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# Rocket report

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Sounding Rockets Program Office

## In Brief...

Phil Eberspaker met with Missile Defence Agency (MDA) to discuss future partnerships to use Sounding Rockets as targets. Further meetings are on the horizon.

The campaign in Poker Flat has been completed. Ten vehicles were launched in January – February 2007.

The “Million Dollar Mirror” was at Wallops for vibration testing.

Missile Alternative Range Target Instrument (MARTI) was at Wallops for T&E. Mass properties measurements were completed successfully.

Work is underway to move a launcher to Norway. The launcher is currently being assembled on Wallops Island.

## “Million Dollar Mirror” tested at Wallops

Mr. Wallace and Dr. Rabin, both from Goddard Greenbelt campus brought the Solar High Angular Resolution Photometric Imager (SHARPI) mirror to Wallops for vibration testing. All tests were successfully completed by February 10 and the mirror travelled back to Greenbelt for optics testing. More on page 2.



Photo by Berit Bland

## Poker Flat 2007 campaign is a success!



Photo by Scott Hesh

After an initial quiet period with little science activity and poor weather conditions, things got busy at Poker Flat Research Range. A total of ten Sounding Rockets were launched during the January – February launch window. Mission profiles with launch sequences minutes apart and tailored trajectories added complexity to the campaign.

# Rocket Report

## Mirror, Mirror...

in the rocket, is there a planet in your view?

Excitement is building for this one of a kind mission, and it's not just one of a kind for Sounding Rockets, but for space science in general. The Planet Imaging Concept Testbed Using a Rocket Experiment (PICTURE) team, lead by Dr. Chakrabarti from Boston University will attempt to acquire a direct image of an exoplanet. To date, the existence of exoplanets has been deduced by the wobble they induce in the stars they orbit, but no direct imagery of the planets have been possible. PICTURE will change that using the one of the most precise ultra-light-weight mirrors made.

The mirror, originally built for the Solar High Angular Resolution Photometric Imager (SHARPI) mission, is an ultra-light-weight, precision-polished 0.5 meter aperture telescope mirror. In an article about the mirror Dr. Rabin et al. write "At an areal density of  $20 \text{ kg/m}^2$ , the mirror is nine times lighter per unit area and has better surface accuracy (that is, it has similar surface errors but with a correct conic constant) than the primary mirror on Hubble Space Telescope." Go to: <http://newsroom.spie.org/x3847.xml> to read the article.

Epsilon Eridani b is the planet the PICTURE mission will image. It orbits the star Epsilon Eridani in the constellation Eridanus, the River.

The star is slightly smaller than the Sun, about 0.8 Solar masses, but bright enough to be seen with the naked eye. The planet's mass,  $1.55 \pm 0.24$  of Jupiter's, was determined by observing the star's wobble using the Hubble Space Telescope.

If you're interested in finding Epsilon Eridani, the star chart at: <http://www.hawastsoc.org/deepsky/eri/eri.html>, shows the constellation Eridanus and labels the star Epsilon Eridani. A good starting point is finding the star Rigel in the constellation Orion.

## MARTI

Missile Alternative Range Target Instrument (MARTI) was in T&E for mass properties measurements. The MARTI missions are diagnostic targets for the Airborne Laser program (ABL), and were originally scheduled for 2007 flights now delayed to 2009.



Photo by Josh Yacobucci

MARTI payload on mass properties table.

## POKER 2007

When it rains, it pours! And it certainly poured rockets at Poker in 2007. Ten launches in two months!



Photo by Berit Bland

Dr. Rabin cleaning the mirror after vibration.

The Poker Flat 2007 campaign included four science investigations, ROPA, HEX, CHARM and JOULE and a total of ten rockets. Tailored trajectories and rapid sequence launches (four rockets in 15-minutes) made this campaign very challenging. Here are a few beautiful rocket and aurora pictures. See the SRPO website for more information.



