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# SKC Wide Field Camera

NASA HASP Flight 5 (September 2010)





## Some facts about Salish Kootenai College ...

- 4-year land grant college, classified as a Tribal College by the U.S. Department of Education
  - Chartered in 1977 by the Confederated Salish & Kootenai Tribes
  - Charter member of the American Indian Higher Education Consortium
  - Full accreditation by the Northwest Commission on Colleges and Universities as a two-year college in 1984, as a four-year college in 1993 (successful 10-year renewal in January 2004)
  - 200 full time personnel, 65 full time faculty, 45 part time faculty
  - 1200 students, 80% Native American (from over 100 federally recognized tribes)
  - 10 bachelor's and 15 associate degrees, and 5 vocational certificate programs
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## Division of Sciences

### Departments

- Biological and Chemical Sciences
- Information Technology and Computer Engineering
- Mathematics
- Natural Resources

### Degrees offered

#### A.S.

Engineering Graphics  
Environmental Science  
Forestry  
General Studies/Science  
Information Technology  
Media Design

#### B.S.

Computer Engineering  
Environmental Science  
Forestry  
Information Technology  
Life Sciences (beginning Fall 2010)  
Science Education (beginning Fall 2010)

- The Division departments also provide mathematics, science, and technology courses for other majors and for general education requirements
- SKC also offers A.S. and B.S. programs in psychology

Students (09-10 AY): 191 majors in the 10 Division degree programs (an additional 60 in psychology)

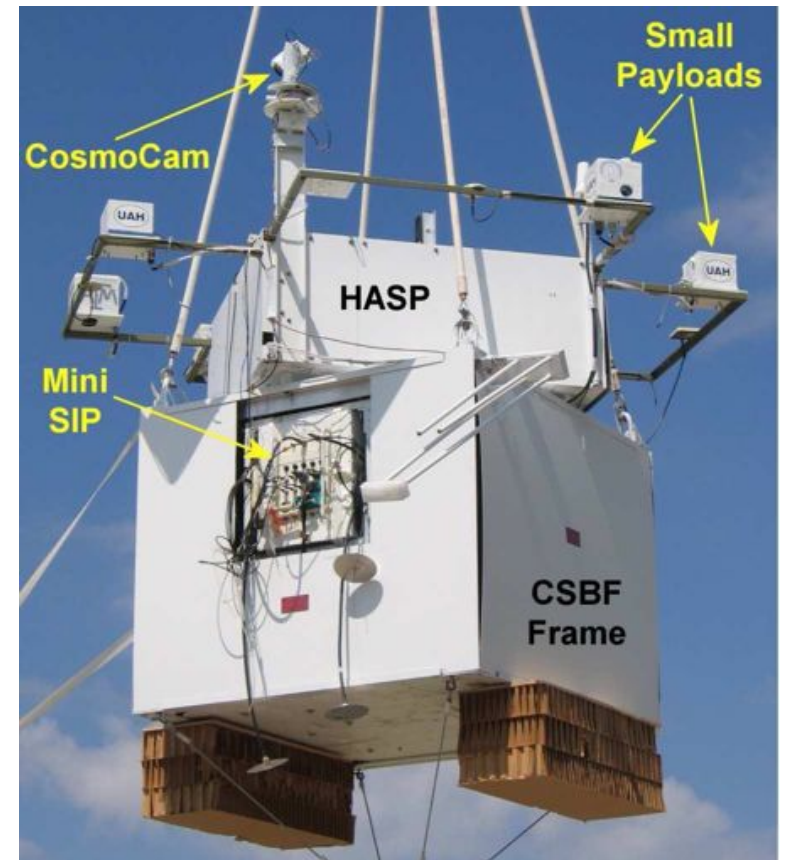
Faculty and staff Currently 21 full time faculty, 7 part time faculty, and 8 support staff

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- Sponsored by the NASA Balloon Program Office and the Louisiana Space Grant Consortium
- Administered by Louisiana State University
- Yearly flights of student-built payloads





