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"STARCRAFT WORLDS"

A CERV-PORT ——> SPACE PORT PROGRAM

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ABSTRACT

Current NASA plans call for the creation of an International Space Station to be located in a low inclination, low altitude earth orbit and to be serviced by the Space Shuttle. Recent developments indicate that a Crew Emergency Return Vehicle (CERV) will be required prior to permanent manning of the station. Instead of just the NASA proposed station, serviced by the shuttle, we propose that a concurrent step into space involve the additional creation of an embryonic and evolutionary CERV-PORT ---> SPACE PORT, associated with and simultaneous to the availability of the CERV.

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The term port implies an interaction between modes of transportation used to transit on or through different mediums. A seaport enables the transition from land to sea transportation and visa versa; likewise an airport enables the transition to and from the land and the air. A Space Port should enable the transition between atmospheric transport and space transport to and from appropriate destinations.

A seaport or airport also usually serves as a base for intermediate means of transportation such as taxis, buses and trains, and is also used for temporary storage of goods being transported as well as fuel for vehicles, etc. A space port would operate in much the same way. Space taxis would provide access from the space port to various installations in space.

Current plans call for the space station to be a multipurpose facility which would perform a variety of functions. There is an alternative way of viewing the problem. An aircraft carrier is essentially a port serving as a transfer point between the air and the sea. However, aircraft carriers require a variety of services that a single ship is not equipped to perform. As a result, aircraft carriers normally operate in a task force with other ships assigned the roles of mine sweeping, protection, etc. In a similar fashion, rather than demanding that a space station perform functions which it is not ideally suited to carry out, it might make more sense to think in terms of a cluster of space platforms accessible through a space port.

There are a number of advantages:

(1) For obvious practical and political reasons some European countries do not want to be involved in a space station that might eventually be used

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for U.S. defense purposes. A space port, however, is completely neutral. It is simply a staging area outside the earth's gravity which permits access to other space installations. The U.S. and Europe, and even the Soviet Union could cooperate on building and operating space ports without limiting the space missions of any party.

(2) To be reachable by the shuttle a space facility or a space station operating without a space port would have to operate in a quite low earth orbit. The optimum orbit for a space cluster carrying out scientific experiments, however, could be considerably higher. By building a port to act as a staging point within the space cluster, the entire cluster would be freed to operate at the optimum common orbit. Intermediate transport from the port down to the shuttle delivery altitude would be provided by multipurpose vehicles.

(3) Transport of supplies and personnel by space shuttle would result in pollution by gasses, etc. coming from the shuttle's engines. This kind of pollution is not disruptive to a space port, but would be very disruptive to delicate scientific experiments being carried out on a space station. It would make more sense to have the station separate from the port, and accessible by less disruptive space taxis and space tugs, etc.

(4) A space station or Industrial Space Facility would necessarily be dependent on direct support from the earth via the shuttle. The creation of a Space Port, however, would mean that the Industrial Space Facility would no longer have to be shuttle based. It could become space based. That is to say that if a problem were encountered, contact would be made with the port, rather than with earth.

(5) The CERV-Port ---> Space Port rather than being attached to the Phase I station, or a separate program development could provide the first building block in a long range comprehensive program, which would eventually lead to contact with and establishment of colonies on the moon and Mars.

The design that we are recommending for the space port involves a modular construction. The key to this is a spherical multi-purpose utility container which can perform a multitude of transport missions. In a close hexagonal packing of spheres in space, where 12 spheres are in contact with a central one while touching each other, the planes of tangency at the points of contact around the central spheres are the locations of docking or berthing ports.

The sphere, in fact, can serve as a multi-purpose vehicle. Approximately 4 meters in diameter, it is bigger than the Apollo capsule, and would be capable of carrying 6 people on a return trip to earth if equipped with a heat shield that can be fitted over the outside. In space, and equipped with small thrusters, the sphere could serve as a space taxi capable of carrying 2 to 5 people on a mission to visit an installation several hundred miles away. OTVs could extend the range to GEO orbit. With solar panels, etc., the spheres could act as the central elements of an embryonic space port.

