INTRODUCTION

Magnetic forces have been invoked for maglev levitation of trains and for launching space vehicles. In each case, the magnetic forces between the moving object and a rail are exerted over a very short distance. Magnetic forces between two current loops fall off with the fourth power of the distance between the coils. Thus, it has been considered out of the question to directly push a vehicle into space without solid rails, or launching along tracked rails or tubes.

The fall off with distance to the fourth power only applies when the current loops are separated by a large distance. When the current loops are within one loop radius of each other, the forces are considerable. The space cities concept involves making a ground based current loop with about a 200 KM radius, with extremely high electrical currents and a second 200 KM current loop that is lifted to an altitude of about 150 KM.

The first figure above illustrates two such current loops. The current loop on the earth's surface (green) is the base loop. The levitated current loop is depicted in yellow, and it is at an altitude of about 150 KM. The electric current in the levitated loop is supplied by microwave power beaming from an earth based antenna. The microwaves are converted to electrical DC current by rectennas located on the levitated loop. The forces involved in this system can be 100's of millions of pounds, allowing a complex space city to be built on the levitated loop.

This levitated loop could be a space port that is a transit station into space. The space lift vehicles

TECHNICAL PROBLEMS-STABILITY FROM FLIP

We have not solved the stability problem. We have ideas but they have not been adequately studied. If you take two permanent circular magnets and hold them one above the other, you quickly see that they are prone to "flip" over and be forced together. One potential means of avoiding this is to have the levitated loop rotate and stabilize much like a gyroscope. Jets could be attached and the stability could be maintained much as the space station.,

The concept of the space city is presented here because much of the technology for the idea exists. The magnets can be built as shown below. Microwave power beaming is possible and can be engineered. This is an idea that could make Space travel accessible to everyone, not just highly trained astronauts.

We welcome the interest of individuals or institutions that might be able to contribute to the stability issues.

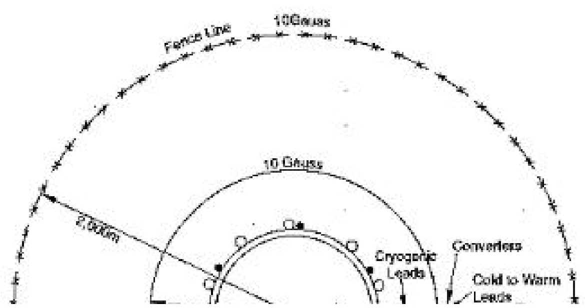
WHAT DOES WORK

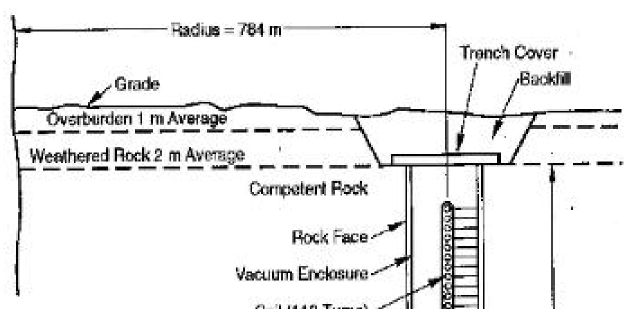
The large superconducting current loops can be constructed with existing technology. Engineering design of a superconducting current installation that includes all the necessary features and is already about 1KM in diameter were developed for energy storage of peaking electrical current in an Electric Power Research Institute study entitled,"Conceptual Design and Cost of a Superconducting Magnetic Energy Storage Plant", EPRI-EM-3457, April, 1984. The design was not put into practice because of concerns over magnetic fields in the air and surroundings of the current coil. (This would of course be a problem with its use to form a space city, but the benefits would be enough to make it imperative to find a suitable location.)

Microwave power beaming, to supply the electrical current to the levitated coil is also a technology that is relatively well developed.

MAGNETIC ENERGY STORAGE CURRENT LOOPS

Detailed engineering studies were performed by General Atomic Corporation for EPRI (The Electric Power Research Institute. The conceptual study cited above includes the following figures. There were to be 112 coils, each carrying 765,000 amperes of current in superconductors. The diameter of this coil was to be 784 meters. This is about 1/250 th of that needed for a space city.





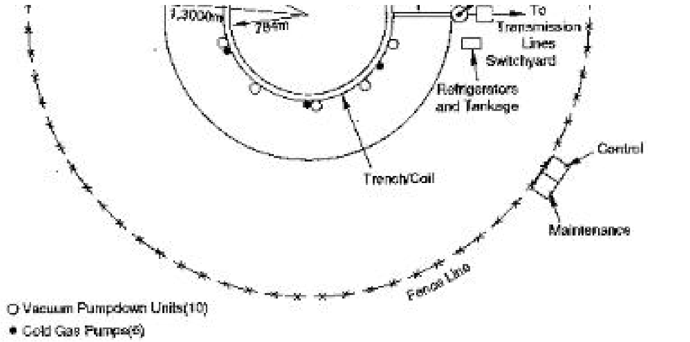


Figure 2
Plan View of the 5500 MWh STORAGE COIL

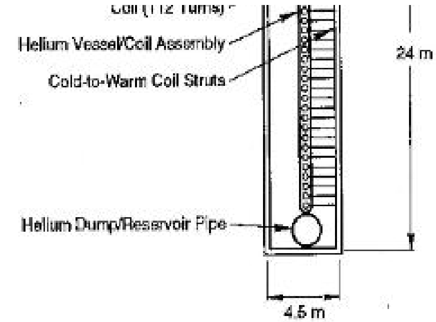


Figure 3
Trench Cross Section

Table 3-1

765 kA CONDUCTOR PARAMETERS

Overall	
Operating current	765 kA
Outside diameter	13.5 cm (5.32 in)
Overall current density	5.34 kA/cm^2
Weight per meter	38.6 kg (85.2 lb)
Superconductor	Nb50.5Ti* alloy
Superconductor radius	5.5 cm (2.16 in)
Stabilizer	High purity aluminum (RRR** = 2000)
Structural elements	Aluminum alloy
Operating temperature	1.8K

* 49.5% Nb and 50.5% Ti by weight
** RRR = Residual resistivity ratio

SAFETY AND REDUNDANCY ISSUES

Numerous safety issues and issues of practicality will need to be addressed.

1. **Potential impact on the ozone layer**
2. **Meteorites, UV and Solar Radiation. (Like the space station, this city would be exposed to all of these issues.**
3. **Oxygen and Material supplies. (These would be brought to the station on heavy lift vehicles.**
4. **The magnetic field loops will need to be maintainable and serviceable. That means there would need to be redundancy in current loops.**

HOME