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## SKC Wide Field Camera

- To be flown on HASP 5 as an engineering prototype of a visible light wide field astronomical camera
  - Micron MT9M131 CMOS sensor (on a Micron head board)
    - 1280 x 1024 active pixels
    - 1/3-inch optical format
    - Bayer pattern filter
    - System on a chip capability
  - 4.5 mm focal length, F/2 lens, 68° field of view
  - Controlled by Altera EP3C25 Cyclone III FPGA (on a SKC designed interface board)
  - Image acquired every 90 seconds in flight, written to a 2 GB microSD card, retrieved post flight
  - Uplink commands controlling operation
  - Thumbnail and temperature data via downlink
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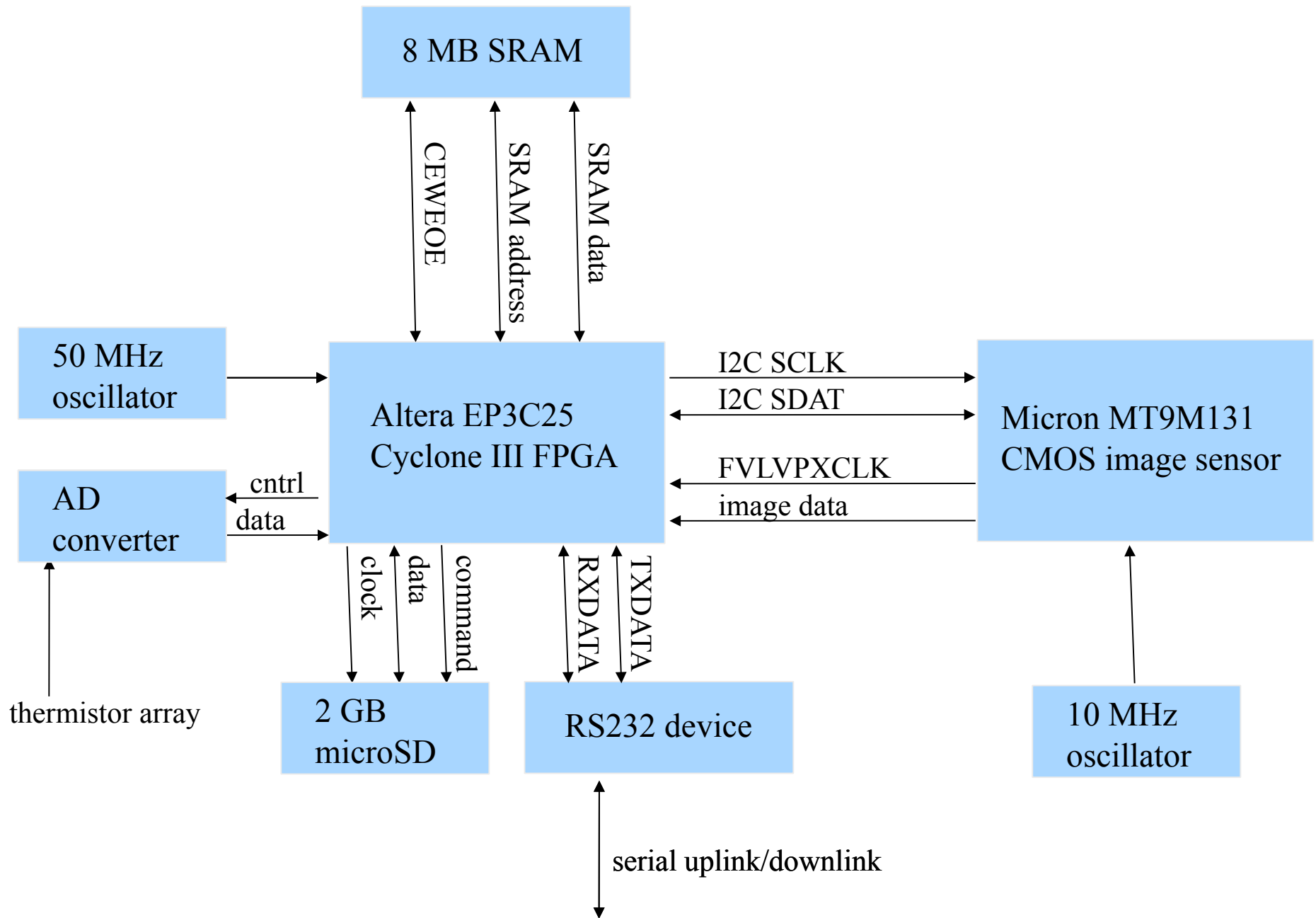