The advantage of building a space port with these spheres as connecting nodes is that the port can be expanded and its configuration changed as real necessities which become apparent through actual use are gradually realized.

Using a sphere as both the central element in the construction of a space port or station, ~~and as a multi-purpose construction of a space port or station~~, and as a multi-purpose vehicle has the advantage of reducing costs by only

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having to manufacture a standard shape which can serve several purposes. In the accompanying diagram of a concept for a CERV-PORT ---> SPACE PORT evolution, an open bottom tetrahedron constructed downward toward the earth forms a hanger for servicing, refueling and maintenance.

The CERV as a multi-purpose vehicle can also serve as a routine launch and re-entry vehicle on Ariane 5, a man-rated Ariane 4, or a Titan 4. Equipped with a controllable parachute, it could in fact, be nearly as efficient for re-entry as a small shuttle. Tremendous progress has been made in the use of maneuverable parachutes, and General Electric is currently developing a maneuverable parachute that will permit a vehicle tested in space to land on board a ship at sea.

What we are recommending is that ESA take a new look at its major programs in the Columbus project. Europeans need to realize just how vulnerable they are likely to be to shuttle launch site availability, to overloads and scheduling considerations.

We feel that the best way for ESA to move toward more independence in space is for it to play a major role in the creation of a space port program. We believe tht if Europe were to join in developing our concept of a utility container/crew multi-purpose vehicle, as a basis for the CERV effort, then it would have an important bargaining chip in its future relations with NASA.

Included

Chart #1 A Comprehensive Space Systems Approach

Chart #2 The Space Cluster Approach

Chart #3 Primary Functions of the Space Cluster

Chart #4 A CERV-PORT ---> SPACE PORT Evolution Concept

Reference

AN EVOLUTIONARY SPACE STATION ARCHITECTURE
by O. P. Harwood, Huntingdon Beach, CA. USA. Jour. Brit. Interpl. Soc. Vol. 38
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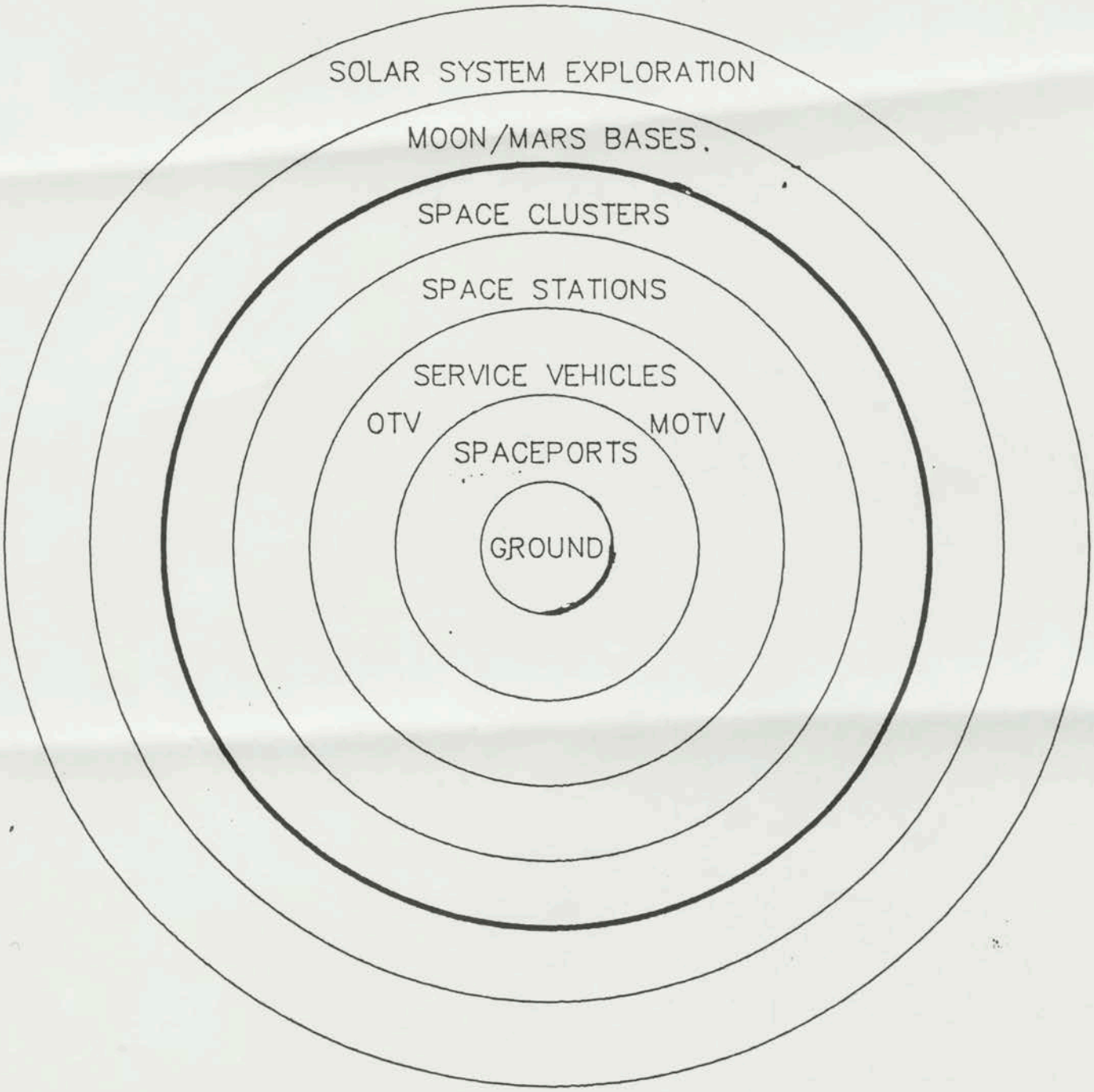
CHART #1



