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THE NEXT GIANT LEAP
A Proposal To Create A Major Educational Exhibit Based On The "Mars Direct" Flight Plan

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ABSTRACT

"One small step for a man, one giant leap for Mankind." Neil Armstrong spoke those words on the moon, more than 30 long years ago. In the age of Sputnik and Apollo, people dreamed about the possibilities of space. This inspired them to study science and engineering, and eventually led to the Moon. Where are we today? Science education lags at an all time low, and our space program inspires fewer dreams. Without education or interest, Mars will remain beyond our reach. But... suppose you could watch the sunrise over the mountains of Mars? Suppose you could dig through it's sands searching for evidence of past life? Suppose you could drive a rover over the Martian surface, or try living in a HAB module? Suppose you could plot the course of the first Mars flight, or even design the ship? What would the dreams be like then?

Interactive science museums, combining science and entertainment to promote learning, are ideal venues to inspire and educate a new generation of space explorers. This proposal outlines a major Mars exhibit to travel nationally, and perhaps internationally. It would use a hypothetical "Mars Direct" mission as a springboard to excite visitors about the topics connected with spaceflight, from physics and astronomy to medicine, politics, and law. Full-scale elements such as a Habitation Module, Mars Ascent Vehicle, or Earth Return Vehicle, would combine with environmental recreations, audio/visual systems, computers, graphics, scale models, and other techniques to bring the emotional power of a Mars mission to life. Outside the museum, a curriculum built around the exhibit would be used by teachers in their classrooms, culminating with an actual museum trip. An exhibit of this type would also expose the Mars Society and potential sponsors to a large audience in a prestigious setting, creating new publicity, education, and fundraising opportunities.

Mars calls, but who will be ready to answer, and who will want to? The Mars Society's mission is to "...instill the vision of pioneering Mars." This exhibit would be a unique and exciting step toward that goal, and another small step toward taking "The Next Giant Leap".

WHY SHOULD WE BUILD A MARS EXHIBIT?

Millions of miles from Earth, Mars floats in the vastness of space. Who cares?

For most people, the answer is "not me." When they think of Mars, if they think of it at all, they think of it as an unobtainable goal, a useless ball of rock, or a place to spend money that has more important uses here on Earth. But any of the thousands of space enthusiasts in this country and others think of opportunity, challenge, and a new frontier waiting to be conquered.

Why such different reactions? Perhaps the main reason is inspiration. Most of the space enthusiasts will agree that something affected them early in their lives and filled them with the wonders of space. It may have been one of hundreds of things: the Apollo moon missions, Sputnik, the Disney "Man in Space" movies, the Space Shuttle, Pathfinder probes, or even Star Trek. No matter what it was, something reached deep inside each person and left its mark.

Inspiration is the primary purpose of "The Next Giant Leap" Mars exhibit. Our goal is to inspire children and adults with the infinite possibilities of space by giving them a taste of what it's like. Inspired people have purpose and vision. They are the people who will look to the future, decide what it should be, and make it come about. They are the people we will need if our children are ever to have a future in space.

Societies always grow when they have a frontier. When a frontier exists, it demands the best from each of its pioneers. Each individual is forced to perform to the peak of his abilities, and find new depths in himself that he never imagined. There are no definitions imposed on a pioneer, each person is free to become the person he wants to be. Most people believe that all the frontiers have been conquered, so the fact that this freedom and challenge still exist in space and on Mars is inspirational news in itself.

Not only is there still a frontier, but it's very existence is a challenge to each individual person. No one person will conquer space alone, yet no one person can leave it to others to do. From Verne to Goddard to Kennedy to Gagarin to Armstrong, the story of space is the story of individuals who said if we are to succeed, it depends on my actions. Few children hear that challenge to themselves anywhere in today's society, and it will be a welcome message.

Finally, "The Next Giant Leap" tries to bring back the excitement of the early days of the space program when people followed it in every detail. Children and adults were glued to the TV, read every book, built every model, and knew every fact about the space program. Children still are interested in space, but now it's the fantasy universes of "Star Wars" and "Star Trek." This exhibit will give them a chance to play with semi-real hardware, learn about the unanswered questions in space, and walk on the surface of a new world. If exposed to the reality of space exploration, they may find it even more exciting than the fantasy.

Education, a second goal of "The Next Giant Leap," springs from inspiration. People with an interest in space will have reasons to study the science, math, and engineering to take them there. Whether or not they eventually find themselves in space, the education they obtain will serve them (and us) well in every aspect of their lives here on Earth. At first glance, Mars flight might only apply to physics or technology subjects. However, space exploration and the colonization of a new world touch on every aspect of human thought. Here are just some of the questions that can be addressed in other educational subjects:

Biology- Did life ever evolve on Mars? Is it there now? What could it be like? How could it be different from Earth life? How could we find out if it was there?

History- What is the history of space travel? When did people first start thinking about Mars? What have countries other than the US done in space?

Physiology- How does space flight affect humans? How do people function in low-or-no gravity environments? How do you use the bathroom in space?

Economics- Why does Mars Direct cost less than other Mars flight plans? Where could the money to fund this flight come from? How could it be repaid?