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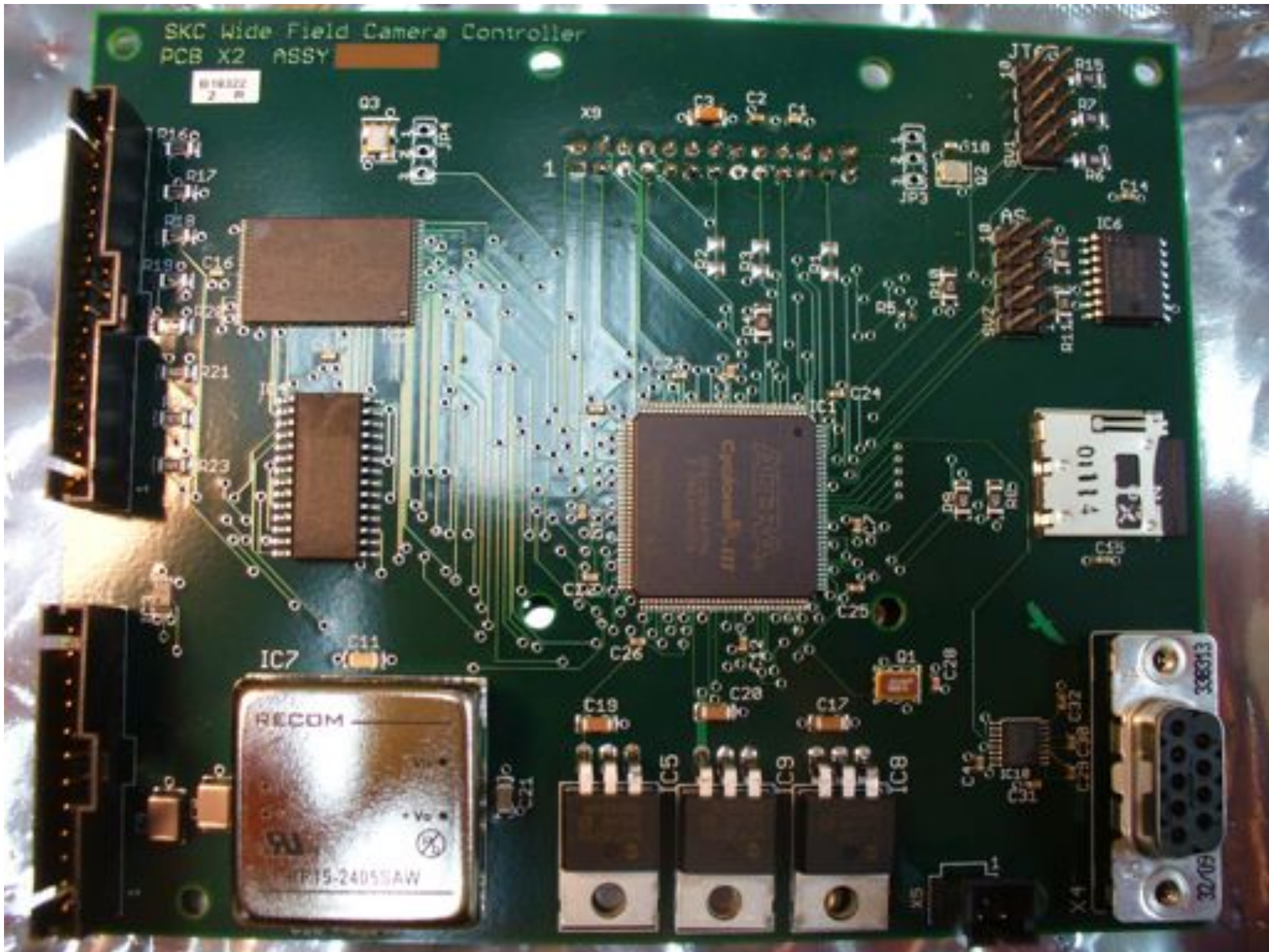
## **Mechanical Specifications:**

