

REQUEST FOR PROPOSAL

JANUARY 18 2068

“ARGONOM” SPACE SETTLEMENT CONTRACT

INTRODUCTION

This is a request by the Foundation Society for contractors to propose the design, development, construction, and operations planning for the first large space settlement on the planet Mars.

STATEMENT OF WORK

1. **Basic Requirements** – Argonom will serve as the major transportation node and commerce center on Mars. Although development of more capable new materials is expected on Mars, the design will employ conventional materials, processes, and technology, for risk reduction.
2. **Structural Design** - provide a safe and pleasant living and working environment for 500 full-time residents at Initial Operating Capability (IOC). Each visit of Benevectoras, which travels between Earth and Mars carrying passengers and cargo, will add 250 additional permanent residents for a total of 1500 full-time residents at Full Operating Capability (FOC). At FOC, over 2500 transients will come through Argonom on their way to other locations on Mars. Show how the expanding population will be accommodated. Provide natural sunlight in public areas and views of local Mars terrain.
 - 2.1. Exterior design drawings must identify all volumes and their uses at IOC and at each intermediate expansion of the population, must illustrate the local Martian terrain and compatibility with it, and must clearly show dimensions of major structural features. Show entry/exit locations for people, cargo, and vehicles. Provide protection from radiation.
Minimum requirement: overall exterior view of settlement, with major visible features (e.g., solar panels, antennas), indicating functions inside each volume (e.g., residential areas and agriculture).
 - 2.2. Argonom facilities designs must specify uses of interior space, with areas designated and drawings clearly labeled and dimensioned to show residential, industrial, commercial, agricultural, port facilities, and other uses.
Minimum requirement: overall map of interior land areas, at IOC and each intermediate expansion of the population, showing usage and sizes of those areas.
 - 2.3. Describe construction of the settlement, focusing on shapes, quantities, and joining methods for components shipped to the construction site. Clearly show the construction timeline from IOC to FOC, highlighting the major structural components and corresponding capabilities available at each intermediate phase. Components for the initial shipment will be delivered in CASSCs, which may be converted to interior structures. Identify construction materials used for major structural components and show how risk assessments have been conducted to determine material selection.
Minimum requirement: drawings showing configuration and capabilities at three or more

steps before IOC, at IOC, after each expansion of the resident population, and at contract end.

- 2.4. A separate contractor will provide ferry services between Mars orbit and the surface of Mars, for both people and cargo in CASSSCs. Show location of landing/launch site on a map, and size to accommodate arrivals of both cargo and passenger ships. Explain justification for distance of the landing/launch site from the main settlement areas. Draw and describe the passenger terminal, show its location on an overall map of the settlement and provide justification for its location. Provide transportation means for passengers and their “carry-on” luggage to travel to main settlement areas from landing/launch site without leaving a pressurized environment. Draw diagram showing cargo handling methods and storage sites, and how items from within CASSSCs will be transported to the settlement’s residential or industrial park areas if needed.

Minimum requirement: drawing(s) of passenger terminal and cargo receiving areas.

3. **Operations and Infrastructure** - Describe facilities and infrastructure necessary for building and operating the Argonom space settlement.

- 3.1. Suggest a location for Argonom that would be optimal for accommodating regular launches and landings to/from orbit. Identify sources of materials and equipment to be used in construction and operations, and means for transporting those materials and assets to Argonom. Allowance for four surface to orbit vessels carrying up to ten CASSSCs each should be able to use the launch facilities concurrently.

Minimum requirement: show vehicle(s) for transporting CASSSCs containing construction materials from landing to building site; specify number of such vehicles needed.

- 3.2. Argonom design will show elements of basic infrastructure required for activities of the settlement’s residents, including (but not limited to):

- food production (including growing, harvesting, storing, packaging, delivering),
- electrical power generation and distribution (specify power generation capacity),
- internal and external communication systems (specify devices and central equipment),
- atmosphere (identify air composition at 0.65 Earth sea level). Must show quantity of trace components, anticipated losses, and provide detail on humidity control to maintain 60% average humidity
- water management (including fresh water creation, distribution, storage, usage, and recycling).