Social Science- How does a crew interact in close environments over long periods of time? Who should be included on a Mars flight crew?

Architecture- What would buildings be like on Mars? What building materials would be available? What impact would this have on building design?

Communication- How does a 40-minute time lag affect communication? What systems would be needed for astronaut teams to work on the Martian surface?

Astronomy- How did the shape of the Martian orbit affect the geocentric view of the universe? What planets can you see without a telescope?

Geology- How did the surface of Mars form? Did it require water, or are there other explanations? Why is the largest volcano in the solar system on Mars?

Law- What legal structures will be necessary for Martian colonists? Will the first law on Mars be an extension of Earth, or something created by the colonists?

Political Science- How did US/USSR competition affect space flight? Can Martian colonists form a government without a revolution against Earth?

Art- What art forms will develop on a new world? What effect does the artist's environment have on their art? Are there artists in the current space program?

Chemistry- How is rocket fuel made from Martian air? What materials can be made from native Martian resources? What is electrolysis? What is distillation?

WHY WOULD ANYONE SPONSOR THIS EXHIBIT?

There is a real need for "The Next Giant Leap". It can be a powerful tool to inspire interest in space travel and contribute to education in science and technology. However, this ambitious exhibit will be impossible without the generous support of sponsors. It will require a major investment of time, creativity, and money to become a reality, but why should anyone donate

their name and money? Beyond any purely altruistic reasons, there are many advantages to sponsorship.

Long-Lasting, Cost-Effective Opportunity- Most advertising is transient and expensive. Sponsorship of sports events costs millions and does not outlive the event; TV ads cost hundreds of thousands and are routinely muted; magazine ads costs tens of thousands and are thrown away monthly. "The Next Giant Leap" presents a unique and exciting venue that will be visited by at least 250,000 highly attentive people over it's 10- to 12-year lifespan. The sponsors will have high-profile exposure in every aspect of the exhibit publicity materials, including print, radio, TV, school curriculums, and the exhibit itself. Not only that, but visitors will take home memories of the exhibit that will last for the rest of their lives. When the initial sponsorship cost is spread across the life of the exhibit, this becomes a very attractive opportunity.

Respected Display Venues- As parents search for more meaningful ways to spend time with their children, the "info-tainment" offered by interactive museums becomes increasingly attractive. Almost every city and town in America has a science museum of some size, and all are respected institutions central to community life. Companies sponsoring exhibits in these venues benefit from the reputation of the presenting institutions.

Relevant, exciting subject material- Space exploration and Mars flight are the cutting-edge science of tomorrow. Rumors are flying about a new direction for the US Space Program, and a flock of probes is about to arrive at Mars with more to follow. Interest in the Red Planet will only increase, so "The Next Giant Leap" should be fresh and interesting for years to come.

Tax-Deductible Advertising Cost- While sponsorship of this exhibit is not guaranteed to be tax-deductible, in most cases it would qualify as an advertising expense with the associated tax advantages.

Variable Sponsorship Levels- The entire cost of sponsorship need not be borne by any one donor. We envision that funding could be provided by a team of donors, and the degree of their recognition would reflect the degree of their sponsorship. A single primary sponsor (40% of total cost or more) would be "above the title" in all materials, and have a major introductory panel at the exhibit entry. Two or three secondary sponsors (10% of total cost or more) would be prominently recognized in publicity materials, and each would have a large, dedicated credit panel at the exhibit entry. Several tertiary sponsors (5% of total cost or more) would be recognized in publicity materials, and share graphic panels at the exhibit entry. Individual sponsors would not be included in publicity materials, but would be recognized on a single entry panel. Other sponsorship opportunities could be created in an exhibit of this type; for example, a company may choose to sponsor an individual interactive exhibit as part of the larger exhibit.

The next three figures show some possible examples of the sponsor's recognition. These are not intended to be final proposals or designs, but to convey the different ways that the sponsorship levels might be treated.

Fig. 1 - Sponsorship levels in Promotional Materials (Poster Example)

1) Single Primary Sponsor- Presented "Over the title" for maximum impact

2) Secondary Sponsors- 1 to 3 sponsors presented in large type with prominent positioning
3) Tertiary Sponsors- 4 to 5 sponsors with logos presented at bottom of poster

Fig. 2 - Primary Sponsor Entry Features

1) Primary sponsor has logo placed on main exhibit title signage
2) Introductory panel describes intent of exhibit and credits major sponsor's assistance

Fig. 3 - Secondary, Tertiary, and Individual Sponsor Panels

1) Secondary sponsors each have a dedicated logo panel
2) Tertiary sponsors have logos presented together on one panel
3) Individual sponsors are all presented together on one panel

OUTLINE OF THE DESIGN PROCESS

The process (Fig. 4) for designing any exhibit is very flexible. Parts of each phase will overlap into each other, reviews will be scattered throughout, and changes will be made constantly. However, this flowchart describes the basic elements common to any design task.

GENERAL CLASSIFICATIONS OF TRAVELLING EXHIBITS

Interactive science museums have a dizzying variety of exhibits available to them for rental. These may range from tabletop exhibits or groups of graphic panels to gigantic blockbuster exhibits with all the bells and whistles. For general purposes, these exhibits fall into three categories.

