

Build a Human Habitat on Mars

Survive and Thrive



An addition to the Sun, Earth, Universe Exhibition

Museum Educator & Promotion Guide

Revised 4-5-23

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Exhibit Description

Build a Human Habitat on Mars is a hands-on exhibit designed to inspire, engage, and educate the next generation of explorers about human exploration on Mars. 52 identical copies of *Build a Human Habitat on Mars* will be distributed as an addition to the 52 copies of the NASA-funded *Sun, Earth, Universe* exhibition located throughout the United States.

To learn more about the project

<https://www.nisenet.org/mars-habitat-project>

To access all host resources for the *Build a Human Habitat on Mars* exhibit

<https://www.nisenet.org/marshabitat>

For more resources for promotion, marketing, education, and much more, check out the original materials included with *Sun, Earth, Universe*:

<https://www.nisenet.org/sunearthuniverse>

Descriptions

One Line: *Build a Human Habitat on Mars* is a hands-on exhibit designed to inspire, engage, and educate the next generation of explorers about human exploration on Mars.

Short Description: For people to live on Mars, we will need to develop technology and systems that will allow humans to survive and thrive. *Build a Human Habitat on Mars* is a hands-on exhibit that allows visitors to design and construct their own imaginary habitat on Mars. Visitors will focus on the real challenges to life on Mars and have thoughtful reflections about possible solutions. From ensuring the bare minimum for human life to exist on another planet to adapting everyday habits that keep us healthy both physically and mentally, visitors will consider all elements necessary for day-to-day routines to transition to a new and very different planet from our own. Wanted: explorers and creative thinkers who can survive, thrive, and *Build a Human Habitat on Mars!*

Long Description: *Build a Human Habitat on Mars* is a hands-on exhibit designed to inspire, engage, and educate the next generation of explorers about human exploration on Mars. For people to live on Mars, we will need to develop technology and systems that will allow humans to survive and thrive. Survival means there are processes in place to maintain the bare minimum for human life to exist: water to drink, oxygen to breathe, shelter from the harsh environment, and much more. Thriving on Mars requires making special efforts to stay healthy both physically and mentally. This means having resources to keep your mind and body active, like your favorite book, music, comfort foods, hobbies, exercise, and ways that allow you to transition your day-to-day routines to a new and very different planet from our own.

Build a Human Habitat on Mars utilizes Strictly Briks® Big Briks™ building blocks, which are compatible with other major brick brands. By using this familiar resource, museum visitors can immediately start to design and construct their own imaginary habitat for successful living and working on Mars. Participants will be able to focus on the real challenges to life on Mars and have thoughtful reflection about possible solutions. The exhibit also includes a set of challenge cards presenting some of the very real challenges people may face when establishing an outpost on Mars. Wanted: explorers and creative thinkers who can survive, thrive, and *Build a Human Habitat on Mars!*

The *Build a Human Habitat on Mars* exhibit is designed to be integrated into the *Sun, Earth, Universe* exhibition.

Learning Goals and Target Audience

The primary goal of *Build a Human Habitat on Mars* is to engage public audiences in authentic STEM learning related to space exploration and to foster 21st Century Skills such as creativity, problem-solving, and collaboration.

STEM Learning Outcomes

- Increased interest and positive attitudes related to learning about space exploration
- Gain in content knowledge about space exploration, science, and engineering
- Fostering 21st Century Skills such as creativity, problem-solving, and collaboration.

Learning Objectives

Primary learning objectives are related to STEM processes and STEM identity. Learners will:

- Work together to accomplish goals and solve problems
- Identify as someone who can learn about and participate in Earth and space exploration

Additional learning objectives are related to greater understanding of key concepts in human exploration beyond low-Earth orbit and lunar/planetary science. To ensure that the exhibit accurately represents key aspects of human exploration of Mars, the project team collaborated with NASA subject matter experts and drew upon content from planned missions, new technology, and the emerging challenges of future human space exploration.

Learning Framework

The Learning framework is consistent with that established for other NISE Network Earth and Space programming:

- Experience Earth and space **phenomena** and explore scientific discoveries.
- Use the scientific **process** and reflect on science as a way of knowing.
- **Participate** in the scientific community and identify as a science learner.

Target Audience

Build a Human Habitat on Mars was designed for students in grades 4-8. However, using a very familiar, all-ages building resource, the exhibit is widely accessible to family audiences of all ages and backgrounds, school field trip groups, underserved audiences, and more.

Mars Programming & Additional Resources

The following Mars resources can also be found on the NISE Network website

<https://www.nisenet.org/mars>

NISE Network Explore Science: Earth & Space Hands-on Activities

In collaboration with NASA, the NISE Network has assembled multiple toolkits of engaging, hands-on Earth and space science experiences with connections to science, technology, and society.



- Explore Science: Earth & Space toolkits may be downloaded here
<http://www.nisenet.org/earthspacekit>
- Earth & Space Learning and Content Frameworks
This content framework and learning framework are professional learning tools for informal educators engaging the public with the hands-on activities in the Explore Science: Earth & Space toolkits and the Sun, Earth, Universe exhibition.
<https://www.nisenet.org/earth-space-frameworks>
- An up-to-date list of all Earth & Space hands-on activities from the NISE Network can be found at this link
http://nisenet.org/search/product_type/programs-and-activities-10/kit/explore-science-earth-space-toolkit-2820

NISE Network Hands-on Activities Related to Mars

- **Explore Mars! A Rover Game** downloadable cooperative board game
<https://www.nisenet.org/catalog/explore-mars-rover-game>
- **Exploring the Solar System: Mars Rovers** activity (included in the Explore Science: Earth & Space 2018 toolkit)
<https://www.nisenet.org/catalog/exploring-solar-system-mars-rovers-2018>

- **Exploring the Universe: Space Guess Quest Game** (included in the Explore Science: Earth & Space 2019 and 2020 toolkit)
<https://www.nisenet.org/catalog/exploring-universe-space-guess-quest-game-2019-2020>
- **Exploring the Solar System: Pocket Solar System** (include in the Explore Science: Earth & Space 2017 and 2019 toolkit)
<https://www.nisenet.org/catalog/exploring-solar-system-pocket-solar-system>
- More Mars resources
<https://www.nisenet.org/mars>

Mars Perseverance Professional Development Workshops

- **Recorded NISE Network Online Workshop - Preparing for NASA Perseverance's landing on Mars**
<https://www.nisenet.org/catalog/online-workshop-recording-preparing-nasa-perseverances-landing-mars>
- **Recorded workshop: How are You Celebrating Perseverance's Landing?**
NASA Museum & Informal Education Alliance resources (log in to Museum & Informal Education Alliance website required; Slides and recording available for download)
<https://informal.jpl.nasa.gov/museum/Conversations/how-are-you-celebrating-perseverance's-landing>