Define initial quantities of air, water, food, and other consumables as the number of CASSSC-loads required for each commodity. Local sourcing will be preferred for readily available consumables (i.e. hydrogen and oxygen for air and water); subcontractor supply is an acceptable alternative but must be justified. Explain placement of major components of habitable volumes.

Minimum requirement: chart(s) or table(s) specifying quantities of commodities required and their sourcing (CASSSC-loads for off-Mars supply; subcontractors for outsourced supply; quantities and source for on-Mars supply).

- 3.3. Show conceptual designs and dimensions of primary machines employed for construction of the settlement, especially for assembling exterior hull and interior buildings. Describe materials and their sources, components, and/or subassemblies delivered to the machines,

and how the machines convert delivered supplies into completed settlement structures. Emphasize standardization of machine processes and automation; human-controlled functionality is acceptable but requires risk assessment and justification.

Minimum requirement: drawing(s) of primary construction machinery, showing how it shapes and/or manipulates raw materials or structural components into finished form.

- 3.4. Identify services for visiting residents from other Mars communities. Most exports and imports will be sent and received in CASSSCs; show how CASSSCs will be stored or warehoused, and the process goods go through as they are moved between origins / destinations and the launch/landing site.

Minimum requirement: show warehouse location(s) on overall drawing of settlement.

4. **Human Factors and Safety** - Quality of life is important to Foundation Society members, who plan to maintain traditional comforts without the sacrifices normally associated with a frontier environment. Natural sunlight and views of local terrain must be readily available to residents.

- 4.1. Argonom will provide facilities for services that residents could expect in a comfortable modern community environment (e.g., medical, parks and recreation, access to fine food and entertainment), variety and quantity of consumables and other supplies. Public areas are to be designed with open space and a prioritization for long lines of sight. Show how the community will change with new residents arriving from IOC to FOC.

Minimum requirement: map(s) and/or illustrations depicting overall community design at several population phases, including locations of amenities/services, with a distance scale.

- 4.2. Include designs of typical homes for residents, clearly showing room sizes. Due to the radiation environment on Mars, sleeping areas must be shielded by terrain, or underground with private access from living areas. Anticipated demographics of the residential population are:

Partnered Adults 27% (average age 37, median age 34)

Single Men 31% (average age 33, median age 32)

Single Women 34% (average age 35, median age 30)

Children 8% (average age 6, median age 5)

Minimum requirement: external drawing and interior floor plan for each type of home design and area (preferably in square feet) for residences.

- 4.3. Specify numbers and types of spacesuits that will be required for activities outside of pressurized volumes; show donning/doffing and airlock areas, and features to mitigate 99.9% of dust ingress into pressurized areas of the settlement. Dust mitigation methods must include at least three phases and one type of hand tool.

Minimum requirement: show location(s) on community map for spacesuit donning/doffing, and process flow diagram explaining dust mitigation..

- 4.4. Provide transportation between the launch/landing site and Argonom, with the option that transports can also be used by tour groups for excursions.

Minimum requirement: show interior and exterior views of an excursion vehicle; define number of passengers, number of crew (if any), and duration of excursions without replenishing supplies.