- A. Measured mass of the payload (not including payload plate)
- camera interface board 86 grams
  - camera headboard 46 grams
  - housing and baffle 303 grams
  - EDAC cable with interface board connect 60 grams
  - serial cable 15 grams
  - fasteners (mounting bolts, washers, standoffs) 60 grams
  - insulation 25 grams
  - total 595 grams
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SKC Wide Field Camera Controller  
PCB X2 ASSY

W19822  
2 B



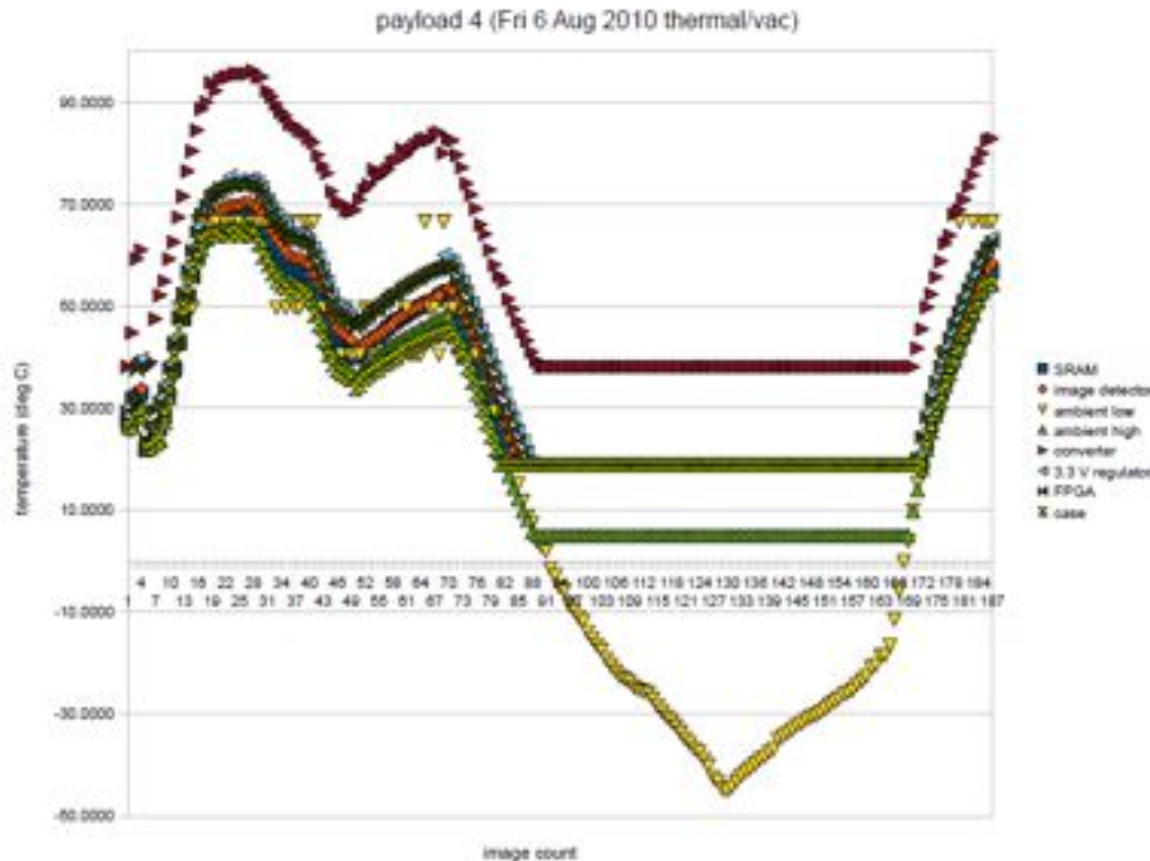