Mars General Resources

- NASA Mars exploration program
<https://mars.nasa.gov>
- Perseverance mission page for the latest news and images
<https://mars.nasa.gov/mars2020>
- NASA Mission to Mars Student Challenge
<https://www.jpl.nasa.gov/edu/mission-to-mars-student-challenge/>
- Mars STEM Toolkit of activities
https://www.nasa.gov/stem/nextgenstem/moon_to_mars/mars2020stemtoolkit
- NASA's Museum and Informal Education Alliance
<https://informal.jpl.nasa.gov/museum/>

- Try the Mars Photo Booth, Send Your Name on the next mission to Mars, and check out other interactive experiences
<https://mars.nasa.gov/mars2020/participate/>
- NASA JPL activities - including Mars helicopter and rover activities
<https://www.jpl.nasa.gov/edu/learn/>

Multimedia and Interactive Resources

- MarsTrek - Explore all the details of the Martian surface
<https://trek.nasa.gov/mars/>
- Use NASA Eyes to see where the rover and Mars orbiters are right now
https://eyes.nasa.gov/apps/orrery/#/sc_perseverance
- NASA Space Place - Explore Mars: a Mars Rover Game
<https://spaceplace.nasa.gov/explore-mars/en/>
- NASA Space Place - Learn about Mars
<https://spaceplace.nasa.gov/search/MARS/>
- Sounds of Mars
<https://mars.nasa.gov/mars2020/participate/sounds/>
<https://www.nasa.gov/mediacast/sounds-of-mars>

NASA Videos

- Mission Overview: NASA's Perseverance Mars Rover
<https://www.jpl.nasa.gov/videos/mission-overview-nasas-perseverance-mars-rover/>
- NASA Mars in a Minute video series
<https://mars.nasa.gov/multimedia/videos/?category=53%3A199>
- NASA eClips videos
<https://nasaclips.arc.nasa.gov/search/?terms=mars>

Printable Materials

- NASA Mars posters
<https://mars.nasa.gov/multimedia/resources/mars-posters-explorers-wanted/>

- NASA Mars Perseverance launch Posters, stickers, fact sheets, mission patches and more
<https://mars.nasa.gov/mars2020/multimedia/resources/>

3D Printing Resources

- 3D printable Mars models
<https://nasa3d.arc.nasa.gov/search/mars>
- Custom 3D print files can be generated using the NASA Mars Trek
<https://trek.nasa.gov/mars/>
Users can draw bounding boxes around any areas of interest to generate output files for 3D printing of desired surface features, instructions: <https://trek.nasa.gov> (choose "3D printing" from menu at the bottom of the screen)

Resources for Educators

- NASA Resources for Educators (Search hundreds of resources by subject, grade level, type and keyword; lesson plans and teaching materials support STEM curriculum)
<https://www.nasa.gov/audience/foreducators/index.html>
- NASA's BEST Educator's Guide to the Engineering Design Process (Educator guides are available for Grades K-2, Grades 3-5, and Grades 6-8)
<https://www.nasa.gov/audience/foreducators/best/activities.html>
<https://www.nasa.gov/audience/foreducators/best/edp.html>
- NASA Space Place (engaging upper-elementary-aged children in space and Earth science through interactive games, hands-on activities, fun articles and short videos)
<https://spaceplace.nasa.gov/menu/parents-and-educators/>

Programming Extensions

There are a number of ways that you can take the *Build a Human Habitat on Mars* experience further with your visitors, including adding a facilitator to the experience. These are just a few ideas to engage audiences more in this content and promote deeper reflection on the concepts presented.

Make Your Own Martian Landforms

The surface of Mars is not flat, and to better represent this you could create different rocky landforms by gluing some of the extra orange and red blocks together in various formations. Once created, these can be added to the bin of blocks for participants to use unfacilitated, or can be part of programming with a staff member or volunteer. You can discuss the landscape on Mars, talk about landforms not so different from those on our own planet, and make the building experience more challenging by placing landforms strategically for participants to build around.

When gluing blocks to create a landform, you will want to choose a liquid or gel glue that is appropriate for non-porous plastic and works for your situation. Whatever glue you choose, please use appropriate safety precautions and ventilation.

- Decide if you want permanent or temporary glue.
- Always follow the instructions on the label. Different glues require different conditions for optimal performance.
- Clean the blocks of any dust or debris to allow the glue to work optimally. Make sure the blocks are dry before applying the glue.
- Test the glue on a few blocks.
- Use a thin layer of adhesive. If you use too much glue, drying times will be longer and the glue might spill from underneath the blocks.

Some resources to help you choose the right glue and application approach:

<https://gluenerd.com/best-glue-for-legos/>

<https://gluetips.com/glue-for-legos/>

<https://www.stickyaide.com/best-glue-for-legos/>

Adding More Blocks for Building

This exhibit uses Strictly Briks® Big Briks™ building blocks that are available for purchase online. These blocks connect perfectly with Lego® Duplo®-style blocks of all kinds. Feel free to add more blocks from your own resources or purchase additional products off the shelf. You can buy red and orange colored Duplo® sized bricks for the Martian landscape in bulk from different suppliers; some examples include:

<https://www.lego.com/en-us/pick-and-build/pick-a-brick>

<https://www.bricklink.com/>

<https://strictlybriks.com/>

Lego® Duplo® also has a variety of its own pre-printed icon blocks, if you would like to explore additional thrive options.

You can even add Lego® mini-figures, though we highly recommend doing so only for experiences facilitated by staff or volunteers so you can keep track of these items.

Adding Stickers to Additional Blocks

Please consult the technical guide for how to print additional stickers and apply them to the blocks. Replacement sticker files for printing with your own printer in small batches can be found with all other host resources online

<https://www.nisenet.org/marshabitat>

Expanding Upon Building Challenges

Included with the exhibition is a set of seven challenge cards. These present some of the very real scenarios humans may face while living and working on Mars. These cards present simple challenges and are meant to be unfacilitated experiences. However, by adding a staff member or volunteer you can increase the difficulty of challenges however you see fit for your audiences. You could layer more content onto the existing challenges, make challenges a race against the clock by adding a timer, and much more. The following is one example of a challenge with facilitation:

Example of a Facilitated Challenge

Communication Challenge

Skill level: Advanced; two-person challenge (you can increase difficulty by also making this a timed challenge)

Goal: receive instructions from Mission Control on Earth to build a rover on Mars

Supplies: each person should collect the same 8 blocks, for two sets of the following

- 1 power block
- 1 satellite block
- 1 science block
- 1 communication block
- 4 Martian soil blocks - be sure participants both grab the same type of blocks! If one has 3 2x2 blocks and 2 1x2 blocks, then the other should grab the same.

