National Aeronautics and Space Administration

Rocket Report

2014

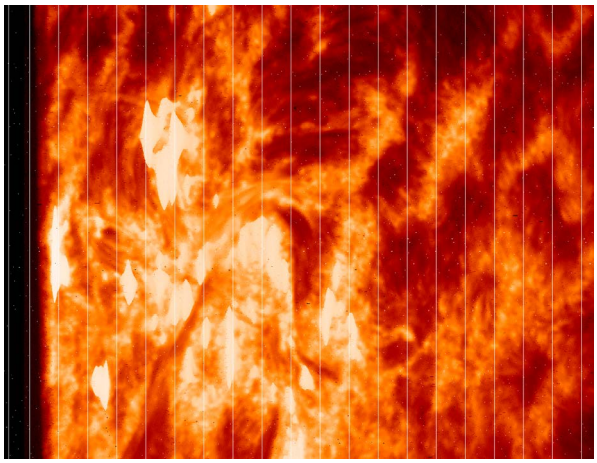
Sounding Rockets Program Office

What's inside...

Happy Holidays!

36.288 DS Vourlidas - VAULT 2.0 Launched September 30, 2014

The Very high Angular resolution ULtraviolet Telescope (VAULT) is a high resolution imaging spectroheliograph designed in the Naval Research Laboratory's (NRL) Space Science Division and sponsored by NASA. It images the solar atmosphere at the Lyman-alpha line (Lyα, 1216 Å) with ultra-high spatial resolution and spectral purity. In two successful flights (1999 and 2002), VAULT obtained the highest resolution images of the solar atmosphere ever from a space-based platform. The flights proved that sub-arcsecond (~0.45 arc-second) imaging is possible with a modest aperture telescope from a solar physics sounding rocket. The VAULT2.0 project, under NASA sponsorship, refurbished and upgraded the VAULT payload with new control and camera electronics and a new CCD detector. The instrument maintains the f/24.6, 30-cm diameter Cassegrain telescope followed by a zero-dispersion spectroheliograph, which provides a modest bandpass (150 Å at Lyα). A filter with 70 Å FWHM further restricts the instrument bandpass. VAULT2.0 can obtain images at twice the cadence of the VAULT payload with the same spatial resolution. VAULT2.0 was successfully launched on September 30, 2014 from the White Sands Missile Range. It obtained 33 images, 8 secs apart, of the Lyα atmosphere over active region 12172, as it was approaching the solar limb.



A snapshot of the Lyα atmosphere over active region 12172 as observed by VAULT2.0. In this 3-sec exposure, several areas are bright enough to cause saturation in the imaging detector. The field of view is 384 by 256 arcseconds or 0.4 x 0.3 of the solar radius.

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36.253 US Hassler - Rapid Acquisition Imaging Spectrograph Experiment (RAISE) launched November 6, 2014

RAISE is a UV/EUV Imaging Spectrograph that uses only two reflections to provide stigmatic imaging over multiple wavelengths and spatial fields simultaneously. RAISE uses a single off-axis parabola telescope to scan an image of the Sun across a narrow entrance slit which feeds a toroidal variable line space (TVLS) grating spectrograph, and produces stigmatic spectra on two intensified Active Pixel Sensor (APS) cameras. Spectral Images are then built up by rastering. RAISE has an extremely high speed scanning-slit imaging spectrograph designed to observe and analyze dynamics and heating of the solar chromosphere and corona on time scales as short as 100 ms, with TRACE-like spatial resolutions, and velocity sensitivity of 1-2 km/s.

RAISE is capable of capturing 5 images per second enabling studies of the highly active regions of the Sun where changes and eruptions occur very rapidly. This was the second flight of RAISE.

Image Credit: NASA/RAISE

RAISE payload at White Sands.

52.001 UE Conde - Cusp-Region Experiment (C-REX) launched on November 24, 2014

Image Credit: NASA/Brea Reeves

C-REX was successfully launched from Andoya Rocket Range, Norway on November 24, 2014.

The C-REX mission objectives were to visibly show motions of the neutral wind and electric field by releasing vapor trails of barium and strontium in the region of the thermsophere that is exposed to the Earth's geomagnetic cusp. These motions may in turn explain a permanent density increase in this part of the thermosphere. Measuring winds and ion flows at multiple locations inside the density region may enhance the understanding how it's created and sustained.

Deployable sub-payloads or ampules contained the vapor material and were ejected from the main payload. After ejection from the main payload, the sub-payloads were propelled by small rocket motors to cover a larger area of the sky. The vapors were dispersed at altidues ranging from 150 to 400 km.

