

Model Based Systems Engineering For CubeSats

*Lloyd Walker and Dr. L. Dale Thomas,
 Industrial and Systems Engineering and Engineering Management*

Introduction

CubeSats are becoming more prevalent with use in industry and educational settings. NASA's iSAT mission is currently being modeled to assist in analysis through Model Based Systems Engineering. A closed loop model is being developed integrating the orbital characteristics, power, propulsion, and control subsystems

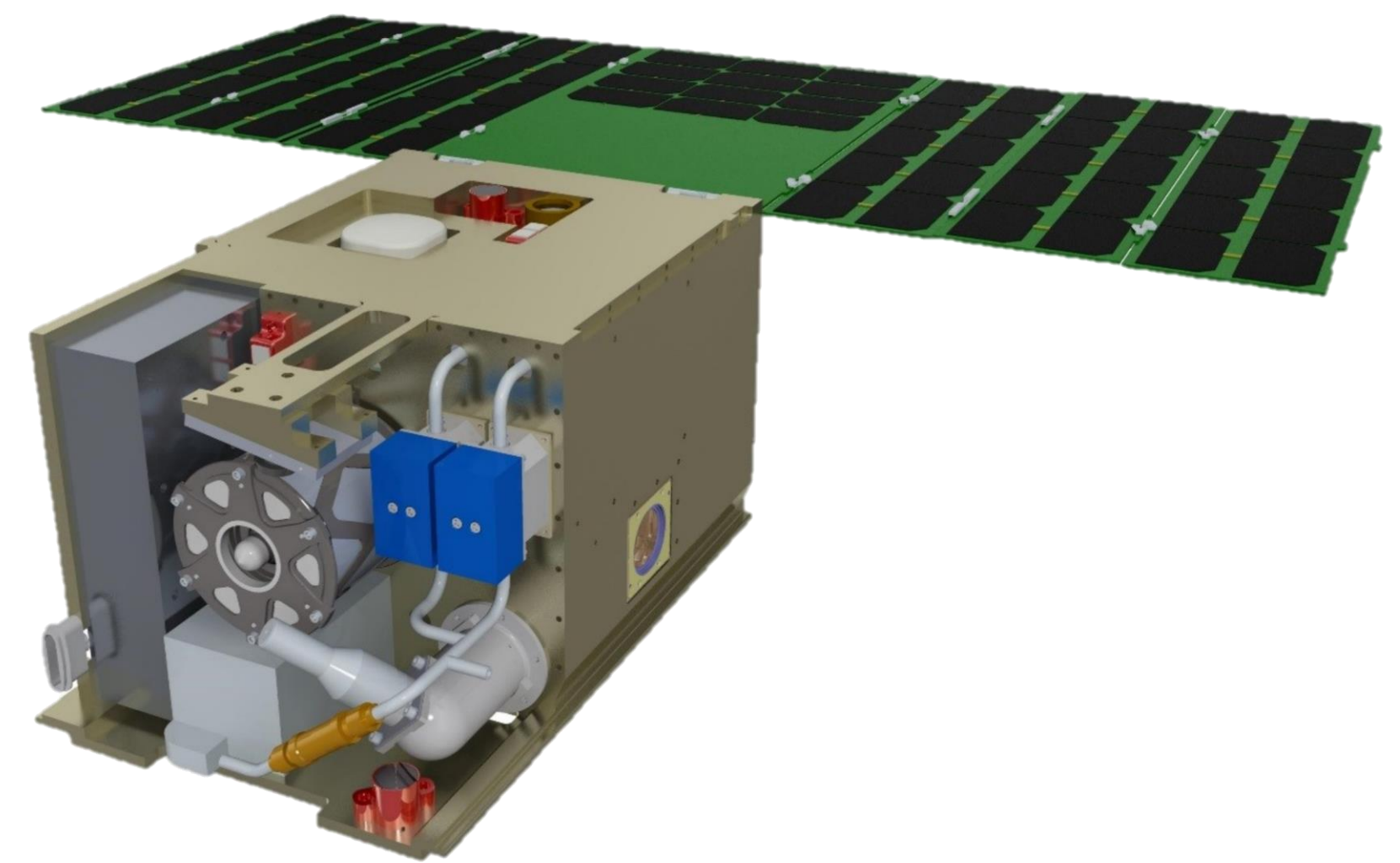


Figure 1: iSAT CAD model

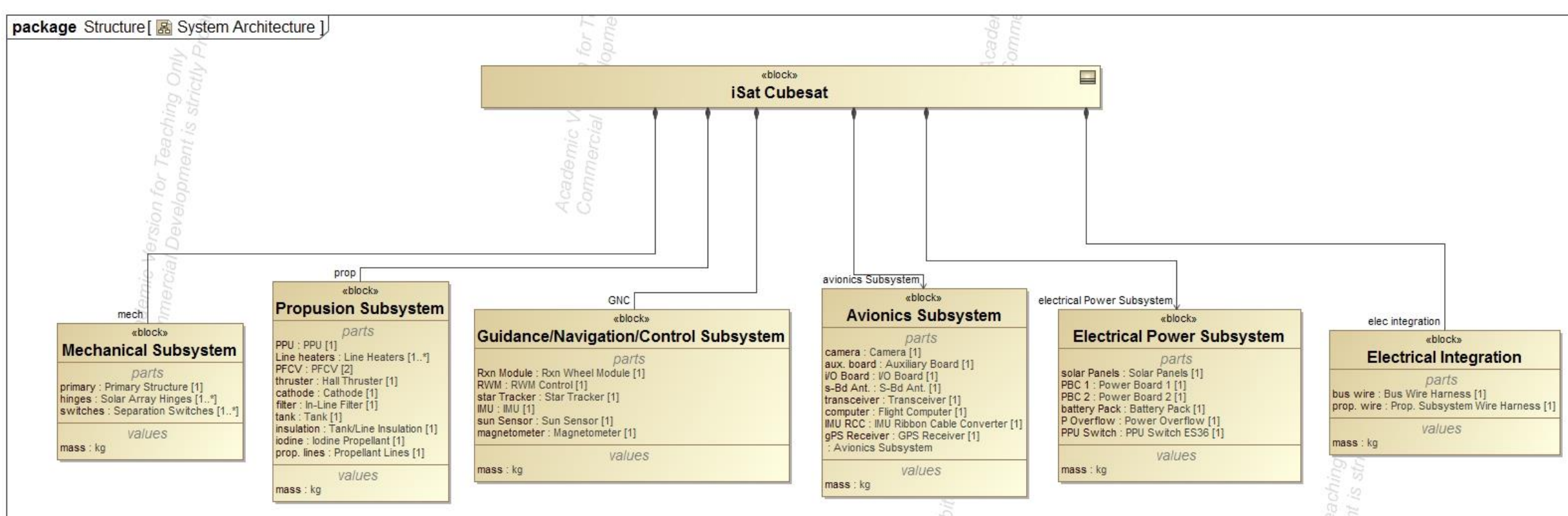


Figure 2: System Architecture Block Definition Diagram

Preliminary Results

Under initial parameters the spacecraft does not produce enough power to last through the eclipse. The solar panels do not charge up the batteries enough upon deployment. The sizing of the panels would have to increase or the power draw would have to decrease to provide enough power during the eclipse

Framework

The satellite is laid out through a Block Definition Diagram entailing the subsystems. Initial analysis is combining the power and orbital model. The models are translated into a parametric diagram. Each system then can be coupled to provide analysis.