Challenge: Life on Mars requires teamwork, so for this challenge you need a partner. This person is back on Earth with an exact copy of the rover you need to build on Mars. They will guide you through the process of building, but be sure to listen closely to their instructions. Communication from Earth to Mars may be delayed anywhere from 5-20 minutes, taking precious time away from your build!

- Step 1: Stand back to back with your partner so you cannot see what they build
- Step 2: Mission Control - build your rover however you want with the 8 pieces
- Step 3: Mission Control - once your rover is complete, begin to give step-by-step instructions to your partner to build the same rover on Mars. After each instruction, wait 30 seconds before giving the next. If your partner asks you any followup questions, wait 30 seconds to answer.
- Step 4: When you think your rovers match you can turn around and compare. How successful were you? Was communication difficult?

Fun fact: NASA's Mars rovers Curiosity and Perseverance have nearly identical twins here on Earth that live at NASA's Jet Propulsion Laboratory ([JPL](#)) MarsYard in California.

Facilitation with Staff and Volunteers

If you choose to include additional programming with skilled facilitators be sure to introduce these staff and volunteers to the exhibition. A short walk-thru video will be included with all host resources online

<https://www.nisenet.org/marshabitat>

Tips for Engaging Visitors

While experienced museum educators may be trained in facilitation techniques, here is a list of tips to help engage visitors in the exhibition.

- Greet visitors – Say “hello”; make eye contact, and smile. Simply looking like you’re available and friendly will bring visitors to your station.
- Let visitors do the activities – As much as possible, let visitors do the hands-on parts of the activity, and let them discover what happens. (If your activity has a surprise, don’t give it away!)
- Share what you know – Use clear, simple language. Focus on one main idea – don’t feel that you need to tell visitors everything at once! Keep the information basic for starters, and be willing to expand on an idea for interested learners.
- Use examples from everyday life – Familiar examples can help explain abstract concepts. Be aware of visitors’ abilities, keeping in mind that children do not have the same skills or vocabulary as adults.
- Ask questions – Help visitors observe and think about the activity. Try to use questions that have more than one answer, such as:
 - What do you see happening?
 - Why do you think that happened?
 - What surprised you about what you saw?
 - Does this remind you of anything you’ve seen before?
- Be a good listener – Be interested in what visitors tell you, and let their curiosity and responses drive your conversation forward. Offer positive and encouraging responses. If visitors haven’t quite grasped a concept, you might say, “That’s a good guess,” or “Very close, does anyone else have something to add?” Don’t say, “No” or “Wrong” in response to visitors’ observations or explanations.
- Share accurate information – If you aren’t sure about something, it’s OK to say, “I don’t know. That’s a great question.”

- Nonverbal communication is important, too – Try to maintain an inviting face and body language.
- Thank visitors – As your interaction ends, suggest that visitors explore other Sun, Earth, Universe activities.
- HAVE FUN! A positive experience will lead to learning.

Facilitation Training and General Exhibition Orientation Videos

The NISE Network has created videos that model good facilitation strategies for educators sharing Earth and space science concepts and other complex STEM content. These videos can be shared as part of a *Build a Human Habitat on Mars* staff and volunteer training.

- **Explore Science: Earth & Space Toolkit Activity Training Videos**
Explore Science: Earth & Space toolkit activities (including those related to Mars content) come with short content training videos
<http://www.nisenet.org/catalog/explore-science-earth-space-activity-and-content-training-videos>
- NISE Network training videos on more topics including facilitation skills
<https://www.nisenet.org/training-videos>

Finding and Collaborating with STEM Experts

The NISE Network strongly encourages you to collaborate with local experts and science enthusiasts in your area. Volunteer experts are a key ingredient to many successful public engagement efforts and can add to visitor experiences in the exhibition. The following tools may assist you in approaching collaborations in your community.

- Working with STEM Experts: A Guide for Educators in Museums and Other Informal Learning Settings
Please see the "Space and Earth Science" and section
<https://www.nisenet.org/working-with-experts>
- Museum & Community Partnerships: Collaboration Guide and additional resources
<https://www.nisenet.org/collaboration-guide>

More Professional Learning Resources

- Making Earth & Space Science More Relevant and Inclusive resources
<https://www.nisenet.org/making-relevant-inclusive>
- Diversity, Equity, Accessibility, and Inclusion (DEAI) Booklet
<https://www.nisenet.org/DEAI-tools>
- More NISE Network professional learning tools and resources
<https://www.nisenet.org/pd>

Spanish Translation & Bilingual Resources

Build a Human Habitat on Mars is bilingual, with English and Spanish appearing on all public facing materials. Below is a side-by-side translation of all text used in the exhibit.

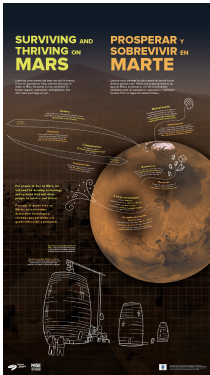
The NISE Network offers many tools, guides, and strategies for engaging bilingual audiences.

Find more info about Spanish language translations and bilingual resources online

<https://www.nisenet.org/spanish>

English	Spanish
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Tall Introductory Graphic on Outer Wall

	
<p>Surviving and Thriving on Mars Exploring other planets has been science fiction for generations. Now, with the discovery of water ice on Mars, the planet is a top candidate for human research, exploration, and habitation. But don't pack your bags just yet . . .</p>	<p>Sobreviviendo y prosperando en Marte La exploración de otros planetas ha sido tema de la ciencia ficción por muchas generaciones. Últimamente, con el descubrimiento de agua congelada en Marte, el planeta es el principal candidato de la investigación humana, la exploración, y para habitarlo. Pero todavía no hagas las maletas...</p>

