ASTRAX 宇宙センターは、HEAVY DUTY 秘密基地という場所の中にありますが、ASTRAX 月面シティ模擬施設全体を作るとすると、スペースが足りないため、周りの土地などに拡張することも想定して計画しています。

ASTRAX では、この施設を広く一般的に誰でも体験できるように運営していく予定ですが、基本的には ASTRAX 月面シティのメンバーが中心となって運営し、ASTRAX 月面シティのビジネスコミュニティのメンバーが、ASTRAX 月面シティレジデンスクラブのメンバーに対してサービスを提供していくというスタンスで運営することで、月の土地を利用した実際の月面シティの運営のための研究や開発、教育や訓練の場にするを目的としています。
詳細は別論文を参照してください。

そのため、宇宙体験アトラクション施設のようなエンターテインメントのための場所というよりは、新しい民間宇宙事業創造のための教育や訓練、研究や開発、さらには防災訓練(避難所生活訓練)や体験の場所として、実用的に機能させていくことを目標としています。

滞在中の活動としては、キャンプ場やグランピング施設のような休息や余暇を楽しむためのものではなく、プログラム化されたカリキュラムや計画に沿って、滞在型宇宙体験学習プログラムのような形で月面生活や宇宙生活を学びつつ、

同時に地球上での防災訓練にもなるものとして、専門家ではない一般人が参加できるようにする予定です。

参加者は大人や子供に限らず、誰でも参加できますが、基本的には ASTRAX 月面シティのメンバーであることを基本条件にしようと考えています(短期の一時体験であれば、誰でも参加可能とする予定)。

3. 設備や機材の選定状況

ASTRAX では現在、2 項で示した計画を実行するために必要となる設備や機材の選定作業を行なっています。そのうちのいくつかを紹介します。

3.1 共用スペース用ドーム

ASTRAX 月面シティ模擬施設内の与圧滞在区画のうち、共用スペースを模擬したドームとして、日本の株式会社 TCL が販売・提供しているドームハウス EZDOME550 を利用する予定です。そして、このドームを4つ繋いで、調理・飲食スペース、ワーク・リビングスペース、食材育成スペース、バストイレ・リラクゼーションスペースを作ります。

月面基地などで集団生活を行うためには、個室だけでなく、共通インフラを共有するための共用スペースの確保が重要になるため、ASTRAX 月面シティ模擬施設においても同様の共用スペースを配置することになっています。

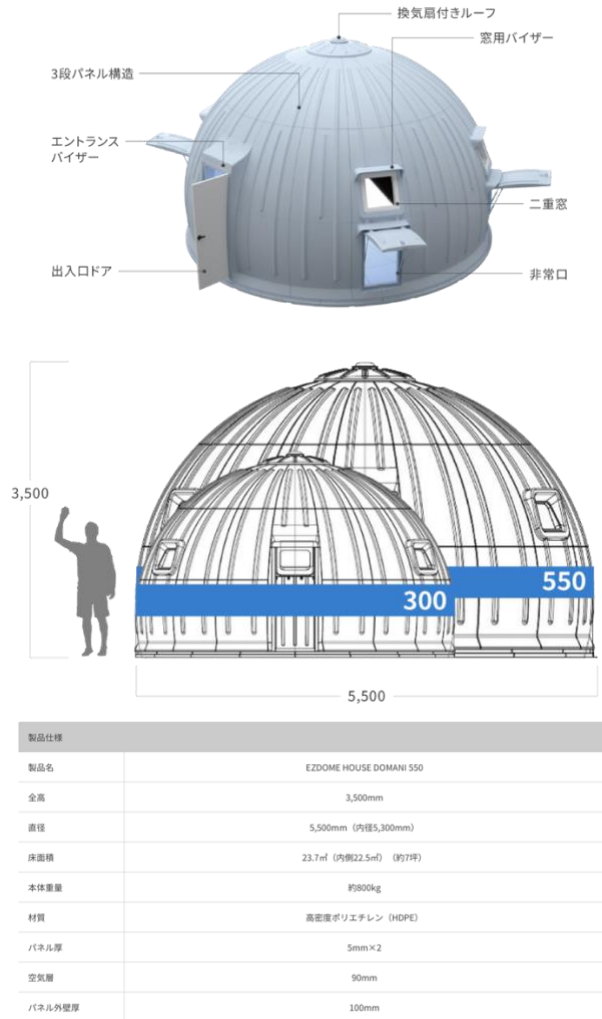


図 4 EZDOME550 概要図

3.2 個室用ドーム

3.1 に示した共用スペース用ドームの周りに、小型のドームハウス (EZDOME HOUSE 300) を利用した個室用のドームを滞在人数分だけ配置する予定です。初期の段階では 6 個のドームを配置し、与圧された通路で共用スペースと