Small- Less than 1,000 square feet, ships in one truck
Medium- 2,500 sq. ft., ships in one truck
Large- 5,000 sq. ft., or more, 30 or more individual exhibits, ships in 4-5 trucks

Although an effective exhibit could be designed at any of the above sizes, this proposal for "The Next Giant Leap" describes a very large, highly interactive exhibit, with at least 30 sub-exhibits. Some of its initial guidelines are described below:

Approximately 5,000 sq. ft.- This size is appropriate to most of the rental galleries for large science museums. Smaller sizes don't fill the galleries well, and it would be difficult to find a museum large enough to accommodate a bigger exhibit.

30-plus exhibits- There is no formal definition of "exhibit" but it can be anything from a simple graphic panel to an exotic environmental simulation, or anything in between. The exact number of exhibits depends on the content presented, but for major exhibitions museums expect at least 30 identifiable "things to do".

Full audio, video, graphics, and environmental simulations- The more high-level interactives that are included, the more attractive the exhibit is to the public and museums. This proposal describes an exhibit that utilizes the most exciting available technologies to create the most powerful possible marketing draw.

Educational outreach and curriculum- The exhibit would be supported by complete teacher's kits, aligned to national educational standards.

Modular format for adaptable size- The exhibit would be built in several stand-alone sections so parts can be rented to smaller museum venues.

Design-Fabrication cycle of 3-5 years- This depends entirely on content and budget, but 3-5 years is an industry-standard timeline.

Shipping- Rental of 4-5 shipping trucks for transportation between venues.

$300-$400 per square foot estimation- Cost depends entirely on the complexity of the material and exhibits, but this is an industry-standard planning number.

Approximately $2 million cost range- (5,000 sq. ft) X ($400). This is an estimate for the design of exhibits, curriculum, and graphics, equipment purchase, and exhibit fabrication. It would not include the on-going costs of exhibit transportation, insurance, or refitting.

CONCEPTUAL DESIGN SKETCHES

Any design process needs a starting point, and the following sketches are the starting point for "The Next Giant Leap". They probably will have very little in common with the appearance or content of the final exhibit, but they are intended to convey the general ideas and approach that would be employed in creating the exhibit. They show possible ways that the same basic educational concepts can be presented depending on budget, aesthetics, educational content, and educational emphasis.

Orbital Mechanics- These sketches show two possible options (Fig. 5) for an exhibit on orbital mechanics. "A" is a development drawing from the "SpaceBase" exhibit at the Ft. Lauderdale Museum of Science and Technology. Balls were shot up from the bottom of one of the clear "gravity wells" to spiral down into the adjacent one. "B" is a possible design for a similar exhibit for "The Next Giant Leap". Launchers are positioned around a globe to shoot balls into "orbit" around Mars. Visitors control launch force, attitude, and direction to hit a narrow orbital window around the planet. Visitors can use trial-and-error to hit the window, or they can use equations to determine the correct launch attitude at the first attempt.

Greenhouse Agriculture- These sketches (Fig. 6) show how the same concept can be changed to facilitate different types of visitor interactions. "A" shows a large-scale greenhouse that entirely encloses the visitor. Graphic panels on one wall would explain the plants behind the glass on the other wall. "B" is a much more mechanical version of the exhibit, in which a mechanical "plant" can "grow" depending on the visitor's ability to balance light, water, and nutrients. "C" is an option that would fit well in the "MarsDome" environmental simulation. It shows a scaled-down version of a greenhouse, with either live or artificial plants beneath the dome. Graphic panels around the base would explain the basics of extraterrestrial agriculture.

CONCEPTUAL SUBJECT LAYOUT

The way the subject matter is arranged in the exhibit (Fig. 7) will depend entirely on what subjects are finally chosen, but this is one example of how they might be laid out. The visitor enters through introductory sections on Mars planetary science and space program history. Next, the nut-and-bolts science exhibits help them understand the Mars Direct, Mission Control, and MarsDome exhibits that follow. They exit through exhibits telling them what part they can play in Mars exploration.

CONCEPTUAL FLOORPLAN

A floorplan will also flow from the subjects that are finally chosen. The floorplan in Fig. 8 is designed to show the variety of exhibit techniques available to museums and one possibility of how over 30 exhibits might be laid out in a 5,000 square foot space.

CONCEPTUAL VIEW OF EXHIBIT EXTERIOR

The exterior view (Fig. 9) should tantalize visitors and make them curious about what they'll find inside. In this design the MarsDome is front-and-center, with the Habitation Module (HAB) projecting through the wall. Visitors can see parts of the Martian landscape through the HAB windows, but they must go inside to actually experience it. Spaceships, graphics, interactives, and other hardware are also visible in glimpses before entering the main area.

CONCEPTUAL VIEW INSIDE MARSDOME

The MarsDome, the central exhibit of "The Next Giant Leap", is a full simulation of a Mars landing site. The dome structure has a mural painted on it looking out across the Martian landscape in all directions. The floor replicates Martian regolith, and low rocks surround the perimeter. Equipment includes a Habitation Module (HAB), Mars Ascent Vehicle (MAV), spacesuit, Mars rover, and greenhouse dome.

