Dr. N. M. Komerath
Georgia Institute of Technology
Tailored Force Fields: Phase 2

Phase 1 of this project explored a new approach to build massive structures in Space. We had shown from microgravity flight tests œ that multitudes of particles in a standing wave field, would form into thin walls along the nodal surfaces of the field. We examined how this could be used to build structures of various sizes and shapes, without molds or machining. In gas-filled containers, small objects can be built using acoustic or microwave fields. In vacuum, radio waves will build large, massive structures from blocks of stone. Theory and validation in Phase 1 linked experiments and analyses from acoustics, ultrasonics, optics, microwaves and radio waves. A test case studied construction of a 50m diameter, 50m long cylindrical module with 2m-thick walls of Near Earth Object rock suitable for radiation shielding, at the Earth-Sun L-4 libration point. Even such an extreme conceptual leap could be tackled with a reasonable level of solar energy and other resources in the next 30 years. Subsequent events have shown that our —space economy“ architecture projections which set the context for such a project, are directly in line with the new US Space Program roadmap. In Phase 2, we will detail the architecture and systems for construction using tailored ectromagnetic force fields œ from initial launch to completion of construction. Propulsion and system options will be explored. Conceptual design of antennae for force-field applications will be developed, studying mass, cost and risk tradeoffs between energy collectors, storage, resonator technology and construction time. Systems to pulverize NEO material, and to perform surface sintering and structural assembly will be described to show the enabling technologies and tradeoffs. Direct conversion of solar to radio-wave energy is seen to offer a potential breakthroughs in efficiency and mass reduction. Several other applications for this revolutionary concept will be explored.

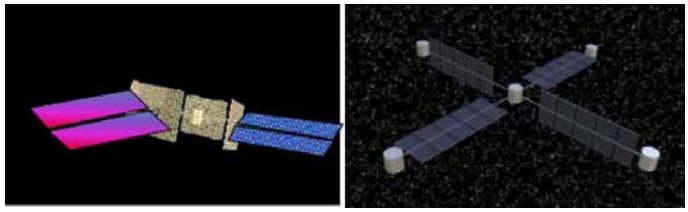

Figure 2: Left: TFF constructors move in to form a wire-grid cage around the rubble cloud where a cylinder is being formed. Right: Completed radiation-shielded station with 4 artificial-gravity modules and a central 0-g module.

Figure 1: "Rock-breaker" plasma beam cutter generates a doughnut-shaped cloud of nominally 0.2m blocks.