繋ぎ、合計 6 人が滞在できるプライベートな個室を各人用に設置します。



図 5 EZDOME HOUSE 300

各ドーム内の設備としては、ベッド、デスク、簡易トイレ、簡易シャワー、簡易キッチンなど、基本的に各自が自立して生活できる設備を提供することを想定しています。これは、月面シティでのプライベート生活空間の確保と同時に、小型の宇宙船での生活のための教育や訓練に使用する目的もあるからです。スペース X のクルードラゴンのような小さな空間で生活することを個室ドームで体験できるようにするためです。

3.1 に示す 4 つの共用スペース用ドームを含め、これらのドームをどのように接続することが効率的か、ということについて4項でまとめています。実際にドームを接続してみて、利用(滞在)しながら、必要があれば、適切な接続の仕方に組み換えていくことを想定しています。

その上で、共用スペースや個室の様々な設備をどう利用していくかについて、テーマや目的(宇宙基地滞在体験、月面基地滞在体験、火星基地滞在体験、地上での避難所生活体験など)に応じて、運営方針を考えています。

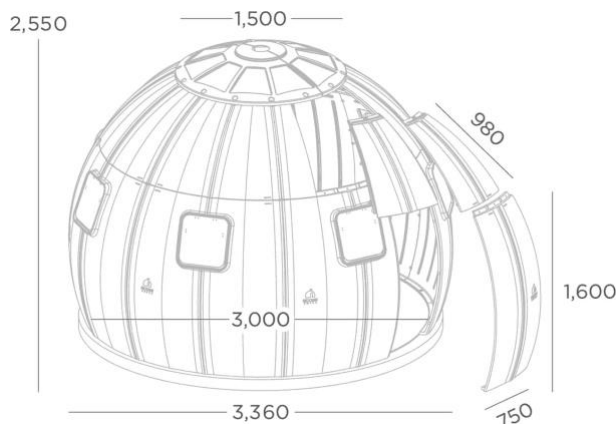


図 6 EZDOME HOUSE 300 概要

3.3 電源・給湯設備

電源は、共用ドーム、個室ドームそれぞれに、ソーラーパネルと蓄電装置を設置し、分散して電源を確保することを想定しています。理由は、各自が利用する電力を各自がしっかり把握しながら、個人の責任で利用していけるようにするためです。それによって、限られた電力利用のノウハウが身につくだけでなく、公平に電力を分配することができるからです。もし電力が足りなくなる場合は、共用スペースの電力ではなく、有料で地上電力インフラ(東京電力など)の電力を提供することを想定しています。

どれくらいの数のソーラーパネルと蓄電装置が必要になるかは、実際にドームや機材を設置しながら、本当に必要な分だけ導入していくことを想定しています。

給湯についても同様に、各ドームに太陽熱温水器を設置することで、それぞれが水・お湯の利用ができるようにする予定です。



図 7 蓄電装置・ソーラーパネル・太陽熱温水器

3.4 トイレ・バス設備

バス・トイレについては、共用スペース用ドームのうちの一つを共用バス・トイレにする予定ですが、トイレについては各個室ドームでも簡易トイレ(宇宙用のトイレ(宇宙ベンキング))を設置することも想定しています。

新たに開発している宇宙用のトイレや宇宙用のシャワーを想定した実験設備と、既存の地球用のトイレやシャワーの両方を用意し、実用と実証実験の両方を同時に行うことを想定しています。

宇宙用トイレスペースベンキングの開発や、宇宙シャワーの開発については、ASTRAX による別論文を参照ください。



図 8 ユニット型トイレと簡易トイレ BENKING

3.5 キッチン・飲食スペース

共用スペースドームのキッチン・飲食スペースは、参加者全員で調理をして食事をする場所です。個室ドームにも簡単なキッチンがあり、簡単な自炊ができるようにする予定です。その上で、必要に応じて、共用スペースでの調理や飲食もできるようにすることで、チーム活動とプライベート活動を適切に切り替えられるようにする予定です。

共用スペースのキッチン・飲食スペースに設置する設備としては、IH コンロ、調理器具、冷蔵庫、料理用テーブルなどを想定しています。これらのうち、宇宙用(重力が異なる環境に合わせたもの)に開発を進めているものはまだないので、今後 ASTRAX で開発の検討を進めていく予定です。当面は既存の機器(地球で私たちが普段使用しているもの)などを設置し、利用できるようにします。