<p>Distance Earth and Mars are in different orbits, causing the distance between the two to range from 35-250 million miles. With current propulsion technology, a one-way trip to Mars would take at least seven months.</p>	<p>Distancia La Tierra y Marte están en diferentes órbitas, haciendo que la distancia entre ellos oscile entre 56 y 402 millones de kilómetros. Con la tecnología actual de propulsión, un viaje de ida a Marte tardaría por lo menos siete meses.</p>
<p>Mental health Everything we're used to, from hobbies, to spending time outdoors, to eating our favorite foods, to social interactions, will come with new challenges. Staying physically and mentally healthy will require special effort.</p>	<p>Salud mental Todo lo que estamos acostumbrados a hacer, desde nuestros pasatiempos, el tiempo que pasamos en la naturaleza, comer nuestra comida favorita, hasta las interacciones sociales, vendrán con nuevos retos. Mantenerse física y mentalmente sanos va a requerir un esfuerzo especial.</p>
<p>Communication The distance creates a 5 to 20-minute delay sending messages to or from Mars.</p>	<p>Comunicación La distancia crea un retraso de 5 a 20-minutos al enviar mensajes desde y para Marte.</p>
<p>Resources The soil, rocks, and ice on Mars would need to be mined and processed to be used as a source of water, building materials, and for other purposes.</p>	<p>Recursos El suelo, las rocas, y el hielo en Marte necesitaría ser extraída y procesada para ser usada como fuente de agua, materiales de construcción y otros propósitos.</p>
<p>A harsh environment Harmful radiation, temperatures as low as -225° F (-153° C), days-long dust storms, and an atmosphere without enough oxygen to support human life endanger any mission to the Red Planet.</p> <p>For people to live on Mars, we will need to develop technology and systems that will allow people to survive and thrive.</p>	<p>Un ambiente hostil La radiación nociva, temperaturas tan bajas como -153° C (-225° F), tormentas de arena de varios días de duración, y una atmósfera sin suficiente oxígeno para sostener la vida humana ponen en peligro cualquier misión al Planeta Rojo.</p> <p>Para que las personas puedan vivir en Marte, necesitaremos desarrollar tecnología y sistemas que permitan a las personas sobrevivir y prosperar.</p>

BOTTOM CAPTION: Drawing of a possible habitat on Mars, inspired by the work of AI SpaceFactory of New York, the top prize winner in finale of NASA's 3D-Printed Habitat Challenge.	Caption: Esquema de un posible hábitat en Marte, inspirado por el trabajo de AI SpaceFactory de Nueva York, el ganador del gran premio en la final del 3D-Printed Habitat Challenge (Reto hábitat en 3D) de la NASA.
To Earth	Hacia la Tierra
From Earth	Desde la Tierra

Activity Instruction Graphic on Inner Wall

	
Build a Human Habitat on Mars	Construye un hábitat humano en Marte
BUILD: Construct outpost buildings using the red and orange building blocks made from Martian soil.	CONSTRUYE: Construye un edificio de avanzada utilizando los bloques rojo y naranja hechos de suelo marciano.
CONNECT: Use connector blocks to create safe passageways between all outpost buildings.	CONECTA: Utiliza los bloques conectores para crear pasajes seguros entre todos los edificios de avanzada.
SURVIVE: Include each of the necessary systems in your outpost.	SOBREVIVE: Incluye cada uno de los sistemas necesarios en tu edificio de avanzada.

THRIVE: Stay healthy and happy by including at least four of the pink, blue, and green blocks.	PROSPERA: Mantente sano y feliz al incluir por lo menos cuatro de los bloques rosa, azul, y verde.
For more building ideas, explore the challenge cards.	Para más ideas de edificios, explora las cartas con retos.
connector blocks	Bloques conectores
building blocks	Bloques de construcción
SURVIVE: <ul style="list-style-type: none"> ● Water ● Recycle ● Oxygen ● Power ● Communications ● Food 	SOBREVIVIR: <ul style="list-style-type: none"> ● Agua ● Reciclar ● Oxígeno ● Energía ● Comunicaciones ● Comida
THRIVE: <ul style="list-style-type: none"> ● Entertainment ● Tools and scientific instruments ● Physical and mental exercise ● Comfort Food and Drink ● Pets ● Hygiene ● Comfort ● First Aid 	PROSPERAR: <ul style="list-style-type: none"> ● Entretenimiento ● Herramientas e instrumentos científicos ● Ejercicio físico y mental ● Comidas y bebidas caseras ● Mascotas ● Higiene ● Comodidad ● Primeros auxilios

Graphics on Top of Stools (four)

 <p>NASA 3D-Printed Habitat Challenge competition finalist: AI SpaceFactory of New York, the top prize winner in finale of NASA's 3D-Printed Habitat Challenge.</p>	<p>Finalista de la competencia NASA 3D-Printed Habitat Challenge: AI SpaceFactory de Nueva York, el ganador del mayor premio en la final del 3D-Printed Habitat Challenge de la NASA.</p>
 <p>NASA 3D-Printed Habitat Challenge competition finalist: Mars Incubator, a team of engineers and artists from New Haven, Connecticut.</p>	<p>Finalista de la competencia NASA 3D-Printed Habitat Challenge: Mars Incubator, un equipo de ingenieros y artistas de New Haven, Connecticut.</p>
 <p>NASA 3D-Printed Habitat Challenge competition finalist: Zopherus, a team from Rogers, Arkansas whose design is inspired by the natural world.</p>	<p>Finalista de la competencia NASA 3D-Printed Habitat Challenge: Zopherus, un equipo de Rogers, Arkansas cuyo diseño está inspirado en el mundo natural.</p>



NASA 3D-Printed Habitat Challenge
 competition finalist: SEArch+/Apis Cor, a team from New York whose design focuses on using Martian soil and rock.

Finalista de la competencia **NASA 3D-Printed Habitat Challenge**: SEArch+/Apis Cor, un equipo de Nueva York cuyo diseño se enfoca en usar el suelo y las rocas de Marte.

Challenge Cards (Seven)

Survive a Dust Storm

TO SURVIVE
 build a backup power supply and then connect it to each building of your outpost.

SUPPLIES
 4 Power

On Mars, windstorms can last for months and blow enough to reach and dust that the Sun's rays are blocked from your solar panels.

Mars Opportunity rover solar panels covered in dust during a storm in 2014.

Survive a Dust Storm

To survive
 build a backup power supply and then connect it to each building of your outpost.

Supplies
 ● 4 power

Sobrevive a una tormenta de arena

PARA SOBREVIVIR
 Construye una fuente de energía de respaldo y después conéctala a cada edificio de tu puesto de avanzada.

SUMINISTROS
 4 Energía

En Marte, las tormentas de viento pueden durar meses y pueden desmenuzarse hasta llegar a polvo con los rayos del Sol son bloqueadas y no llegan a las paneles solares.



Panels solares del Rover de Marte Opportunity cubiertos de polvo durante una tormenta en 2014.