5. **Automation Design and Services** – Provide appropriate services to the settlement residents from IOC through daily operations post-FOC. Automation should replace dangerous or boring tasks and enhance the lives of residents and visitors, but not be deployed when unnecessary or cost prohibitive.
 - 5.1. Describe uses of automation for construction of settlement structures. Consider automation for transportation and delivery of materials and equipment, constructing stand-alone and interior buildings, installing utilities and infrastructure, and finishing interior spaces and surfaces. When designing automated systems, prioritize the impact Martian dust will have on reliability.
Minimum requirement: chart or table describing automated construction and assembly devices and capabilities.
 - 5.2. Describe automation systems for settlement business and production processes, maintenance, repair, and safety functions. Define which processes/systems are monitored by automated processes and what parameters would require human action. Describe security measures for authorized personnel to access critical data and command computer and robot systems. Provide a control room with consoles for keeping track of and directing movement of CASSCs and controlling traffic at landing/launch site. Provide a separate control room for managing settlement operations and emergency responses, including monitoring Mars surface vehicles.
Minimum requirement: list control room consoles, show examples of displays, and list types of alerts to get human attention (console operators, or community alerts) for problem resolution. Include a table showing automated response actions taken to protect the settlement and residents.
 - 5.3. Describe automation systems to enhance livability in the community, productivity in work environments, and convenience in residences. Emphasize use of automation to reduce needs for manual labor. Specify how many of each computing device, personal communication device, and robot type will operate at Argonom. Specify where and what type of sensors are placed in the settlement to monitor autonomous systems. Propose method(s) for minimizing the inconvenience of communication delays between Mars and Earth.
Minimum requirement: drawings of typical computers and robots that people will encounter during their everyday lives in Argonom.
 - 5.4. Business priorities require that vehicles be based at Argonom to provide shipping of products (in CASSCs) planet-wide. Define requirements for autonomous operation of vehicles, and provide service(s) to keep track of the location, cargo, customer(s), and schedule for each vehicle.
Minimum requirement: describe tracking and status system for fleet of shipping vehicles.
6. **Schedule and Cost** - The proposal will include a schedule for development and occupation of Argonom, and costs for design through construction phases of the schedule.
 - 6.1. Schedule contractor and subcontractor tasks from contract award (27 July 2070) until contract conclusion in 2091. Schedule must include at least 3 detailed design review stages with the Foundation Society. Show planned progress in a Gantt chart, in increments no larger than monthly. The schedule must be compatible with Mars launch window

opportunities for Benevectoras. Travel between Earth and Mars on Benevectoras will take a total of 34 months total for a round trip to optimize fuel usage. The shortest one-way travel time between Earth and Mars on Benevectoras is 8 months.

Minimum requirement: Gantt chart showing durations and completion dates of major tasks.

- 6.2. Specify costs associated with Argonom design through construction in U.S. dollars. Utilize the provided data sheet and worksheet to calculate costs. Do not include materials or infrastructure supplied by subcontractors, as the Foundation Society will contract separately with these companies.

Minimum requirement: Completed worksheet submitted alongside proposal presentation submission.

EVALUATION STANDARDS

Evaluation of each design presentation considers four general categories of factors:

- A. **Thoroughness** - Design meets depth and diversity of requirements in the entire Statement of Work (SOW). Graphs, tables, drawings, and compliance matrices aid evaluation of this factor.
- B. **Credibility** - Design addresses requirements, safety, physical laws, and cost/schedule in a believable manner. Errors, impossibilities, omissions, and illogic are penalized.
- C. **Balance** - Proposal places equal emphasis on four technical areas: structural design, operations, livability, and automation. Proposal is organized in a logical, easy-to-follow manner.
- D. **Innovation** - Design demonstrates original thinking to address SOW requirements. Technologies are applied and combined in unique and creative ways.

ADDENDA

An alternate name may be suggested for this community, within the Foundation Society's established naming convention that requires the name to end with the suffix "om" (settlement is "on Mars") and begin with the letter "A" (first settlement at an "om" location).

Drawings and/or maps included in the proposal must show dimensions consistently in English (feet/miles) or metric (meters/kilometers) notation, unless otherwise specified in this RFP. Note source of every drawing, image, graph, or matrix, directly below the item; e.g., name of artist(s) or CAD operator(s) in your company, book, Internet site, article, floor plan by [artist name] using Roomsketcher, or work from a previous proposal. Unattributed images will not be judged.

DELIVERABLES

To be considered a valid submission, your company must provide:

- 1. A 30-minute presentation to the panel of judges describing your design and adherence to the requirements in this RFP
 - Presentations can include up to 45 slides— additional slides will not be judged
- 2. A PDF of your presentation slide deck, submitted via email to david.shaw@insimeducation.com at the specified deadline time on Sunday morning. You must present this exact version of the presentations to the panel of judges— changes to slides between submission and presentations will not be accepted.