Mobile CubeSat Command & Control (MC3) Ground Stations

Giovanni Minelli
Philip Ibbitson
Aaron Felt
Ernesto Yzquierdo

James Horning
David Rigmaiden
Dr. James Newman

This Brief is Classified:
UNCLASSIFIED

Excellence Through Knowledge
What is MC3?

The Mobile CubeSat Command and Control (MC3) System is a network of fully autonomous ground stations which support the NRO’s Colony Program.
Objectives

• Geographically distributed ground stations provide continuous coverage for 30+ CubeSats
• Provide “hands on” educational opportunities in satellite communications, networking, and coding
• Ground station hosts adapt their government furnished hardware to further their own research in small satellites

• **Foster government and civilian institutional partnerships in the Small Satellite community**
MC3 Node Locations:
Hardware

### UHF
- 450 MHz TX
- 915 MHz RX

### S-BAND
- 2.1 GHz TX
- 2.2 GHz RX
Ground stations run a GOTS Linux-based software program developed over the last 30 years by the NRL. This software enables stations to run fully autonomously with either remote or local control.

<table>
<thead>
<tr>
<th>Software Capabilities</th>
<th>Description</th>
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<tr>
<td>Ground Station Equipment Control</td>
<td><em>provides control and status of ground station equipment.</em></td>
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<td>Ground Control</td>
<td><em>Provides a GUI that allows for modification of ground site parameters, equipment priorities and availability.</em></td>
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<td>Operations and Control</td>
<td><em>Supports and provides automatic scheduling and control of MC3 nodes. Determines satellite contacts based on ephemeris, or time based events.</em></td>
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<td>Resource Equipment Management</td>
<td><em>Allocates equipment to support future data collects for overhead passes. Produces a perform file that sets the hardware to be used in a satellite contact.</em></td>
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• **Colony II Program:**
  - Bus Provider: Boeing
  - 20 buses over 3 years
  - Features: flight processor, EPS with 70W peak power (20 min), high-performance ADACS with star cameras, TT&C Radio, AES 256-bit software encryption

• **STARE Launch:**
  - September 2012
  - Space-based Telescopes for Actionable Refinement of Ephemeris (STARE)
  - **First Colony II to orbit**
• 8 CalPoly P-PODs integrated into NPSCul for OUTSAT mission on NROL-36

• 11 CubeSats in one launch!
MC3 Path Forward

Access to LEO, MEO, and GEO CubeSats

Better Pointing

More Gain

Increased Coverage

Optimized Scheduling/Performance
QUESTIONS?

Contact Information
MC3 Mission Operations Team
Naval Postgraduate School
mc3@nps.edu