A COMPREHENSIVE SPACE SYSTEMS APPROACH.

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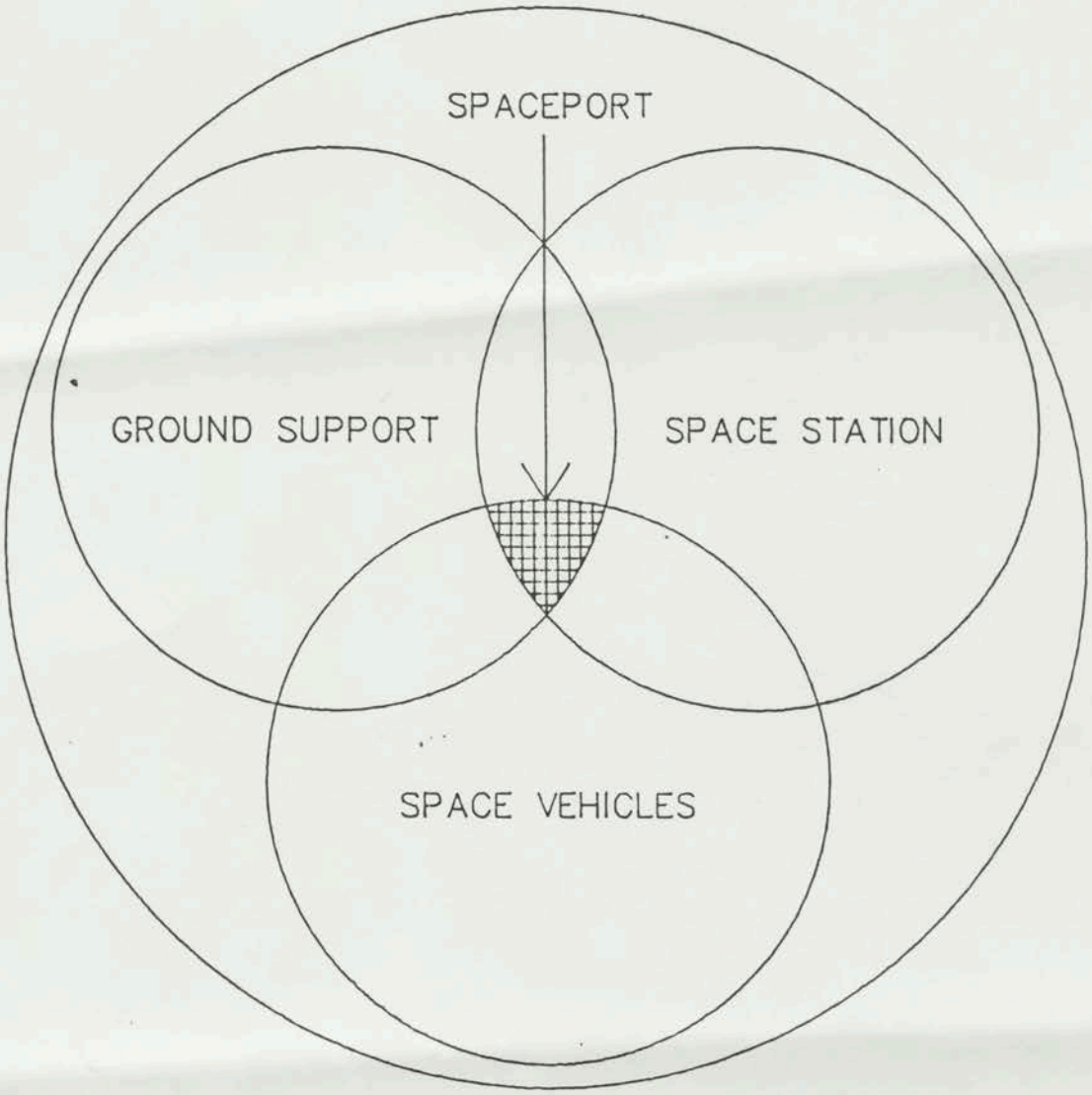
STAGES AND FUNCTIONAL RELATIONSHIPS