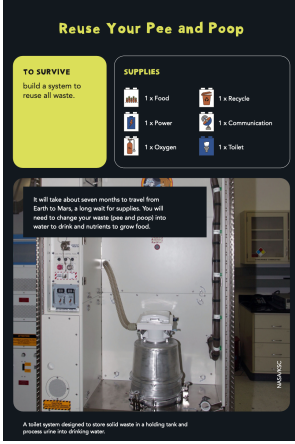
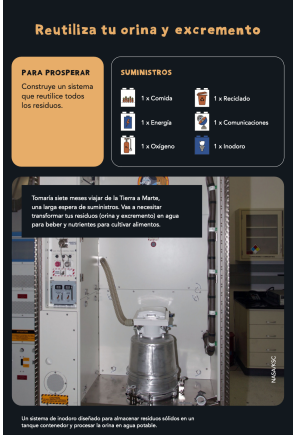
Sobrevive a una tormenta de arena

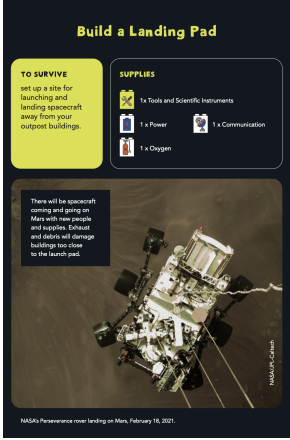

Para sobrevivir
 Construye una fuente de energía de respaldo y después conéctala a cada edificio de tu puesto de avanzada.

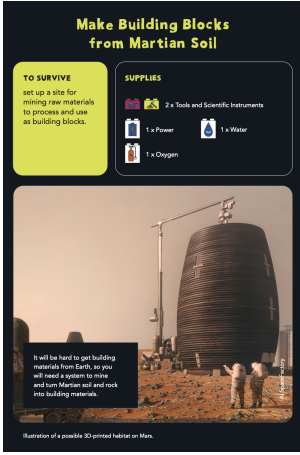

Suministros
 ● 4 energía

<p>On Mars, windstorms can last for months and blow around so much soil and dust that the Sun’s rays are blocked from your solar panels.</p>	<p>En Marte, las tormentas de viento pueden durar meses y pueden dispersar tanta tierra y polvo que los rayos del Sol son bloqueados y no llegan a tus paneles solares.</p>
<p>CAPTION: Mars Opportunity rover solar panels covered in dust during a storm in 2014.</p>	<p>PIÉ DE FOTO: Paneles solares del Rover de Marte Opportunity cubiertos de polvo durante una tormenta en 2014.</p>
 <p>Build a Lab for Scientific Research</p>	 <p>Construye un laboratorio para investigación científica</p>
<p>To thrive build a research lab to further your explorations on the Red Planet.</p>	<p>Para prosperar Construye un laboratorio de investigación para avanzar tus exploraciones en el planeta rojo.</p>
<p>Supplies</p> <ul style="list-style-type: none"> ● 2 Tools and Scientific Instruments ● 1 Power ● 1 Oxygen ● 1 Communication 	<p>Suministros</p> <ul style="list-style-type: none"> ● 2 herramientas e instrumentos científicos ● 1 energía ● 1 oxígeno ● 1 comunicaciones
<p>Living on Mars will provide exciting new research opportunities. Will you discover</p>	<p>La vida en Marte proveerá nuevas e interesantes oportunidades de investigación. ¿Descubrirás vida microbial ancestral,</p>

<p>ancient microbial life, valuable minerals, or something completely unexpected?</p>	<p>minerales valiosos, o algo completamente inesperado?</p>
<p>CAPTION: A flower-shaped rock that may have been formed by ancient flowing water.</p>	<p>PIÉ DE FOTO: Una roca en forma de flor que pudo haber sido formada por una corriente de agua ancestral.</p>
 <p>Keep Your Crew Happy and Healthy</p> <p>TO THRIVE using only six thrive blocks, build a recreation area where your crew can exercise and relax their brains and bodies.</p> <p>SUPPLIES</p> <ul style="list-style-type: none"> 6 x Any Thrive Blocks 1 x Power 1 x Communication 1 x Oxygen 1 x Water <p>Imagine living indoors for months, possibly years, with the same people. How would you keep your crew active both physically and mentally?</p> <p><small>Crewmates aboard the International Space Station find ways to keep life in space just like home.</small></p>	 <p>Mantén tu tripulación feliz y sana</p> <p>PARA PROSPERAR Usando sólo seis bloques para prosperar, construye una área recreativa donde tu tripulación pueda ejercitar y relajar sus mentes y cuerpos.</p> <p>SUMINISTROS</p> <ul style="list-style-type: none"> 6 x Bloques de prosperar 1 x Energía 1 x Comunicaciones 1 x Oxígeno 1 x Agua <p>Imagínate viviendo encerrado por meses, tal vez años, con las mismas personas. ¿Cómo mantendrías a tu tripulación activa tanto física como mentalmente?</p> <p><small>Compañeros de la tripulación a bordo de la Estación espacial Internacional encuentran maneras de mantener la vida en el espacio como si estuvieran en casa.</small></p>
<p>To thrive using only six thrive blocks, build a recreation area where your crew can exercise and relax their brains and bodies.</p>	<p>Para prosperar Usando sólo seis bloques para prosperar, construye una área recreativa donde tu tripulación pueda ejercitar y relajar sus mentes y cuerpos.</p>
<p>Supplies</p> <ul style="list-style-type: none"> ● 6 Any Thrive Blocks ● 1 Communication ● 1 Power ● 1 Oxygen ● 1 Water 	<p>Suministros</p> <ul style="list-style-type: none"> ● 6 bloques de prosperar ● 1 comunicaciones ● 1 energía ● 1 oxígeno ● 1 agua
<p>Imagine living indoors for months, possibly years, with the same people. How would you keep your crew active both physically and mentally?</p>	<p>Imagínate viviendo encerrado por meses, tal vez años, con las mismas personas. ¿Cómo mantendrías a tu tripulación activa tanto física como mentalmente?</p>