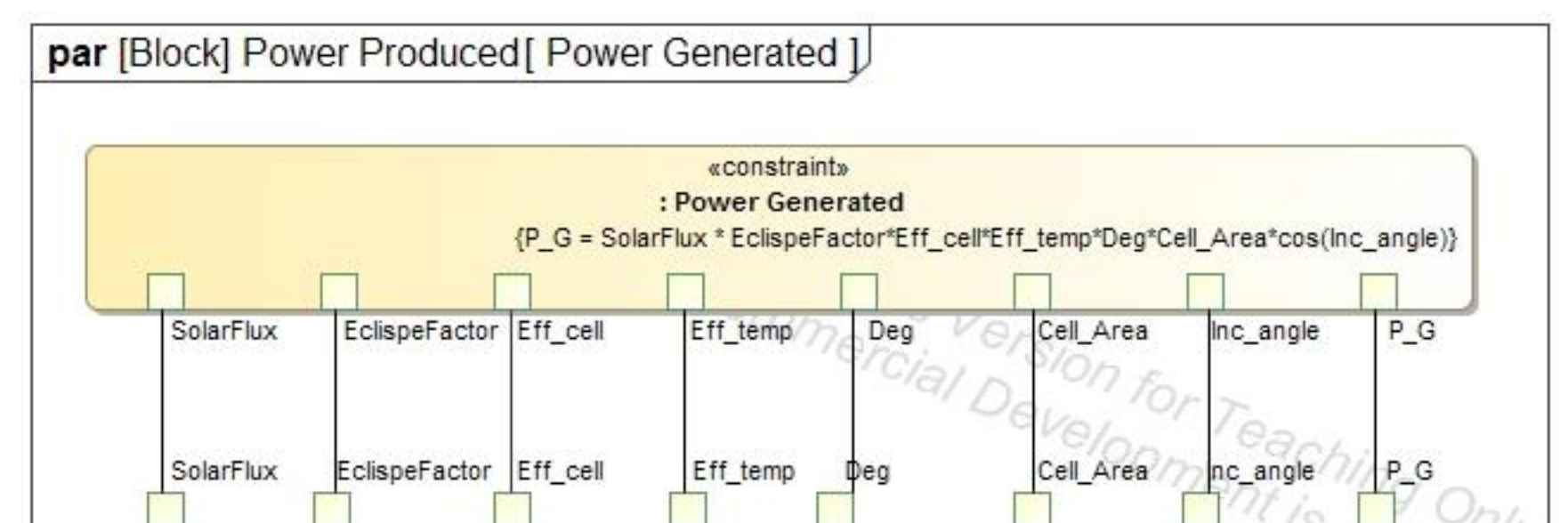


Figure 3: Power Generated Parametric Model

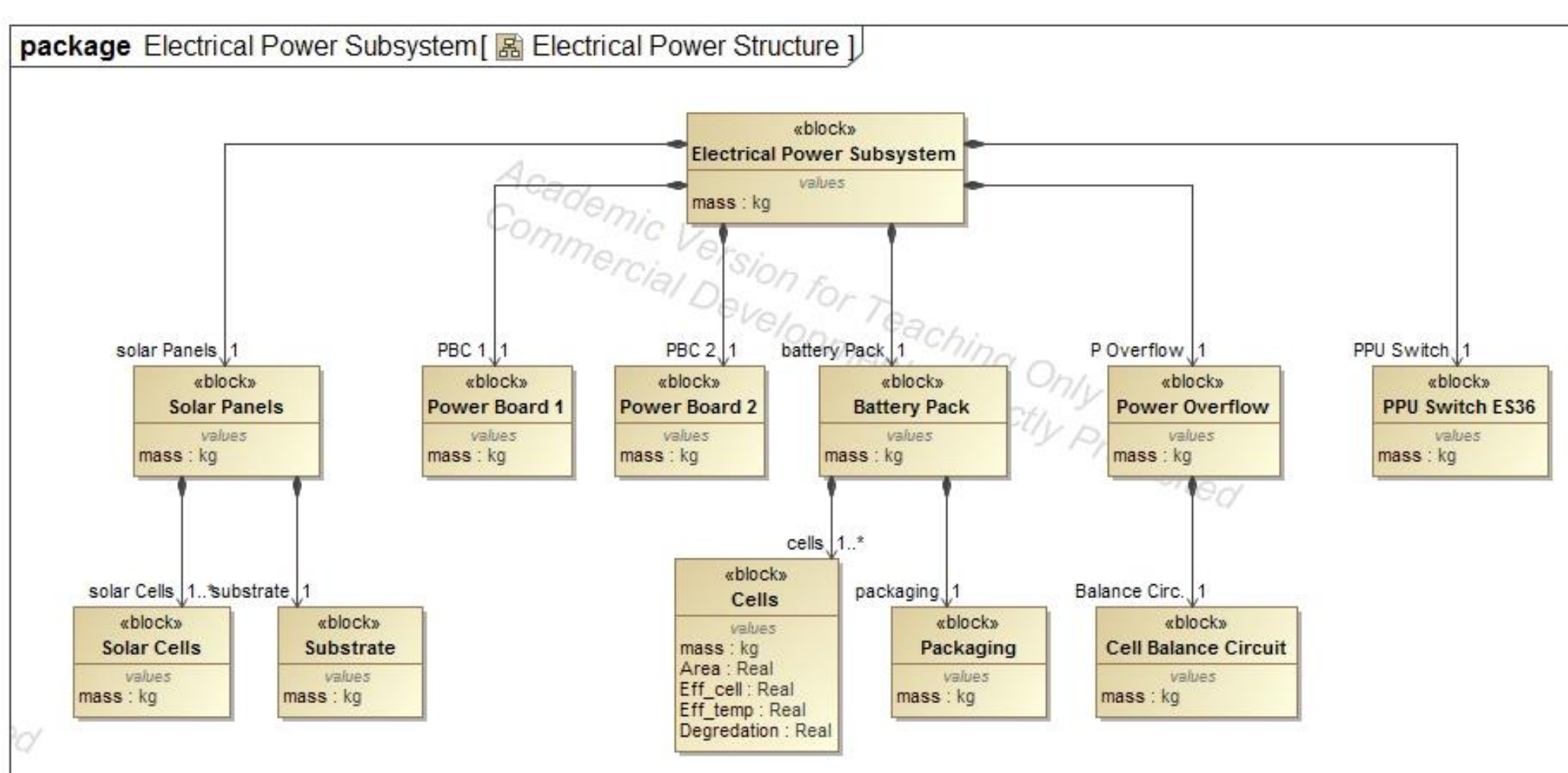


Figure 4: Electrical Power Structure Block Definition Diagram

Conclusions

Model Based Systems Engineering can assist engineers in the design and development of CubeSats. It can provide mission and spacecraft framework as well as initial design analysis.

Acknowledgements

This project would not have been possible without the help from Dr. L. Dale Thomas, Dr. Paul Collopy, and Dr. Bryan Mesmer.

Special thanks is given to John Dankanich, Project lead NASA Marshall Space Flight Center, and to David Kaslow INCOSE SSWG Chair