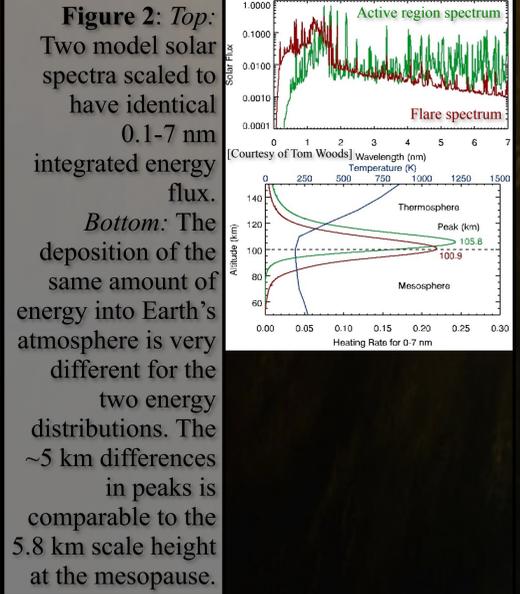
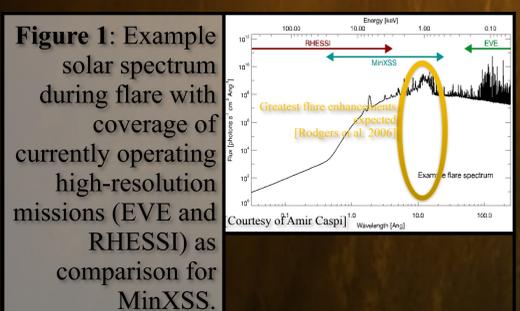