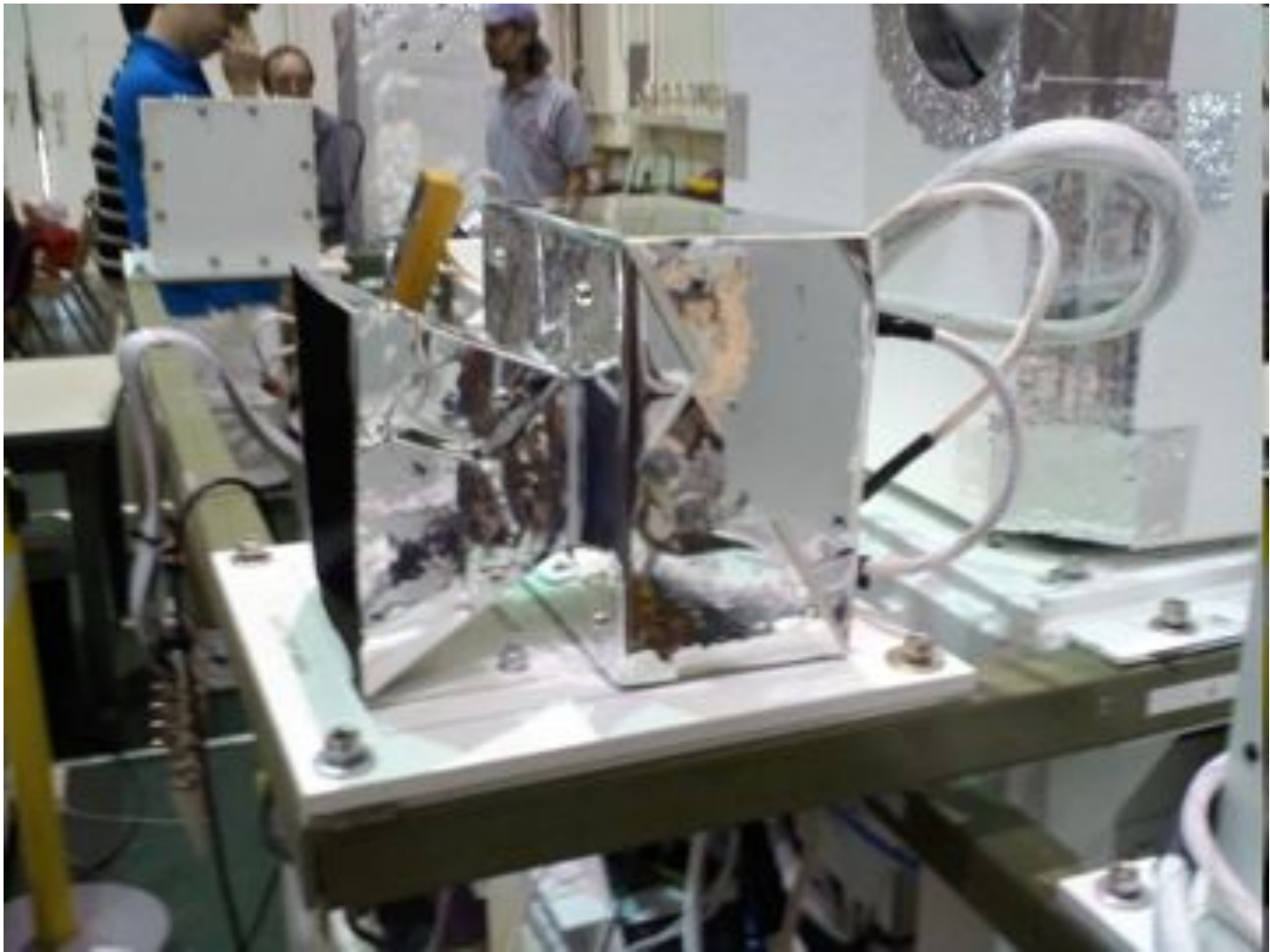


# SKC HASP Wide Field Camera Thermal Monitoring System

The system returns hex values for the voltage input from each channel of the voltage divider. These values are recorded to the on-board SD card amidst each image header, in addition to the SRAM where they may be attained via an uplink command. Upon downlink, the voltages can be processed on the ground using software written by the SKC team to calculate the decimal temperature values (C°), and also to archive the data in a spreadsheet format.