THE SPACE CLUSTER APPROACH

WORKING IN A CLUSTER SIMILAR TO A NAVAL TASK FORCE CREATES A SYNERGISTIC EFFECT THAT MULTIPLIES THE CAPABILITIES, SAFETY, AND ECONOMIC RETURN.

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PRIMARY FUNCTIONS OF THE SPACE CLUSTER

SPACEPORT

- ⊕ FUEL STORAGE & MANAGEMENT
- ⊕ REPAIR & STORAGE HANGERS — OPEN
- ⊕ ASSEMBLY & TESTING OF SPACECRAFT
- ⊕ ORBITAL TRAFFIC CONTROL CENTER
- ⊕ BERTHING - CLOSE STATION-KEEPING - TRANSFER CREWS-CARGO
- ⊕ HANGERS PRESSURIZED

SERVICE VEHICLES

- ⊕ PEOPLE TRANSFER
- ⊕ CARGO & PROPELLANT TRANSFER
- ⊕ WORK PLATFORMS MANNED - TENDED
- ⊕ WORK PLATFORMS AUTOMATED
- ⊕ RESCUE
- ⊕ RETRIEVAL

SPACE STATIONS

- ⊕ HABITATION
- ⊕ LABORATORY
- ⊕ OBSERVATION
- ⊕ EARTH SCIENCES
- ⊕ SPACE COMMERCIALIZATION
- ⊕ MEDICAL RESEARCH

MANY OF THE AFOREMENTIONED FUNCTIONS ARE INHERENTY CONFLICTING IN NATURE . . . .