<p>CAPTION: Crewmates aboard the International Space Station find ways to keep life in space just like home.</p>	<p>PIÉ DE FOTO: Compañeros de la tripulación a bordo de la Estación espacial internacional encontrando maneras de mantener la vida en el espacio como si estuvieran en casa.</p>
 <p>Reuse Your Pee and Poop</p> <p>TO SURVIVE build a system to reuse all waste.</p> <p>SUPPLIES</p> <ul style="list-style-type: none"> 1x Food 1x Recycle 1x Power 1x Communication 1x Oxygen 1x Toilet <p>It will take about seven months to travel from Earth to Mars, a long wait for supplies. You will need to change your waste (pee and poop) into water to drink and nutrients to grow food.</p> <p>A toilet system designed to store solid waste in a holding tank and process urine into drinking water.</p>	 <p>Reutiliza tu orina y excremento</p> <p>PARA PROSPERAR Construye un sistema que reutilice todos los residuos.</p> <p>SUMINISTROS</p> <ul style="list-style-type: none"> 1x Comida 1x Reciclado 1x Energía 1x Comunicaciones 1x Oxígeno 1x Inodoro <p>Tomaría siete meses viajar de la Tierra a Marte, una larga espera de suministros. Vas a necesitar transformar tus residuos (orina y excremento) en agua para beber y nutrientes para cultivar alimentos.</p> <p>El sistema de inodoro diseñado para almacenar residuos sólidos en un tanque contenedor y procesar la orina en agua potable.</p>
<p>To survive build a system to reuse all waste.</p>	<p>Para sobrevivir Construye un sistema que reutilice todos los residuos.</p>
<p>Supplies</p> <ul style="list-style-type: none"> ● 1 Recycling ● 1 Oxygen ● 1 Communications ● 1 Power ● 1 Toilet ● 1 Food 	<p>Suministros</p> <ul style="list-style-type: none"> ● 1 reciclado ● 1 oxígeno ● 1 comunicaciones ● 1 energía ● 1 inodoro ● 1 comida
<p>It will take about seven months to travel from Earth to Mars, a long wait for supplies. You will need to change your waste (pee and poop) into water to drink and nutrients to grow food.</p>	<p>Tomaría siete meses viajar de la Tierra a Marte, una larga espera de suministros. Vas a necesitar transformar tus residuos (orina y excremento) en agua para beber y nutrientes para cultivar alimentos.</p>
<p>CAPTION: A toilet system designed to store solid waste in a holding tank and process urine into drinking water.</p>	<p>PIÉ DE FOTO: Un sistema de inodoro diseñado para almacenar residuos sólidos en un tanque contenedor y procesar la orina en agua</p>

	potable.
 <p>Build a Landing Pad</p>	 <p>Construye una plataforma de aterrizaje</p>
<p>To survive set up a site for launching and landing spacecraft away from your outpost buildings.</p>	<p>Para sobrevivir Erige un sitio para lanzar y aterrizar los vehículos espaciales lejos de tus edificios de avanzada.</p>
<p>Supplies</p> <ul style="list-style-type: none"> ● 1 Communications ● 1 Power ● 1 Oxygen ● 1 Tools and Scientific Instruments 	<p>Suministros:</p> <ul style="list-style-type: none"> ● 1 comunicaciones ● 1 energía ● 1 oxígeno ● 1 herramientas e instrumentos científicos
<p>There will be spacecraft coming and going on Mars with new people and supplies. Exhaust and debris will damage buildings too close to the launch pad.</p>	<p>Van a haber vehículos espaciales llegando y saliendo de Marte con nuevas personas y suministros. Los gases de escape y los escombros dañarán los edificios que están demasiado cerca de la plataforma de lanzamiento.</p>
<p>CAPTION: NASA's Perseverance rover landing on Mars, February 18, 2021.</p>	<p>PIÉ DE FOTO: Rover Perseverance de la NASA aterrizando en Marte, el 18 de febrero de 2021</p>

 <p>Make Building Blocks from Martian Soil</p> <p>TO SURVIVE set up a site for mining raw materials to process and use as building blocks.</p> <p>SUPPLIES</p> <ul style="list-style-type: none"> 2 x Tools and Scientific Instruments 1 x Power 1 x Water 1 x Oxygen <p>It will be hard to get building materials from Earth, so you will need a system to mine and turn Martian soil and rock into building materials.</p> <p>Illustration of a possible 3D-printed habitat on Mars.</p>	 <p>Fabrica bloques de construcción del suelo de Marte</p> <p>PARA SOBREVIVIR Establece un sitio para extraer materiales en bruto para procesarlos y usarlos como bloques de construcción.</p> <p>SUMINISTROS</p> <ul style="list-style-type: none"> 2 x Herramientas e instrumentos científicos 1 x Energía 1 x Agua 1 x Oxígeno <p>Va a ser muy difícil obtener materiales de construcción de la Tierra, por tanto vas a necesitar un sistema para extraer y convertir la tierra y las rocas de Marte en materiales de construcción.</p> <p>Ilustración de un posible hábitat en Marte impreso en 3D.</p>
<p>To survive set up a site for mining raw materials to process and use as building blocks.</p>	<p>Para sobrevivir Establece un sitio para extraer materiales en bruto para procesarlos y usarlos como bloques de construcción.</p>
<p>Supplies</p> <ul style="list-style-type: none"> ● 2 Tools and Scientific Instruments ● 1 Power ● 1 Water ● 1 Oxygen 	<p>Suministros:</p> <ul style="list-style-type: none"> ● 2 herramientas e instrumentos científicos ● 1 energía ● 1 agua ● 1 oxígeno
<p>It will be hard to get building materials from Earth, so you will need a system to mine and turn Martian soil and rock into building materials.</p>	<p>Va a ser muy difícil obtener materiales de construcción de la Tierra, por tanto vas a necesitar un sistema para extraer y convertir la tierra y las rocas de Marte en materiales de construcción.</p>
<p>CAPTION: Illustration of a possible 3D-printed habitat on Mars.</p>	<p>PIÉ DE FOTO: Ilustración de un posible hábitat en Marte impreso en 3D.</p>

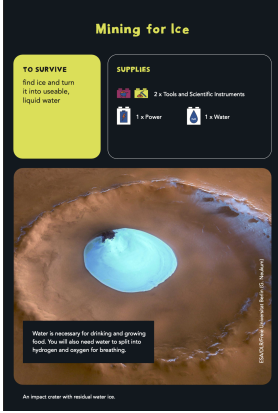
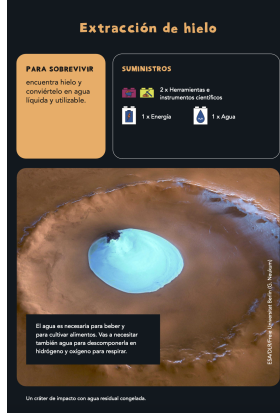