WHERE CAN WE BE IN 10 YEARS?

The immediate goals of "The Next Giant Leap" are real and tangible. We want people excited, inspired, and educated. We look forward to the publicity the exhibit would generate for the Mars Society and the sponsors. But the most important goals are long term. If this exhibit is successful, its impact should still be felt many years in the future. So, where can we be 10 years from now?

<u>New people excited about Mars and space exploration</u>- Over its 10-12 year lifespan, a conservative estimate of visitors would be at least a quarter of a million people. If only a small percentage of these people are affected by the exhibit, then there will be tens of thousands of new people pressing for a space exploration agenda.

New corporate partnerships- We will have established new and productive partnerships between the Mars Society and the exhibit sponsors. The close relationship necessary to make this exhibit a success will help make other projects easier to start, and open new horizons for cooperative ventures.

Hundreds of new science, aerospace, and engineering graduates- The vast majority of the visitors to this exhibit will be children 12 years old or younger. In 10 years they will be graduating college, and many will be graduating with science and engineering degrees they might never have considered without seeing this exhibit.

An expanded group of people working for the Mars Society agenda- This exhibit offers the opportunity for a radical increase in Mars Society membership by exposing the Society to new people who may never have heard about it in any other forum. These are people who will be ready to push for Mars and space exploration, and who will have educated opinions about the subject when politicians ask for their support.

All this adds up to the single biggest advantage of all: if we build this exhibit, we will be one small step closer to taking "The Next Giant Leap".

FIGURES

Fig.1

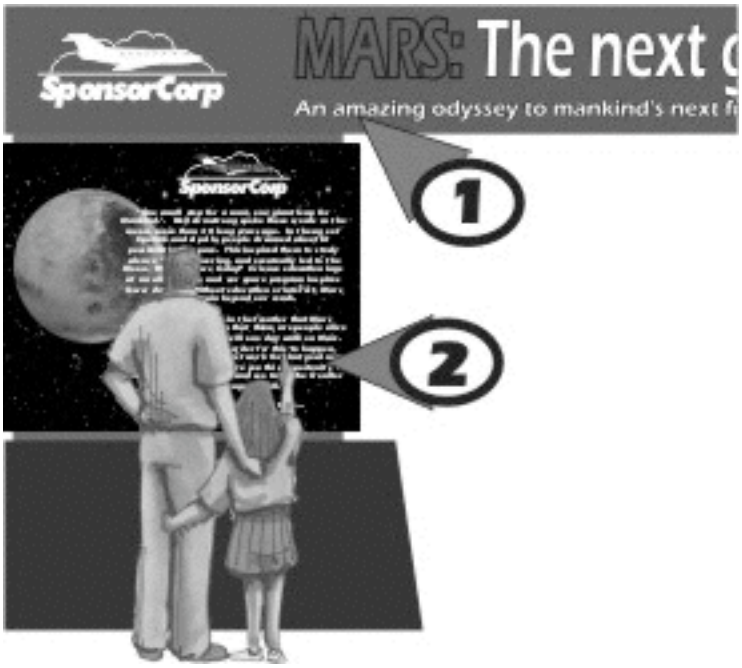
SponsorCorp
MARS: The next
An amazing odyssey to mankind's next
SponsorCorp
1
2

Fig. 2

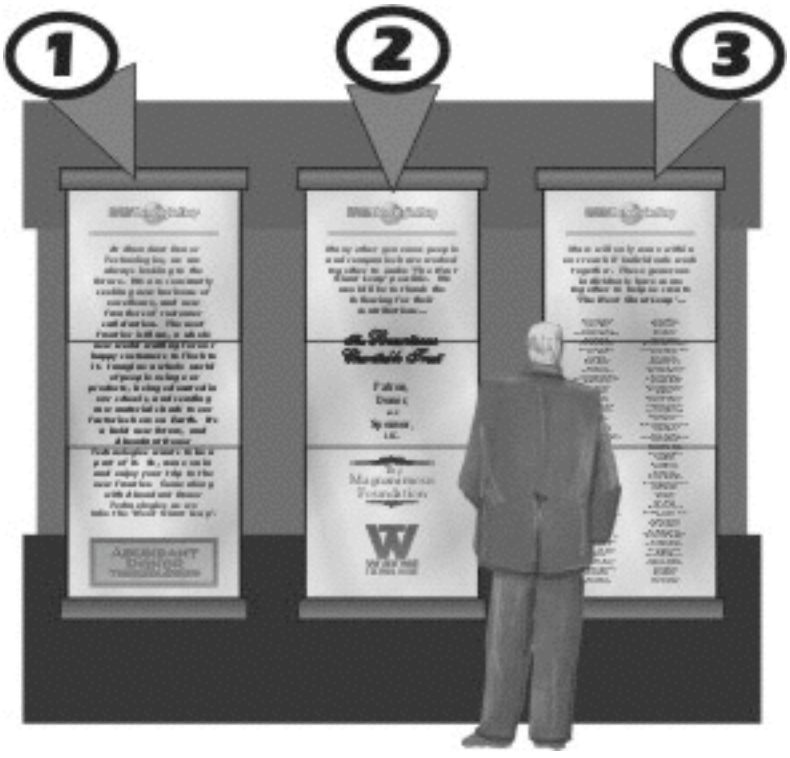
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Fig. 3