OVERVIEW AND MOTIVATION

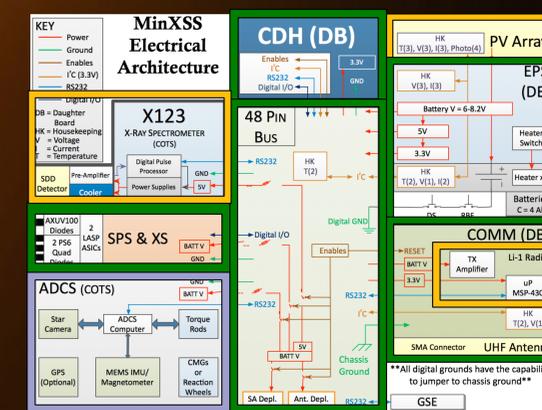
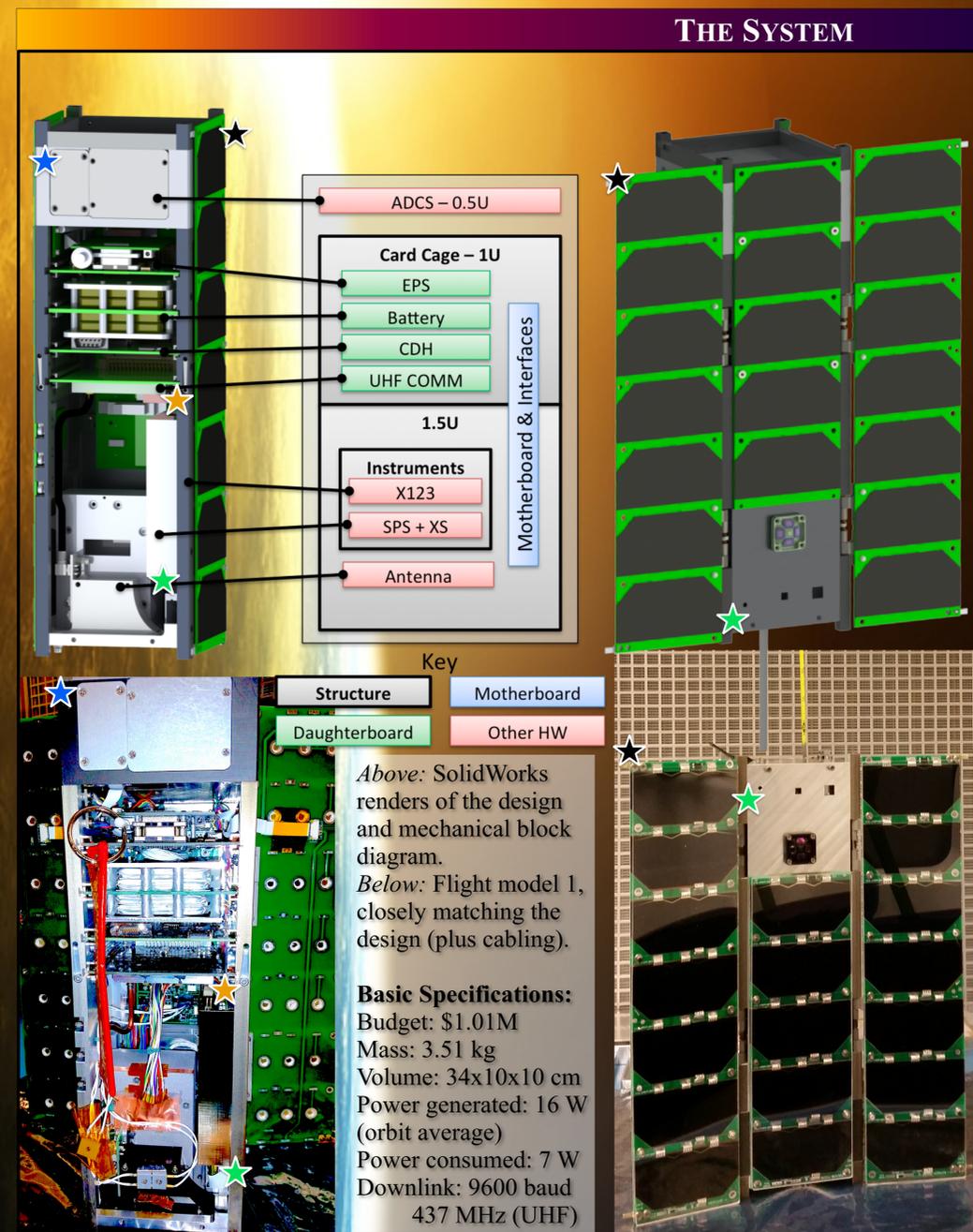
MinXSS is a 3U (34.5 cm x 10 cm x 10 cm), ≤ 4 kg CubeSat intended to launch into low-Earth orbit in 2015 and will observe the soft X-ray (SXR) spectrum (0.4-30 keV or 2.5-20Å) of the Sun at high resolution (0.15 keV). This band has historically been difficult to observe at high resolution due to technological limitations.

Solar SXRs are particularly important because the greatest intensity enhancements during solar flares are expected to occur near 20 Å (Rodgers et al., 2006, see Figure 1). Additionally, the distribution of energy in the SXRs plays an important role in Earth atmospheric properties (Figure 2). Current models of the Earth's thermosphere and mesosphere can be improved by incorporating data that MinXSS will provide.



TECHNOLOGY ENABLING SCIENCE

The Amptek X123 is a commercial off-the-shelf (COTS) X-ray spectrometer that uses a silicon drift detector and includes a thermoelectric cooler, beryllium filter, and support electronics. Its price (~\$11k), size (14 x 5.4 x 2.5 cm), mass (180 g), and power (2.5 W nominal), make it ideal for a CubeSat mission. Originally developed for applications such as X-ray fluorescence analysis for art and archaeology, process control, and quality assurance, it will now be used to observe the Sun from space to enable new scientific studies and the improvement of Earth upper-atmospheric models.