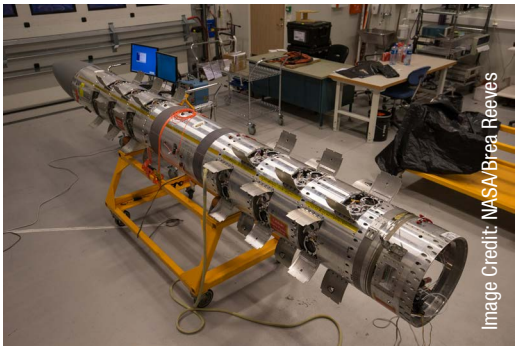

Image Credit: NASA/Brea Reeves

C–REX payload with doors open before launch.

For more information on C-REX see: http://zubenelgenubi.smugmug.com/SpacePhysics/Rocketry/CREX/CREX-Sounding-Rocket-Mission/

36.295 US Krucker - Focusing Optics X-ray Solar Imager (FOXSI) launched on December 11, 2014

Image Credit: NASA/RAISE

FOXSI team at White Sands.

The Focusing Optics X-ray Solar Imager (FOXSI) mission tested the fabrication and function of focusing optics for solar high energy X-ray observations in the 4 – 15 keV energy range. During the approximately five minute of observation time, FOXSI observed the non-flaring "quiet" Sun to search for non-thermal X-rays from these regions. The goals of the FOXSI mission are to demonstrate the use of direct focusing optics for solar high energy x-ray observations, serve as a pathfinder for future observatories investigating particle acceleration on the Sun and search for the signature of energetic electrons in the "quiet Sun". This was the second flight of FOXSI.

Integration and Testing

46.009 & 46.010 UE Collins – Mesosphere–Lower Thermosphere Turbulence Experiment (M–TEX)
41.111 & 41.112 UE Larsen – Mesospheric Inversion–layer Stratified Turbulence (MIST)
49.002 UE Swenson – Auroral Spatial Structures Probe (ASSP)

M-TEX and MIST will be launched from Poker Flat Research Range in early 2015. A total of four rockets will be flown to investigate and enhance our understanding of how meteorological processes control the impact of solar processes on the Earth's atmosphere, i.e. how does the atmosphere respond to auroral, radiation belt, and solar energetic particles, and what are the effects on nitric oxides (NOx) and ozone. The results from this investigation will add data to current computer models to allow better prediction and understanding of atmospheric circulation. Specifically scientists are trying to answer questions about a) how the transport of nitric oxides in the stratosphere and mesosphere depend on meteorological conditions and b) is turbulence the missing link in understanding the vertical transport between the thermosphere and mesosphere that controls how ozone-active chemicals travel downward into the ozone layer.

Turbulence has thus far been difficult to characterize in models due to the wide range of measurements in a wide variety of conditions. This investigation aims to characterize turbulence under meteorological conditions that create a layer of increasing temperatures in the mesosphere, called the mesospheric inversion layer (MIL), and to define a representative value for turbulence to be used in atmospheric models. The mesosphere starts at an altitude of about 50 km and ends at about 85 km. Under normal conditions the temperature in the mesosphere decrease with altitude, i.e. it gets colder higher up in the mesosphere. When a mesospheric inversion layer exists, temperatures instead increase with altitude in a layer that is approximately 10 km thick. The existence of the mesospheric inversion layer has been known since the 1970's but it is still unclear what atmospheric events or conditions create this layer.

The MIST chemical release payloads, launched in close sequence with the M-TEX rockets, gather data about turbulence in the mesospheric inversion layer by deploying trimethyl aluminum tracer (TMA) material. The TMA is released from the payloads during both the upleg and downleg portions of the flight and creates whitish clouds that are photographed from several groundstations. Analysis of the data will enable detection of turbulence in the region between 80 and 140 km.

The Auroral Spatial Structures Probe (ASSP), also will be launched from Poker Flat Alaska in early 2015. ASSP will be launched into diffuse aurora in geomagnetically active conditions following the recovery of an auroral sub-storm. The rocket will be launched along the magnetic field line and carry six sub-payloads to be ejected from the main payload at high velocity. The sub-payloads will be deployed both along the flight path and perpendicular to the flight path so that both spatial features and temporal-spatial ambiguities can be explored. The low-mass subpayloads that, for a fixed ejection impulse will achieve at least a 50 km separation by the end of the flight are key to the observational success. Each sub-payload will carry a crossed pair of double-probe sensors to measure in-situ electric fields, a three axis magnetometer and a GPS receiver. The data obtained at the different spatial locations and baselines (each pair of sub-payloads defining a baseline) will be used to develop models for the spatial and temporal distribution of E-fields and their correlations, enabling progress on the proposed science question.

