



# Crystalline Ordered Spread Micro-gravity Observation (COSMO) and Micro-gravity Ant Pathfinding Study (MAPS) Dual Payload Experiment

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## COSMO



Figure One: COSMO Module

### Feasibility Studies

Several petri dishes of potassium aluminum sulfate will be tested in a centrifuge to determine the effects of simulated microgravity on the crystalline lattices. The crystals will be spun at one-third gravity, one-sixth gravity, and as close as possible to micro-gravity.

### Suborbital Flight

#### COSMO

Prior to launch, several seed crystals will be grown. These seen crystals will be placed in COSMO modules with a crystalline solution. During flight, these crystals will continue growing, producing a different lattice structure than that formed in a 1G environment

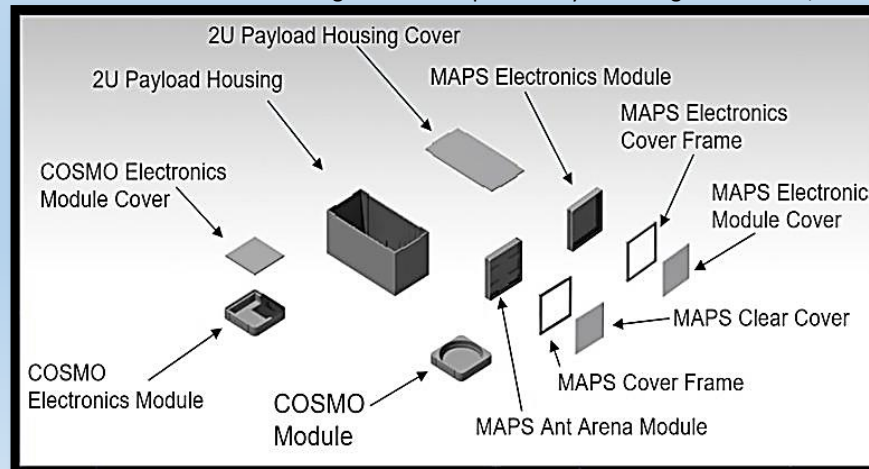
#### MAPS

Two MAPS modules will be loaded with worker ants. Using the MAPS electronics module, the exploration of the MAPS arenas by these ants will be recorded during the suborbital flight for post-launch processing.

### Abstract

MAPS & COSMO is a dual payload experiment which is aimed at expanding the fields of robotics and materials science. The first payload, Micro-gravity Ant Pathfinding Study (MAPS), will observe and analyze the *Camponotus Floridanus* species of ants' pathfinding ability while in micro-gravity. Using control groups on the ground, the ants' pathfinding ability will be quantified and compared to that of their counterparts, *Tetramorium Caespitum* species of ants', during the micro-gravity trials. This analysis will help us to further understand the way multiple autonomous constructs interact and the benefits of emergent intelligence. The second payload, the Crystalline Ordered Spread Micro-Gravity Observation (COSMO), will grow potassium aluminum sulfate in micro-gravity to be collected and analyzed, once back on Earth. It is theorized that due to the lack of strong gravitational forces, the molecular and atomic structures can grow more slowly, thus forming more perfectly to create stronger and more efficient crystalline lattices and matrices. This phenomenon can be exploited and applied to the development of crystalline structures in other materials such as semi-conductors.

Figure Three: Exploded Payload Design for COSMO/MAPS



## MAPS

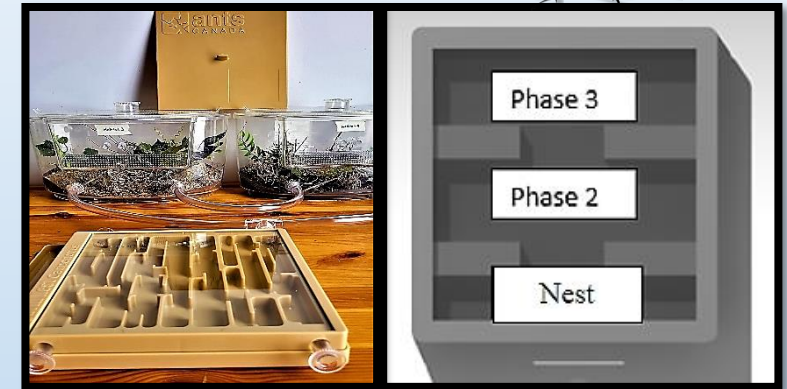


Figure Two: AntsCanada Outworld (left), MAPS module (right)

### Feasibility Studies

As seen in Figure 2 above, AntsCanada outworlds will be used to study ant behavior on the ground. Some test groups will be placed in MAPS arenas in a centrifuge, to see how the ants behave in a simulated micro-gravity environment. Other testing will include shock testing and extreme temperature testing to understand their behavior in these extreme conditions.

### References

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