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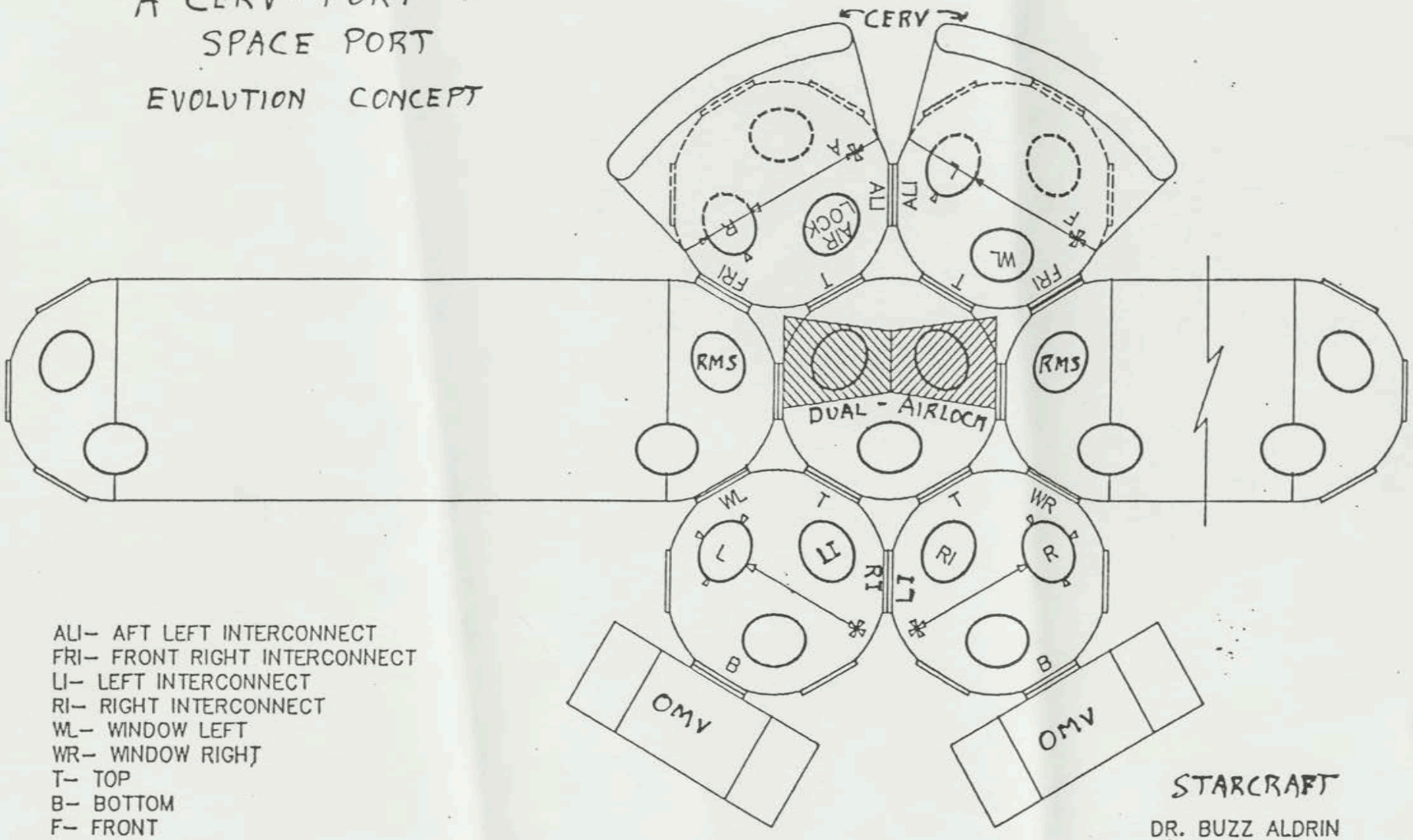
A CERV - PORT → SPACE PORT EVOLUTION CONCEPT



ALI– AFT LEFT INTERCONNECT
FRI– FRONT RIGHT INTERCONNECT
LI– LEFT INTERCONNECT
RI– RIGHT INTERCONNECT
WL– WINDOW LEFT
WR– WINDOW RIGHT
T– TOP
B– BOTTOM
F– FRONT
A– AFT
L– LEFT
R– RIGHT

HABITAT CYLINDERS WITH SEVEN PORTED HEMISPHERES POINTING NORMAL TO ORBIT PLANE CONTAIN AUGMENTED CREW SPACE PLUS HOUSING FOR SOLAR ARRAYS AND RADIATORS. TWO MANIPULATOR ARMS MOUNTED ON UPPER SIDE OF EACH INNER HEMISPHERE.