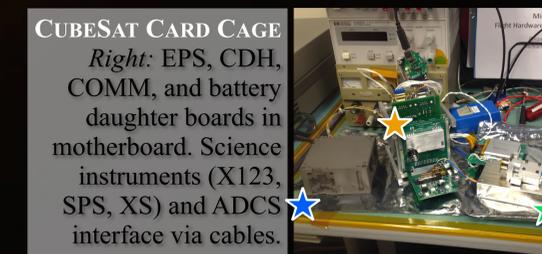


DESIGN/PURCHASING

Commercial off-the-shelf (COTS) subsystems. These items are available on the market. Our efforts are simply to interface with them. Of these 3 subsystems, the Li-1 radio is currently in-hand.

Designed, built, integrated, and tested by students with guidance from professionals. EPS has heritage from CSSWE. CDH and the motherboard are new designs but have been flown on a rocket.

Strong collaboration. The ADCS is being designed and built by Blue Canyon Technologies (BCT), a relatively new aerospace company in Boulder. MinXSS is helping them to refine requirements and define interfaces.



COLLABORATION AND INDUSTRY

- LASP**: CU provides graduate students from aerospace and electrical engineering, computer science, and astrophysical and planetary sciences. Professors act as mentors for the MinXSS graduate project. LASP provides professional mentors and facilities.
- BCT**: Blue Canyon Technologies provides that attitude determination and control system and support. This will be the first flight of their system, concurrent with an Air Force CubeSat also flying this XACT ADCS. As a local company, they have supported major reviews of the MinXSS project and have assisted in multiple air bearing tests of the satellite.
- FIRST RF Corporation**: First RF in Boulder allowed us two opportunities to measure the RF gain pattern of our system in their anechoic chamber. The data collected were used as model validation and high fidelity input to the MinXSS link budget.
- BRAXTON**: MinXSS flight model satellites are being used to aid in the development of Braxton's ground software for ground telemetry and control operations, a system intended to improve upon and replace ISIS, the ground software MinXSS currently uses.

THE WORK AND PEOPLE

MINXSS ORGANIZATIONAL CHART

ADVISORS: TOM WOODS (PI), ANDREW JONES (CO-I), AMIR CASPI (CO-I), XINLIN LI (PROFESSOR), SCOTT PALO (PROFESSOR), RICK KOHNERT (LASP SYSTEMS ENGINEER)

PROJECT MANAGER: BENA MERO

SYSTEMS ENGINEER: JAMES MASON

TEAM MEMBERS: ABHIJEET KUMAR - ALBERTO LÓPEZ DAYER - AMARJIT SINGH - ANDREW DAHIR - ANDREW KELLEY - ANDREW ZIZI - BENA MERO - BHASKAR VAISH - BRIJEN RAVAL - CHEN ZHAO - CHRIS MILLER - CHRIS MOORE - CHRIS SAWYER - CHRISTINA WILSON - DAVID HALL - DIVYA PAI - DONGXUE (LENA) LI - FELIX BIDNER - GABE BERSHENYI - HONG ZHAO - JAKE MASHBURN - JAMES MASON - JORDAN STONE - KATELYNN MCCALMONT - LOGAN FINCH - MARTEN KENDALL - MATT CARTON - MATT CIRBO - MATT YAVORSKY - MICHAEL BONNICI - MICHAEL MURRY - NATHAN SHEIKO - NEERAJ SHARMA - OMKAR RAO - ROHIT KANDURWAR - SAM LINER - SARAH McNAMARA - SETH FOLLEY - SIDDHESH NAIK - SINDHURA BANDAPALLE - VARUN RAVICHANDRAN

Collaboration and Industry: Ball Aerospace (Vibration testing), NIST (Synchrotron calibration), AMP/TEK (X123), AZUR SPACE (Solar cells), Astronautical Development LLC (Li-1 radio).

Operations Heritage: The ground station we will use was built by the MinXSS predecessor, the Colorado Student Space Weather Experiment (CSSWE) CubeSat project, at CU and is on the roof of LASP.

Team Spring 2014: Group photo of the project team.

Activities: Solar panel fabrication, Anechoic chamber testing, Students with NASA administrator Bolden, NIST instrument calibration.