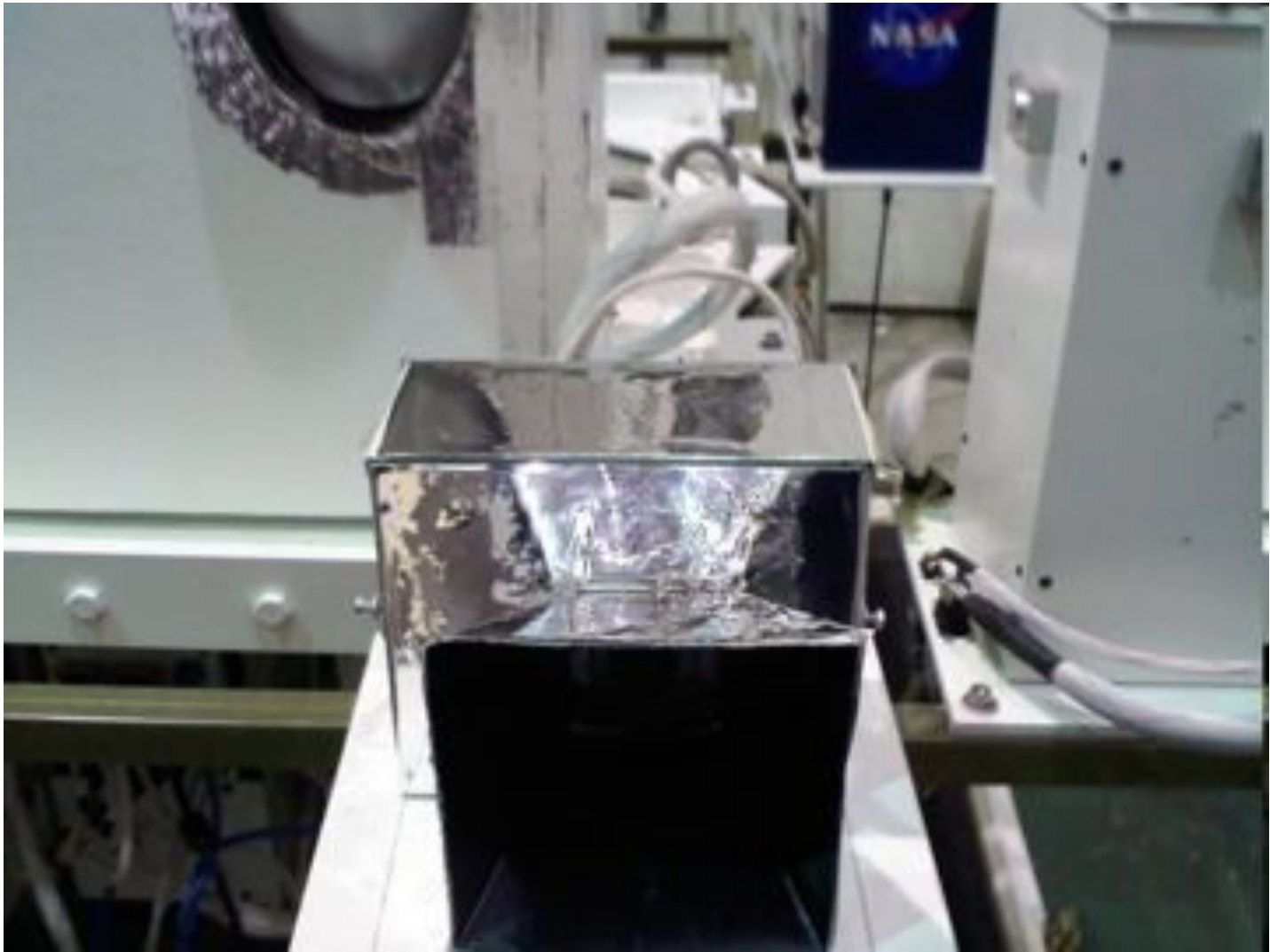


This graph demonstrates one capability of our ground-based processing and illustrates temperature readings from the thermal-vac testing conducted at the Columbia Scientific Balloon Facility during integration. Note that the system was limited on the low end of the read range, which prompted changes in the final fixed resistor array values and thermistor configuration to rectify the limitations (as previously noted).





**FRAGILE  
ELECTRONIC  
EQUIPMENT**





















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## SKC Wide Field Camera HASP Schedule

19 December 2010	SKC Wide Field camera HASP proposal submitted for one of 12 payload positions
14 January 2010	SKC awarded a payload position on HASP flight #5
February-April 2010	Preliminary design
April-May 2010	Fabrication and testing of test camera for first thermal/vac
26 May 2010	First thermal/vac test at the NASA Columbia Scientific Balloon Facility (Palestine, TX)
June 2010	Comprehensive design