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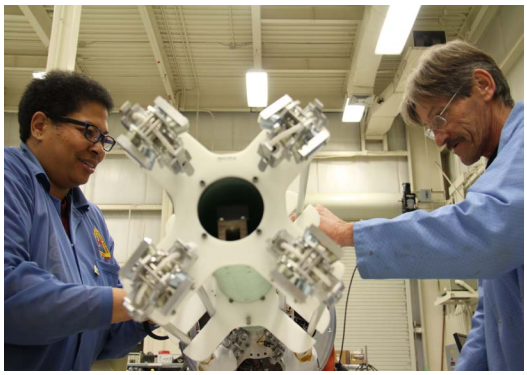
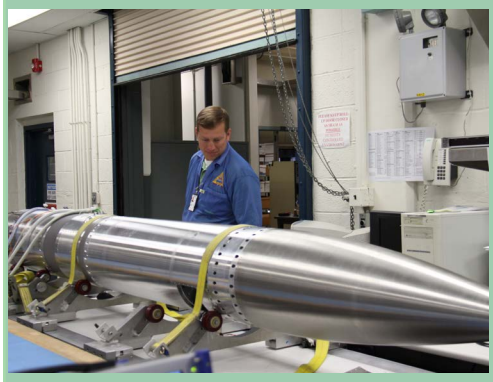
M–TEX science team.

M–TEX build up.

ASSP testing.



ASSP integration.



MIST payload.

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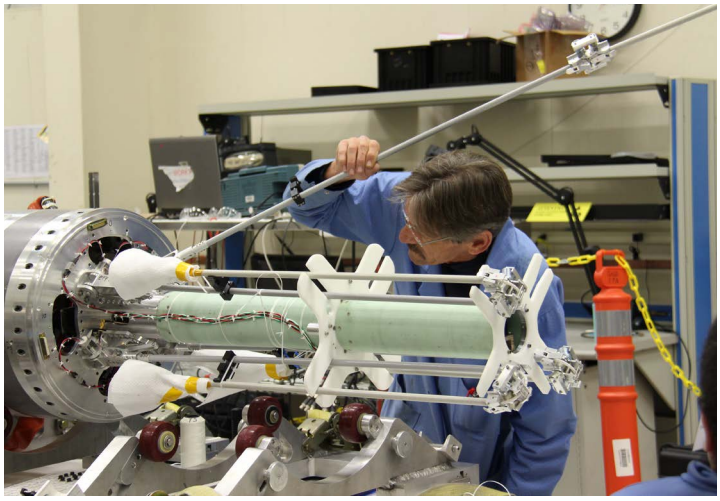
Picture Place

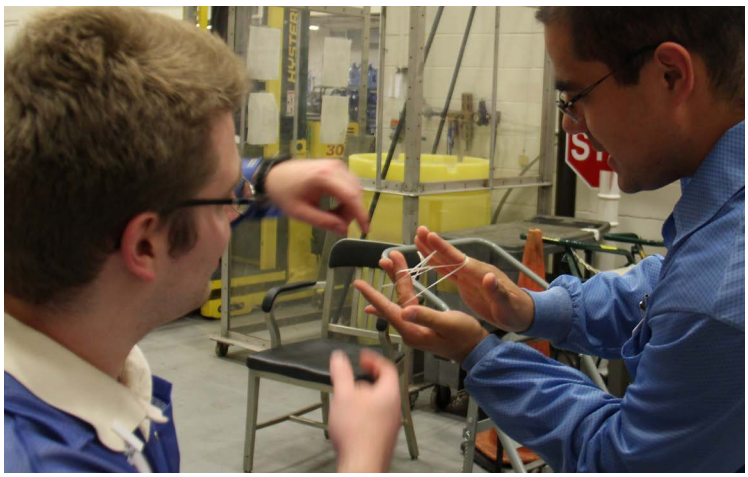
Motor man Bill Payne.

Chris working on M–TEX.



Clay inspecting booms on ASSP.

Bernita with the ASSP payload.



From rocket science to something more challenging...

Rocket Report

Want to contribute?

Working on something interesting, or have an idea for a story? Please let us know, we'd love to put it in print!