図 9 検討中のキッチン・共用スペース用家具イメージ

3.6 ベッド

ベッドは各個室ドームだけに設置する予定です。EZDOME HOUSE 300 専用オプションのベッドにするか、別なベッドを入れるかは、今後検討していく予定です。



図 10 導入検討中のベッドイメージ

3.7 通信設備

共用スペース及び個人スペースにおいて、インターネットの存在は非常に重要です。そこで、WiFi 設備を設置し、施設内のどこからでもアクセスできるようにしていきます。

4. 設置構成(配置)案

4.1 共有ドームと個別ドームの配置案

まずは 6 人が滞在することを想定し、共用ドーム(4個)と個別ドーム(6 個)の配置と結合方法について、図 11 に示す 5 つの配置案を検討しています。

ここでは、あくまでドームの結合方法と配置だけを検討しており、入口の数や場所などはまだ検討していません。まずは滞在者の利便性やプライバシーなどを考慮しつつ、実際に接続して、活用しながら適切なドームの配置を検討していくことにします。

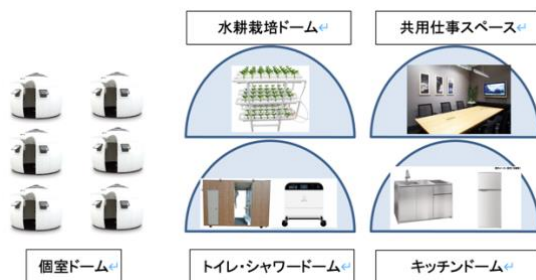


図 11 必要なドーム概要

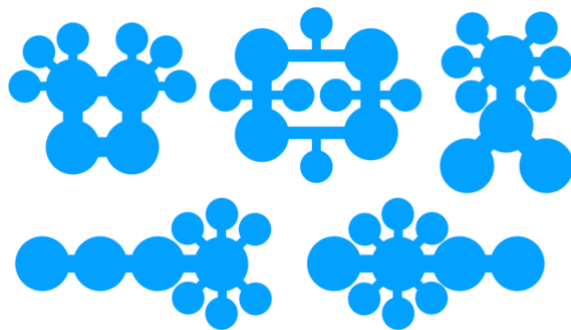


図 12 ドームの配置 5 案

5. 試験的な運用

ASTRAX では、4 項に示した計画を実施する前に、既存のキャンピングトレーラーを改装して、滞在型教育設備を構築しています。さらに、それらの設備を使って、月面シティ模擬施設で利用する電源装置や太陽光給湯設備、通信設備、トイレ・バス、キッチンなどの試験運用を行っています。

5.1 キャンピングトレーラーによるテスト

宇宙基地での生活は、地上におけるハウスボートやキャンピングトレーラーでの生活が酷似しています。そこで ASTRAX

では、過去に数年間ハウスボートでの滞在経験を積むとともに、現在はキャンピングトレーラーを利用した検証を行っています。4 に示したドーム型の月面シティ模擬施設ができるまで、キャンピングトレーラーも利用しながら検証を行っていく予定である。



図 13 月面基地生活の検証のためのハウスボートやキャンピングトレーラー

5.2 ASTRAX 宇宙センターのインフラ設備

ASTRAX 宇宙センターがある HEAVY DUTY 秘密基地全体のインフラ設備(トイレ、バス、電源、工房、車、水道、ガス)なども同様に利用して検証を行っている。科学者や研究者、宇宙飛行士だけでなく、一般人が宇宙や月面や火星などで生活できることを想定した滞在体験や訓練を行える施設として、実際に利用しながら機能向上や、拡大をしていく予定である。

6. 今後の計画

今後、実際に ASTRAX 月面シティ模擬施設を構築するために、共用スペースや個室ドームのためのドームハウスを調達し、建設を行っていく予定です。同時に、照明器具、エアコン、冷蔵庫、トイレ、バス、電源機器や給湯器機など、様々な設備や機器も導入していかなければなりません。

そのためには、現在よりも広い敷地も確保しなければならず、さらには、運用者の確保、利用者の確保、サービスの充実も行っていく必要があります。そして様々な補助金や自己投資などを行いつつ、実際のものにしていく必要があります。また、なるべく既存の商品や技術やサービスを利用

することで、開発コストを下げ、迅速に具現化していくことが重要です。

ASTRAXでは、日本国内にASTRAX月面シティ模擬施設の建設を実現させるために、ASTRAX月面シティのメンバーやビジネスコラボレーションパートナー、世界の月面基地模擬施設や火星基地模擬施設などの協力を得ながら、一つ一つ形にしていく予定です。

7. 結論

本論文では、日本におけるASTRAX月面シティ模擬施設の建設に関する計画を紹介しました。
次回の国際宇宙会議において、さらに今後の進捗について発表できたらと考えています。

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