

50th STUDENT CONFERENCE (E2)  
Student Team Competition (3-GTS.4)

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MODULAR PORTABLE ECOSYSTEMS: A SUSTAINABLE AND SCALABLE FOOD PRODUCTION  
MODEL**Abstract**

We propose a fresh food production method: Modular Portable Ecosystem (MPE) aimed to supply deep space exploration with a dynamic and expandible solution for food obtainment. This work has been developed to participate in the first phase of the Deep Space Food Challenge, convened by NASA and the CSA. To put the concept of MPE's in context, we propose a hydroponic prototype. This system can form a positive cycle; we conceive this as a fluid macro-ecosystem wherein the water being used is part of the water cycle within the spaceship and the settlements. When it comes to the plants being grown, we suggest soybeans and lentils; however, the general concept might be applied to any crop, given the conditions are modified correspondingly. Each MPE is thought to function as an environment in and of

itself, but with the possibility of connecting it with another module. This, in turn, provides a dynamic macro environment wherein resources can be maximized while promoting advantageous conditions such as an Oxygen Production Cycle that supports the formation of a Human-Friendly Atmosphere. The modules can function both onboard the spaceship and on extraterrestrial soil. That is, they have a dual quality. Once on land, MPE's are to be mobilized and deployed in their future settlement. The various modules are designed to be quickly mobilized on irregular terrain. This is achieved through a good wheeled platform. Both onboard and on land, MPE's are planned to strengthen the bonds among the crew members through cooperation. Psychological distress associated with prolonged isolation in long-duration space missions can be partly addressed by MPE's further design.