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Launch Schedule

WS - White Sands
WI -Wallops Island
NOR - Norway
FB - Fairbanks

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE	TIME
January							
46.009 UE	GEOSPACE SCIENCE	COLLINS	UNIVERSITY OF ALASKA	MTEX	FB	13-Jan	NIGHT
46.010 UE	GEOSPACE SCIENCE	COLLINS	UNIVERSITY OF ALASKA	MTEX	FB	13-Jan	NIGHT
49.002 UE	GEOSPACE SCIENCE	SWENSON	UTAH STATE UNIVERSITY	ASSP	FB	13-Jan	NIGHT
41.111 UE	GEOSPACE SCIENCE	LARSEN	CLEMSON UNIVERSITY	MIST	FB	13-Jan	NIGHT
41.112 UE	GEOSPACE SCIENCE	LARSEN	CLEMSON UNIVERSITY	MIST	FB	13-Jan	NIGHT
March							
12.079 GT	TEST & SUPPORT	HESH	NASA-WFF		WI	5-Mar	DAY
36.293 UG	UV/OPTICAL ASTROPHYSICS	CHAKRABARTI	U. OF MASS. -LOWELL	PICTURE	WS	16-Mar	DAY
46.008 UO	STUDENT OUTREACH	KOEHLER	UNIV. OF COLORADO	ROCKSAT-X IV	WI	27-Mar	DAY
April							
36.292 UH	HIGH ENERGY ASTROPHYSICS	MCENTAFFER	UNIVERSITY OF IOWA	OGRESS	WS	10-Apr	NIGHT
May							
36.300 UE	GEOSPACE SCIENCE	WOODS	UNIVERSITY OF COLORADO	EVE	WS	15-May	DAY
12.077 GT	TEST & SUPPORT	BRODELL	NASA-WFF		WI	12-May	DAY
June							
36.245 UH	HIGH ENERGY ASTROPHYSICS	FIGUEROA	MIT	MICRO-X	WS	15-Jun	NIGHT
36.282 US	SOLAR & HELIOSPHERIC	KANKELBORG	MONTANA STATE UNIV.	MOSES #2	WS	17-Jun	DAY
41.113 UO	STUDENT OUTREACH	KOEHLER	UNIV. OF COLORADO	ROCKSAT-C	WI	25-Jun	DAY
46.011 GP	SPECIAL PROJECTS	MILLINER	NASA-WFF	MUSIC	WI	25-Jun	DAY
July							
36.307 DS	SOLAR & HELIOSPHERIC	MOSES	NAVAL RESEARCH LAB	HERSCHEL	WS	22-Jul	DAY
August							
36.309 US	SOLAR & HELIOSPHERIC	HASSLER	SWRI	RAISE	WS	1-Aug	DAY
46.012 UO	STUDENT OUTREACH	KOEHLER	UNIV. OF COLORADO	ROCKSAT-X	WI	3-Aug	DAY
36.291 US	SOLAR & HELIOSPHERIC	WINEBARGER	U.OF ALABAMA/HUNTSVILLE	CLASP	WS	4-Aug	DAY
12.078 GT	TEST & SUPPORT	MILLINER	NASA-WFF		WS	5-Aug	DAY
36.262 UG	UV/OPTICAL ASTROPHYSICS	KAISER	JHU	ACCESS #1	WS	19-Aug	NIGHT
September							
36.297 UG	UV/OPTICAL ASTROPHYSICS	FRANCE	UNIVERSITY OF COLORADO	CHESS-2	WS	20-Sep	DAY
36.281 UE	GEOSPACE SCIENCE	BOCK	CAL TECH	CIBER-2	WS	25-Sep	NIGHT
November							
52.002 UE	GEOSPACE SCIENCE	LESSARD	UNIV. OF NEW HAMPSHIRE	RENU 2	NOR	10-Nov	NIGHT
December							
36.259 GH	HIGH ENERGY ASTROPHYSICS	GENDREAU	NASA-GSFC	XACT 1	WS	4-Dec	DAY
36.305 UH	HIGH ENERGY ASTROPHYSICS	GALEAZZI	UNIVERSITY OF MIAMI	DXL-2	WS	4-Dec	DAY

From the Archives

Pictures from the Greenland campaign in 1985. A total of seven rockets were launched and included:
1 – Nike–Tomahawk
2 – Terrier–Malemute
1 – Taurus–Tomahawk
2 – Black Brant X
1 – Taurus–Tomahawk