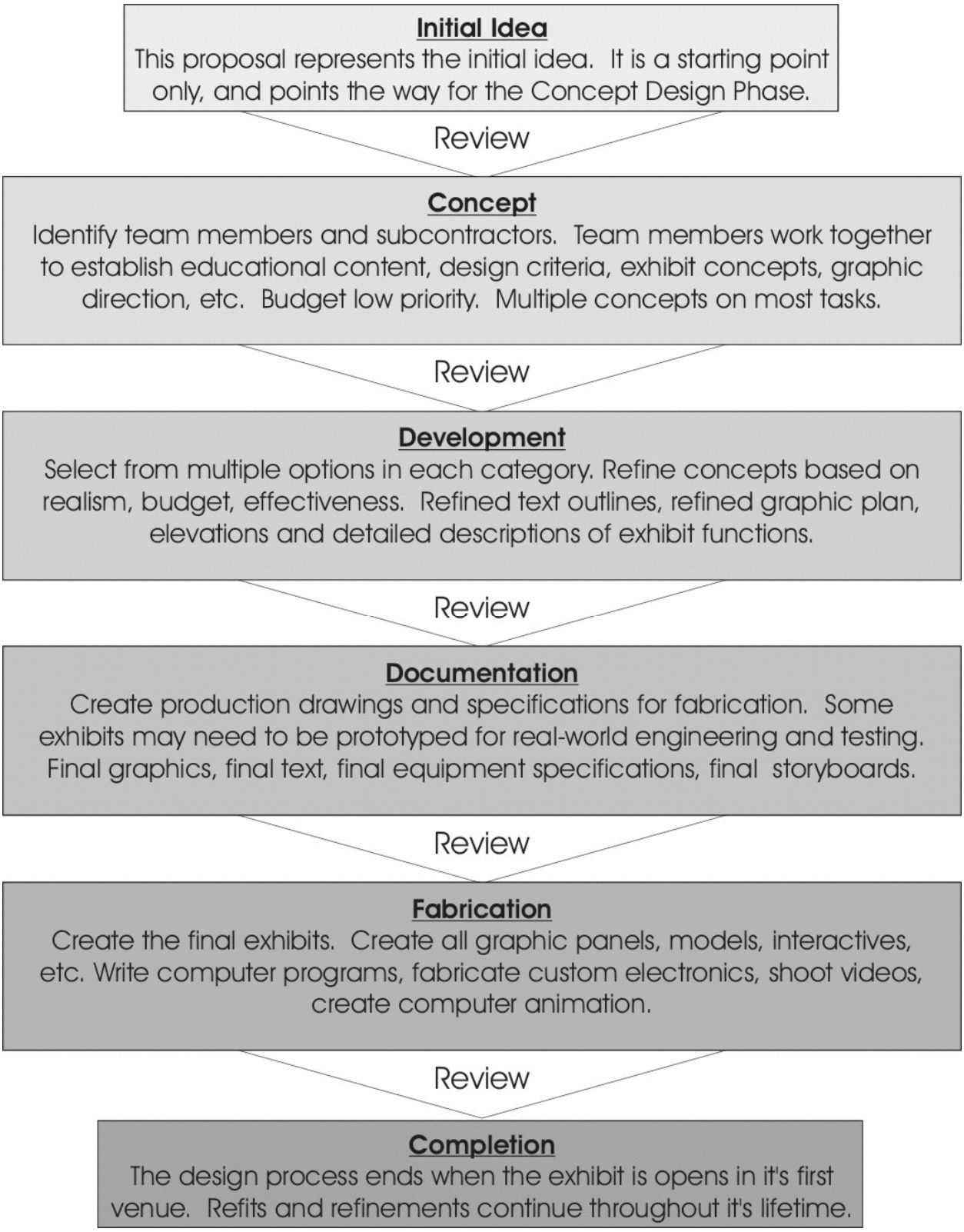
Initial Idea
This proposal represents the initial idea. It is a starting point only, and points the way for the Concept Design Phase.
Review
Concept
Identify team members and subcontractors. Team members work together to establish educational content, design criteria, exhibit concepts, graphic direction, etc. Budget low priority. Multiple concepts on most tasks.
Review
Development
Select from multiple options in each category. Refine concepts based on realism, budget, effectiveness. Refined text outlines, refined graphic plan, elevations and detailed descriptions of exhibit functions.
Review
Documentation
Create production drawings and specifications for fabrication. Some exhibits may need to be prototyped for real-world engineering and testing. Final graphics, final text, final equipment specifications, final storyboards.
Review
Fabrication
Create the final exhibits. Create all graphic panels, models, interactives, etc. Write computer programs, fabricate custom electronics, shoot videos, create computer animation.
Review
Completion
The design process ends when the exhibit is opens in it's first venue. Refits and refinements continue throughout it's lifetime.
Fig. 4