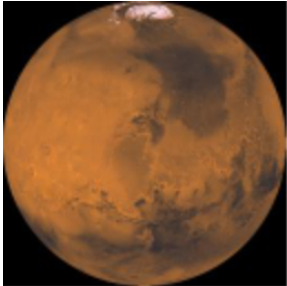

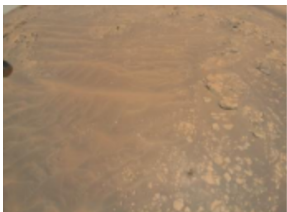
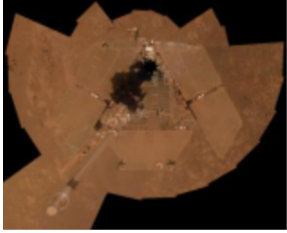





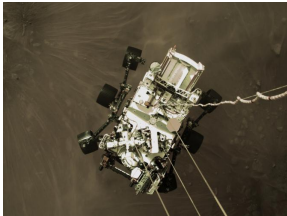
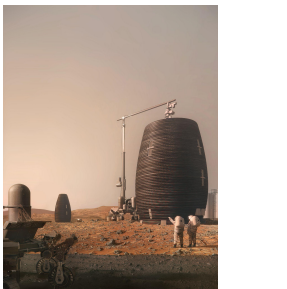
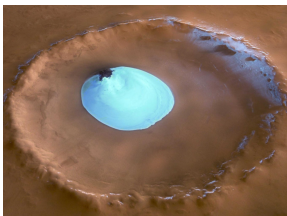

 <p>Mining for Ice</p> <p>TO SURVIVE find ice and turn it into useable, liquid water</p> <p>SUPPLIES 2 Tools and Scientific Instruments 1 Power 1 Water</p> <p>Water is necessary for drinking and growing food. You will also need water to split into hydrogen and oxygen for breathing.</p> <p>An impact crater with residual water ice.</p>	 <p>Extracción de hielo</p> <p>PARA SOBREVIVIR encuentra hielo y conviértelo en agua líquida y utilizable.</p> <p>SUMINISTROS 2 herramientas e instrumentos científicos 1 Energía 1 Agua</p> <p>El agua es necesaria para beber y para cultivar alimentos. Vas a necesitar también agua para descomponerla en hidrógeno y oxígeno para respirar.</p> <p>Un cráter de impacto con agua residual congelada.</p>
<p>To survive find ice and turn it into useable, liquid water</p>	<p>Para sobrevivir encuentra hielo y conviértelo en agua líquida y utilizable.</p>
<p>Supplies</p> <ul style="list-style-type: none"> ● 2 Tools and Scientific Instruments ● 1 Water ● 1 Power 	<p>Suministros</p> <ul style="list-style-type: none"> ● 2 herramientas e instrumentos científicos ● 1 agua ● 1 energía
<p>Water is necessary for drinking and growing food. You will also need water to split into hydrogen and oxygen for breathing.</p>	<p>El agua es necesaria para beber y para cultivar alimentos. Vas a necesitar también agua para descomponerla en hidrógeno y oxígeno para respirar.</p>
<p>CAPTION: An impact crater with residual water ice.</p>	<p>PIÉ DE FOTO: Un cráter de impacto con agua residual congelada.</p>




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	<p>NASA/Bill Ingalls</p>	<p>Subject to NASA Media Usage Guidelines https://www.nasa.gov/multimedia/guidelines/index.html</p>	<p>https://images.nasa.gov/details-iss065e009613</p>

	<p>NASA/KSC</p>	<p>Subject to NASA Media Usage Guidelines https://www.nasa.gov/multimedia/guidelines/index.html</p>	<p>https://images.nasa.gov/details-KSC-08pd3207</p>
	<p>NASA/JPL-Caltech</p>	<p>Subject to NASA Media Usage Guidelines https://www.nasa.gov/multimedia/guidelines/index.html</p>	<p>https://photojournal.jpl.nasa.gov/catalog/PIA24428</p>
	<p>AI SpaceFactory</p>	<p>Must contact AI SpaceFactory</p>	<p>https://www.nasa.gov/sites/default/files/thumbnail/ai-spacfactory-mars-habitat-external-construction-progress.jpg</p>
	<p>ESA/DLR/Freie Universität Berlin (G. Neukum)</p>	<p>Subject to NASA Media Usage Guidelines https://www.nasa.gov/multimedia/guidelines/index.html</p>	<p>https://mars.nasa.gov/resources/5266/mars-crater-ice/</p>
	<p>Team SEArch+/Apis Cor</p>	<p>Must contact SEArch+/Apis Cor</p>	<p>https://www.nasa.gov/directorates/spacetech/centennial_challenges/images.html</p>

	Zopherus	Must contact Zopherus	https://www.nasa.gov/directorates/spacetech/centennial_challenges/images.html
	Mars Incubator	Must contact Mars Incubator	https://www.nasa.gov/directorates/spacetech/centennial_challenges/images.html
	AI SpaceFactory	Must contact AI SpaceFactory	https://www.nasa.gov/directorates/spacetech/centennial_challenges/images.html

Marketing and Promotion

For more resources to promote the complete exhibition, check out the *Sun, Earth, Universe* Promotional and Marketing Materials guide

https://www.nisenet.org/sites/default/files/sunearthuniverse_7_promotional_and_marketing_materials_rev6-17-19.pdf

Exhibition Logos

English



Spanish



English and Spanish



Exhibition Fonts and Pantone Colors

MARS EXHIBIT

FONTS

Dbt Writing Black Bold
headline, subheadings, body text

Avenir Black
image credits

Dbt Writing Medium Regular
body text

Avenir Roman
body text, image credits

COLORS



LAB: PANTONE 388 C
HEX: #e0e721
RGB: 224 231 33
CMYK: 3 0 86 9



LAB: PANTONE 150 C
HEX: #ffb25b
RGB: 225 178 91
CMYK: 0 30 64 0



LAB: PANTONE 1375 C
HEX: #ff9e18
RGB: 225 158 24
CMYK: 0 45 96 0



HEX: #101c2b
RGB: 16 28 43
CMYK: 88 76 54 68

Pantone Colors for Building Blocks

Mars Block Colors



• 7577C



• 1595C



• 718C

Connector Block Colors - 402C



Thrive Block Colors



• 388C



• 675C



• 300C

Promotional Photos

Build a Human Habitat on Mars promotional photos will be available on SmugMug

<https://nisenet.smugmug.com/Build-a-Human-Habitat-on-Mars-Exhibit-Component/>

Sample Customizable Press Release

The following press release template may be adapted for your use promoting the *Build a Human Habitat on Mars* exhibit component at your institution.