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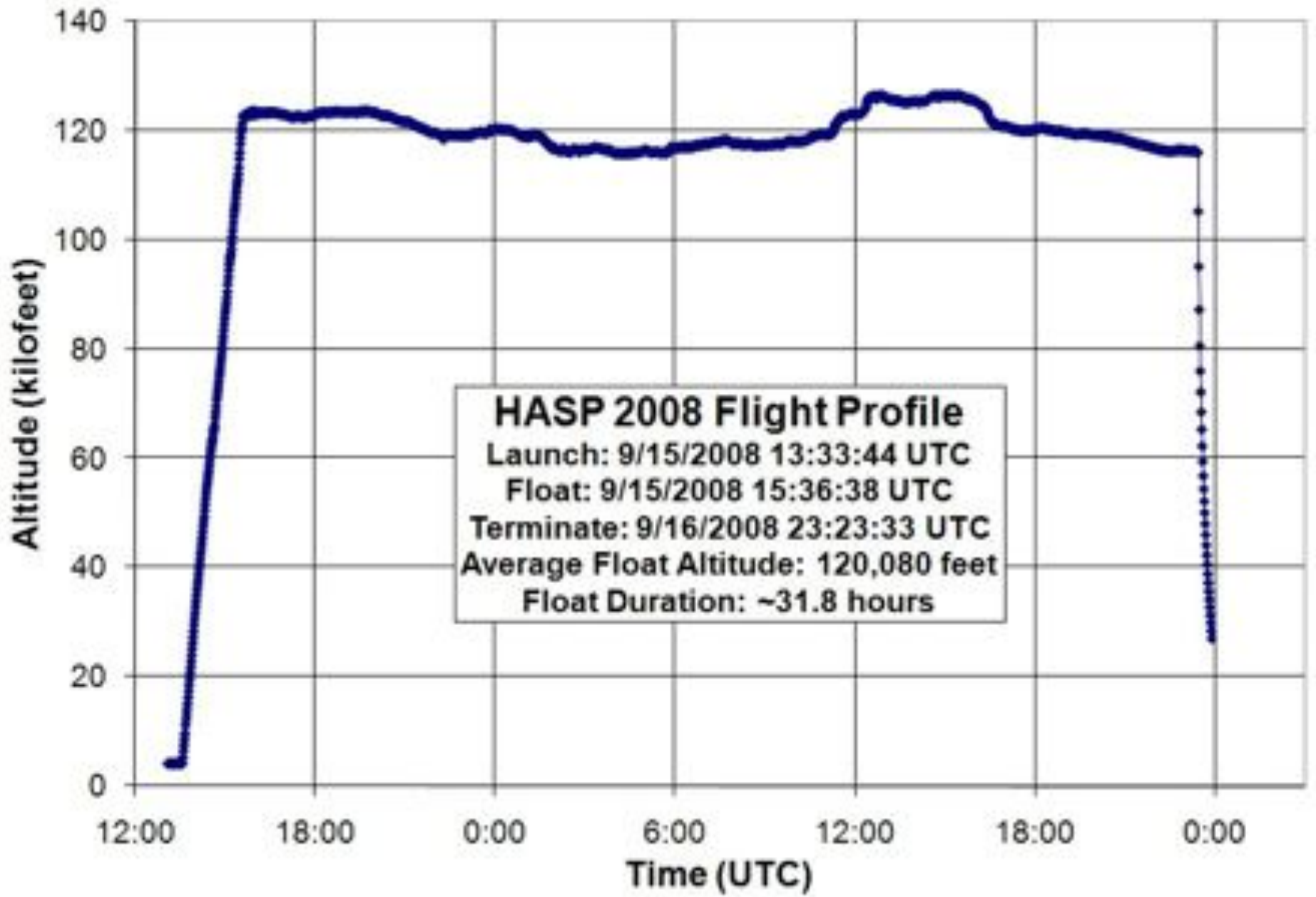
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# SKC Wide Field Camera HASP Schedule

July 2010	Fabrication and testing of primary and backup flight cameras
2-6 August 2010	Integration at NASA CSBF
August 2010	Flight operations training with the backup SKC WFC
May 2011	HASP flight #5 from CSBF Ft. Palestine, Texas
TBA	Data analysis, final report

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# HASP Flights 1-4

HASP 1 (11-12 September 2006)

Max altitude = 123,563 ft

Launch to termination = 17.5 hrs

HASP 2 (11-12 September 2007)

Max altitude = 123,940 ft

Launch to termination = 18.7 hrs

HASP 3 (11-12 September 2008)

Max altitude = 126,843 ft

Launch to termination = 33.9 hrs

HASP 4 (11-12 September 2009)

Max altitude = 124,064 ft

Launch to termination = 14.0 hrs



2009 HASP flight track



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# SKC Wide Field Camera Team

## Faculty

Tim Olson, Division of Sciences Chairman

Tom Trickel, Department of Information Technology and Computer Engineering

## Students

Joni Buckman, 2<sup>nd</sup> yr B.S. in Computer Engineering

Conan Christy, 2<sup>nd</sup> yr B.S. in Computer Engineering

Kody Ensley, 3<sup>rd</sup> yr B.S. in Computer Engineering

Matt Friedlander, 3<sup>rd</sup> yr B.S. in Computer Engineering

James Greene, 4<sup>th</sup> yr B.S. In Information Technology

Brad Lehuta, 2<sup>nd</sup> yr B.S. in Computer Engineering

Robert Sanchez, 2<sup>nd</sup> yr B.S. in Computer Engineering

Sean Shriner, 4<sup>th</sup> yr B.S. in Computer Engineering

Joe Sorrell, 2<sup>nd</sup> yr A.S. In Engineering Graphics

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# Montana State University Explorer 1 Prime