Fig. 5

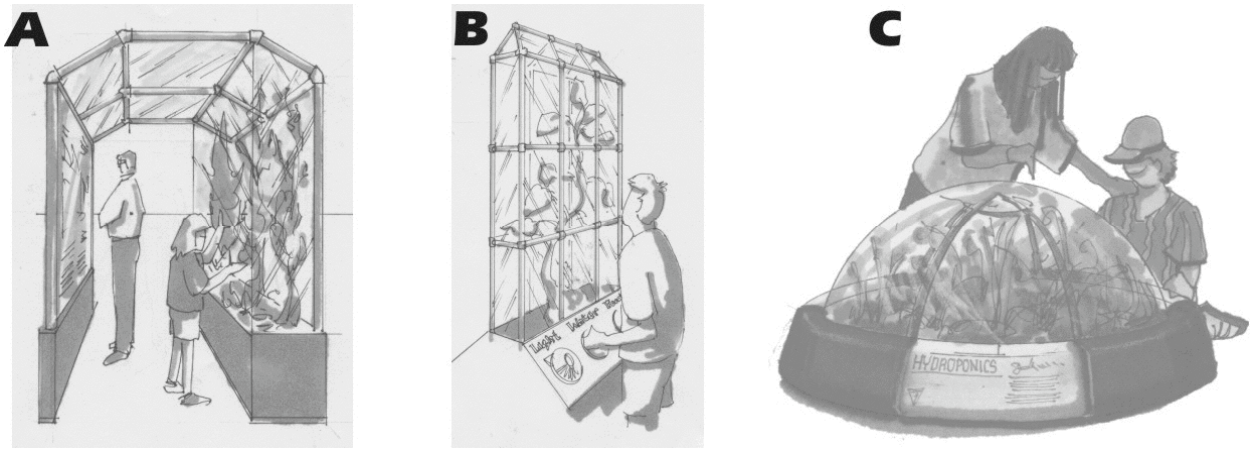

Fig. 6

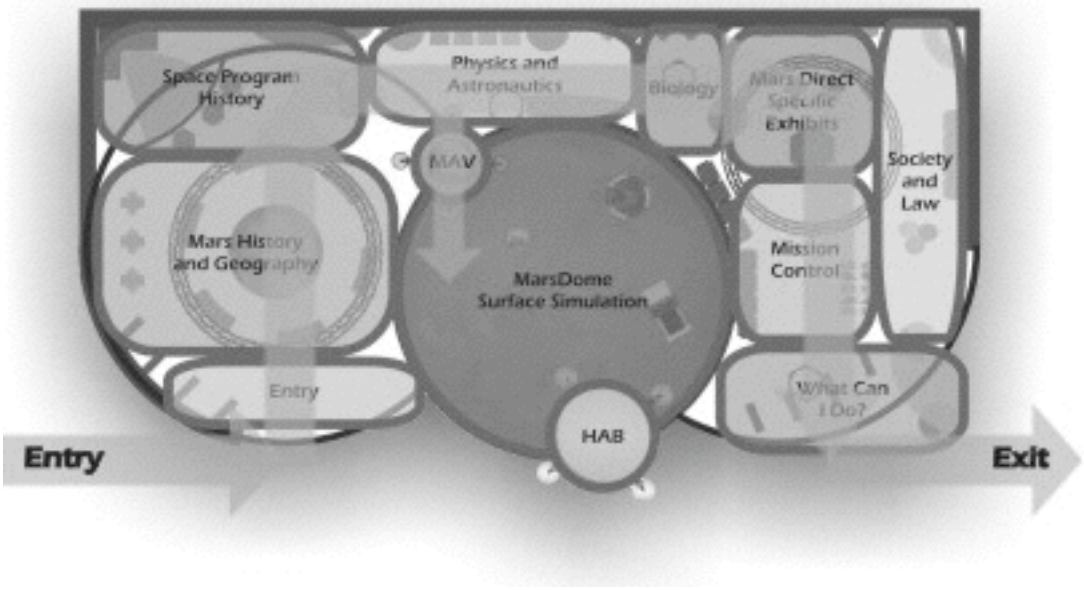

Fig. 7

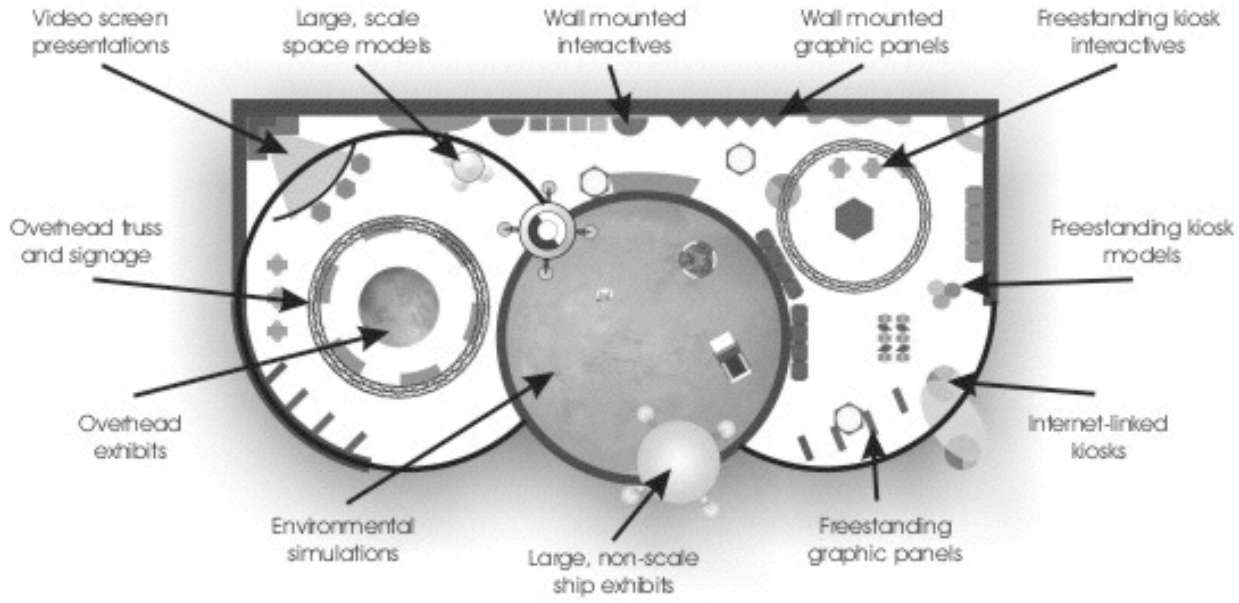
Video screen presentations
Large, scale space models
Wall mounted interactives
Wall mounted graphic panels
Freestanding kiosk interactives
Overhead truss and signage
Freestanding kiosk models
Overhead exhibits
Internet-linked kiosks
Environmental simulations
Large, non-scale ship exhibits
Freestanding graphic panels

Fig. 8

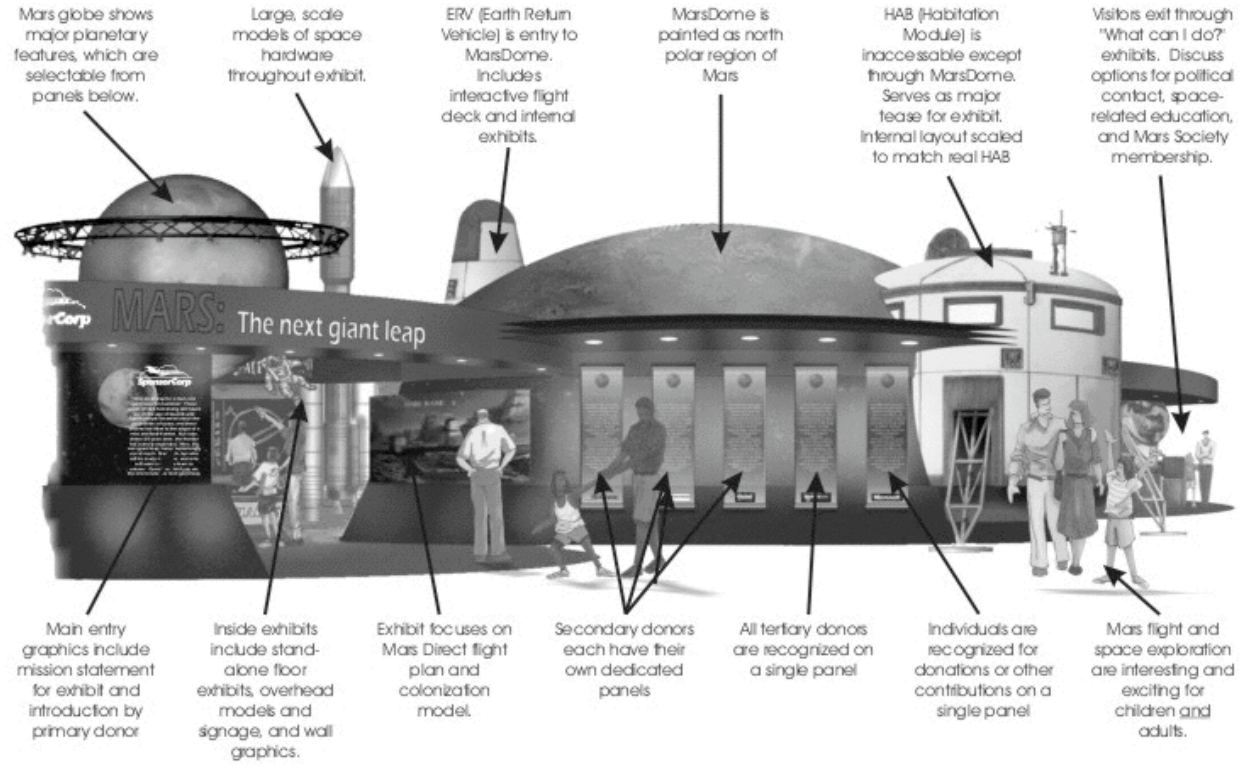
Mars globe shows major planetary features, which are selectable from panels below.
Large, scale models of space hardware throughout exhibit.
ERV (Earth Return Vehicle) is entry to MarsDome. Includes interactive flight deck and internal exhibits.
MarsDome is painted as north polar region of Mars
HAB (Habitation Module) is inaccessable except through MarsDome. Serves as major tease for exhibit. Internal layout scaled to match real HAB
Visitors exit through "What can I do?" exhibits. Discuss options for political contact, space-related education, and Mars Society membership.
MARS: The next giant leap
Main entry graphics include mission statement for exhibit and introduction by primary donor
Inside exhibits include stand-alone floor exhibits, overhead models and signage, and wall graphics.
Exhibit focuses on Mars Direct flight plan and colonization model.
Secondary donors each have their own dedicated panels
All tertiary donors are recognized on a single panel
Individuals are recognized for donations or other contributions on a single panel
Mars flight and space exploration are interesting and exciting for children and adults.