Sample Customizable Press Release

YOUR LOGO

EXHIBITION PHOTO

Date:

Contact:

Phone:

Email:

Wanted: explorers and creative thinkers who can survive, thrive, and Build a Human Habitat on Mars at (name of your organization)!

(Insert your exhibit opening location, date, and specific event information here.)

For people to live on Mars, we will need to develop technology and systems that will allow humans to survive and thrive. *Build a Human Habitat on Mars* is a hands-on exhibit component designed to inspire, engage, and educate the next generation of explorers about human exploration on Mars. Visitors will design and construct their own imaginary habitat on Mars using Strictly Briks® Big Briks™ building blocks, which are compatible with other major brick brands. By using this familiar resource, museum visitors can immediately start to design and construct their own imaginary habitat for successful living and working on Mars. Participants will be able to focus on the real challenges to life on Mars and have thoughtful reflection about possible solutions. The exhibit also includes a set of challenge cards presenting some of the very real challenges people may face when establishing an outpost on Mars.

To survive on Mars we must have the processes in place to maintain the bare minimum for human life to exist: water to drink, oxygen to breathe, shelter from the harsh environment, and much more. Thriving on Mars requires making special efforts to stay healthy both physically and mentally. This means having resources to keep your mind and body active, like your favorite book, music, comfort foods, hobbies, exercise, and ways that allow you to transition your day-to-day routines to a new and very different planet from our own.

(Insert information about other special activities that your location may host, information about local partnerships and collaborations, and any other event-specific information.)

Build a Human Habitat on Mars is an addition to the National Informal STEM Education Network's (NISE Network) *Sun, Earth, Universe* exhibition and will be on display at **(name of your organization)** as part of a nationwide effort designed to engage audiences in the awe-inspiring fields of Earth and space science. Fifty-two copies will be on display across the United States.

The *Build a Human Habitat on Mars* exhibit is designed to be integrated into the *Sun, Earth, Universe* exhibition

More about the *Sun, Earth, Universe* exhibition

<https://www.nisenet.org/sunearthuniverse>

More about the *Build a Human Habitat on Mars* addition

<https://www.nisenet.org/mars-habitat-project>

Background

Build a Human Habitat on Mars was developed in collaboration with the National Aeronautics and Space Administration (NASA). *Build a Human Habitat on Mars* exhibits are developed and distributed nationwide by the National Informal STEM Education Network (NISE Network) and the Science Museum of Minnesota.

Acknowledgement

This material is based upon work supported by NASA under Grant Number 80NSSC20M0030. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).

About the NISE Network

The National Informal STEM Education Network (NISE Network) is a national community of informal educators and scientists dedicated to fostering public awareness, engagement, and understanding of current science, technology, engineering, and math (STEM).

More about the NISE Network

<https://www.nisenet.org/about>

###

Event Planning

If you are planning an event related to the *Build a Human Habitat on Mars* exhibit component or the complete *Sun, Earth, Universe* exhibition, check out the **Explore Science: Earth & Space Toolkit Event Planning and Promotion Guide** for suggested timelines, promo templates, how to find volunteers and experts, and more:

<http://www.nisenet.org/catalog/explore-science-earth-space-event-planning-and-promotion-guide>

Acknowledgment of Support

Build a Human Habitat on Mars was developed in collaboration with the National Aeronautics and Space Administration (NASA). *Build a Human Habitat on Mars* exhibits are developed and distributed nationwide by the National Informal STEM Education Network (NISE Network) and the Science Museum of Minnesota.

Where appropriate, credit should be given to the Science Museum of Minnesota, the NISE Network, and to the exhibition funder NASA.

Build a Human Habitat on Mars

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Sun, Earth, Universe

The *Sun, Earth, Universe* exhibition was created by the National Informal STEM Education Network (NISE Network) in collaboration with NASA.

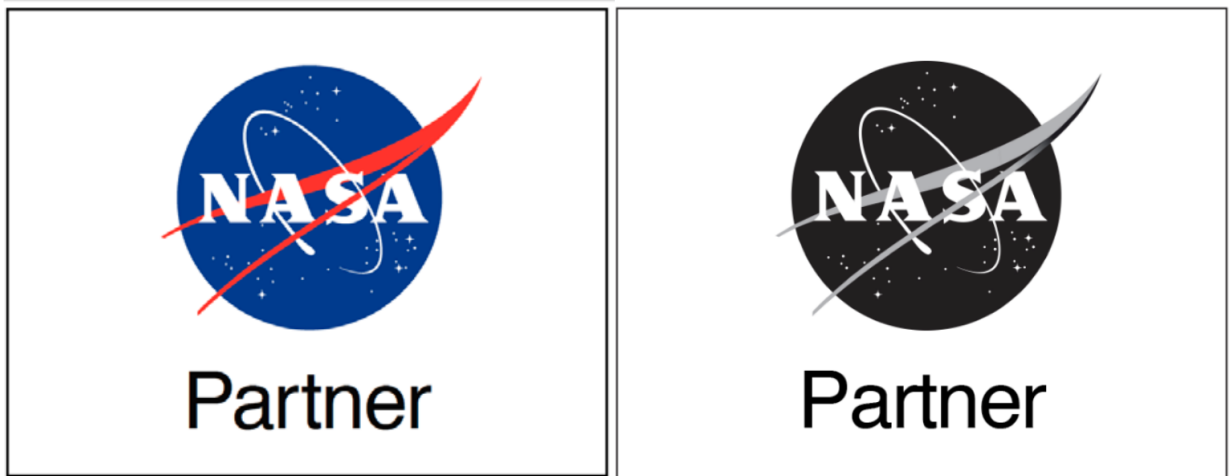
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NASA Partner Logo

Build a Human Habitat on Mars uses the NASA “Insignia Format for Grantees” (NASA Partner Logo), which consists of the NASA Insignia with the word “Partner” in Helvetica font centered below the Insignia, with both elements on a solid white background surrounded by a box.

To learn more how this NASA Partner Logo may be used please see

https://www.nasa.gov/sites/default/files/atoms/files/nasa_insignia_guidelines_for_nasa_grantees.pdf



Figures 1 and 2

NASA Insignia Format in full color and black and white.

Please note, use of the NASA insignia logo and seal is restricted by NASA and using the NASA seal (in a format other than the NASA Partner Logo format) should **NOT** be added to your press releases, promotional materials, exhibition signage, or wayfinding signage.

For more information about obtaining permission to use the NASA seal, please see

<https://www.nasa.gov/multimedia/guidelines/index.html>