STARCRAFT
DR. BUZZ ALDRIN

DESIGN SCIENCE CORPORATION
DEW CAD
COMPUTER ASSISTED DRAFTING
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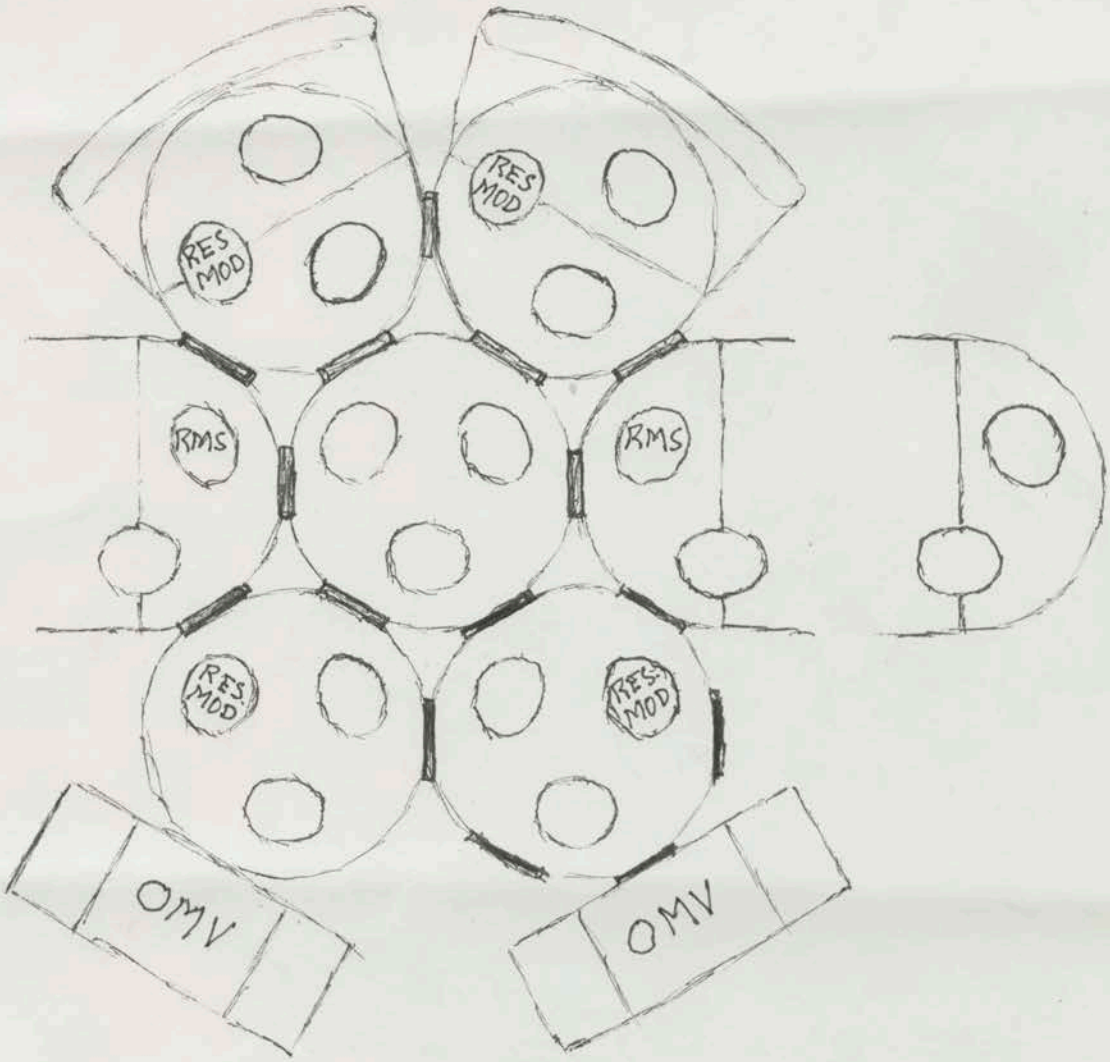
Asociación de Exploradores del Espacio

Tercer Congreso Planetario

México, D.F. Octubre de 1987



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