Fig. 9

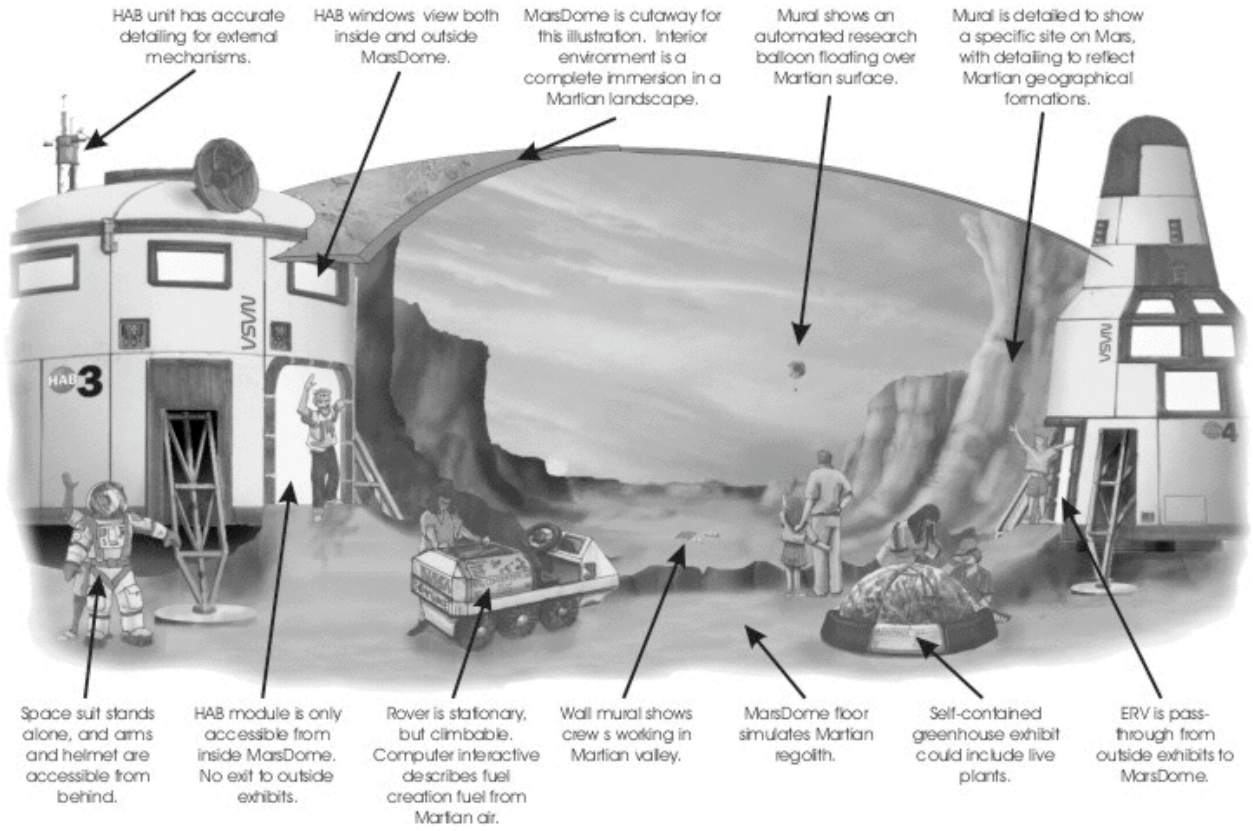
HAB unit has accurate detailing for external mechanisms.
HAB windows view both inside and outside MarsDome.
MarsDome is cutaway for this illustration. Interior environment is a complete immersion in a Martian landscape.
Mural shows an automated research balloon floating over Martian surface.
Mural is detailed to show a specific site on Mars, with detailing to reflect Martian geographical formations.
HAB 3
Space suit stands alone, and arms and helmet are accessible from behind.
HAB module is only accessible from inside MarsDome. No exit to outside exhibits.
Rover is stationary, but climbable. Computer interactive describes fuel creation fuel from Martian air.
Wall mural shows crew s working in Martian valley.
MarsDome floor simulates Martian regolith.
Self-contained greenhouse exhibit could include live plants.
ERV is pass-through from outside exhibits to MarsDome.

Fig 10