

INTRODUCTION

AIM OF THE PROJECT

The goal is to provide a realistic and useful design for future projects. The focus of the project is to deal with problems that have not been, or have scarcely been analyzed in previous projects and to provide possible solutions.

Here, I aim to give a comprehensive analysis of the population design and of self-sustainment of an orbital space colony, to show reasonable development plans, to thoroughly analyze nutrition and water management issues and to provide a detailed study of passive shield techniques. Some of the concepts introduced in this project are new, at my best knowledge.

STRUCTURE OF THE PROJECT and MAIN PROBLEMS DEALT WITH

The focus was not only to pinpoint problems that were not analyzed by past projects, but also to analyze data existing in literature (as the NASA Summer Study) and to assess the aspects that were not yet discussed. The project does not focus on general aspects. I look at this project and at my previous two entries (TEBA, Grand-Prize 2003 and SEEDS, Second-Prize 2004, co-authored with my friend Lucian Gabriel Bahrin) as a whole. The aspects treated in the past two projects complete the present entry. As structural design (including resistance structure analysis), materials extraction and recycling, locating the space settlement were treated in detail in both past projects, I do not reanalyze these problems. I concentrate on a series of problems that are new:

- *The concept of population design* - Population design refers to the conditions the population has to satisfy in order to become self-sustainable from physiological, economical, educational, cultural and scientific points of view.
- *Feasibility analysis of population self-sustainment* – What are the requirements for a population in order to become self-sustainable from social, physiological, scientific, cultural, economical and industrial points of view? At what extent may the settlement become self-sustainable?
- *Population growth models* – What models should be applied for determining the growth of a population in a closed environment, with limited resources, such as the space settlement? What are the conditions in order to accurately predict the growth of such a population? Can we really state how it will evolve?

- *Project management* – How do we plan the construction of a space colony? How do we manage resources and what is the balance time/cost/resources for a construction of such proportions? What is the rational amount of time in which an orbital space colony, which is self-sustainable - from all the points of view, may be built in order to minimize costs and maximize efficiency? A schedule has been proposed for the construction of the space colony.
- *Nutrient requirements* – Whether in space or on Earth, nutrient requirements remain largely the same. What is exactly the average nutrient consumption for an active person working in different fields and what is the corresponding oxygen consumption?
- *Water management* – Water is essential not only to satisfy the physiological requirements of inhabitants, but also for developing industry and agriculture. The amount of domestic water that is required is in a direct relationship with costs and comfort. What is the optimal cost/comfort balance for water consumption?
- *Radiation shielding* – A comprehensive analysis of radiation sources in space and of passive shielding techniques is required. Shield shapes were considered based on the irradiation distribution; a general problem was stated and particularizations were made for various shield shapes. Radiation distribution inside the settlement was analyzed for cylindrical shields.
- *Comfort-cost balance* – One important aspect covered by this design is the comfort/cost balance. Comfort is an essential part of the space colonies' and settlements' life, as without a minimum comfort people may lose interest to settle in. Many past designs considered that the requirements of a non-permanent space station are similar to the ones of a permanent space colony. For example, in terms of water consumption, many past designs considered that 11.3 liters per capita per day is sufficient for all activities. However, agriculture and industry have requirements not covered by this consumption quota. Past designs considered in a wrong manner the proposed consumption for Space Station Freedom – as it is non-permanent, small-scale and has no industry or agriculture.

GENERAL FACTS

TEMIS will have a population of 100'000 people. The population composition of the colony is analyzed in respect to employment. The space settlement will be located in the L₄ or L₅ Lagrange libration points. The construction of the settlement is supported with materials processed and extracted from the Moon and asteroids. Structural design is not treated, as it was thoroughly analyzed in the TEBA (2003) and SEEDS (2004) projects. Structural construction will take five years and overall construction will take seven to ten years. Population will be protected by a massive

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passive radiation shield. Full energetic independence will be ensured by using solar energy, as I explained the topic in the TEBA project.

The project is named in honor of T(h)emis, the personification of justice, wisdom and good counsel in Greek mythology. I hope that the first space settlement will propel mankind into a new exploration era. It shall bring along with knowledge the wisdom to develop our society keeping it safe, just and prosperous.

I consider this project, along with the past two entries, as a whole. But I presume that I will have to write another project next year to complete these three.

Mankind's work toward the space colonization will and should never end.