Photo by Todd Valentic

ROPA launch



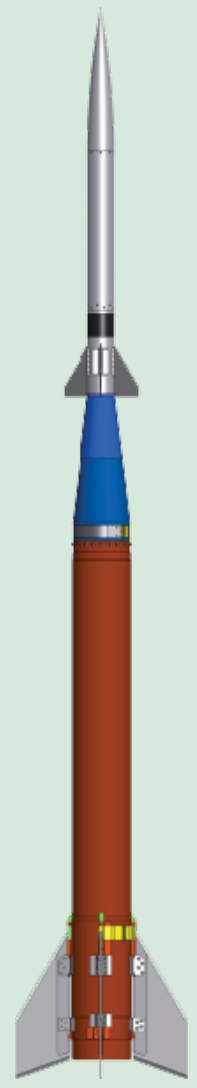
HEX-1 launch



Rockets on the pad

## In the Works...

Coming soon! The "Mesquito", a Mesospheric Sounder, capable of carrying a 50-lb Dart to approximately 95-km, is under development. The booster is a de-militarized version of the Multiple Rocket Launch System (MRLS) M-26 motor, and the Dart is designed and built in-house at Wallops. First test-round is anticipated to occur Spring or early Summer '07.



Rendering courtesy NSROC Mechanical Section

## NSROC Reports

The Mission Initiation Conference (MIC) for Sub-TEC Terrier Orion 41.075 NP was held on February 23, 2007. A variety of interesting instrument candidates were discussed.

Embry-Riddle University launched a student built two-stage rocket from Wallops Island.

A new rocket display of a Nike-Orion and a Terrier-Black Brant have been installed at the main gate of Wallops Flight Facility. They look great!

The 40,000 lb capacity Athena launcher is assembled and is being tested on Wallops Island, prior to shipment to Norway. The launcher will be used for the Kletzing mission in December '07.

Tooling requirements for the Mesquito vehicle are under evaluation in the Machine Shop.

Terrier motors are being evaluated for use as single stage vehicles to fulfill customer requirements for a very high dynamic pressure environment.

The Aegis Readiness Assessment Vehicles (ARAV) are undergoing sensor installation at Wallops.

## SRPO Reports

Kudos to all involved in the highly successful Poker Flat 07 field campaign. These outstanding results can only be achieved with a truly dedicated and highly competent team!

Meetings with the Missile Defense Agency (MDA) are continuing. A path forward is being formulated.

Procurements have been initiated for Geospace Science and High Energy Astrophysics grants.

Meetings with the Air Force Research Lab Scramjet project team continue. This may lead to future flight opportunities.

New Aeronautics research proposals using Terrier-Orioles are contemplated by a NASA Ames & Langley team. Synergies may exist with the AFRL hypersonics program

Good data was received from the Horizon Crossing Indicators (HCI) flown on three Craven payloads during the Poker Flat '07 campaign. The HCI data combined with magnetometer data provides an attitude solution with 2-3 degree accuracy.

Work is underway to prepare the Beam Former, developed by Jem Engineering under the SBIR program, for Environmental Testing. The Beam Former and a new 8-segment Phased Array antenna, designed by Dan Mullinix/AETD, will be flown on the Sub-Tec payload in the Fall of '07.

Solid-state, Fiber Optic Gyro's (FOG) are providing a highly-accurate attitude solution for Sounding Rockets. 19 of these gyros have been flown to date.

# Rocket Report

① Athena Launcher under assembly on Wallops Island. Insert: Don Langley/569

② Lee Miles machining Orion tailcans.

③ John Ozanne with fiber optic gyro.

④ PennState Student Interns; Frederick Upchurch, Kenny Kwok and Nathan Empson displaying their NEW & IMPROVED paper rocket launcher. Paper rockets are part of the Wallops Inspire Day activities.

⑤ Beam Former and Phased Array antenna being prepared for environmental testing by Roger Chandler & Bill Doughty/NSROC and Bruce Smith/569.



## Upcoming Launches – FY '07

### May

12.059 GT COSTELLO/NASA–NSROC WS

### June

36.220 UG McCANDLISS/JHU WS

### July

36.225 UG CHAKRABARTI WS

### August

41.069 UE ROBERTSON/UNIV. OF COLORADO NOR

41.070 UE ROBERTSON/UNIV. OF COLORADO NOR

41.055 NP PLAYER/LARC WI

### September

36.218 UE EARLE/UNIVERSITY OF TEXAS–DALLAS WI

36.221 DS MOSES/NRL WS

### TBD

36.223 UH MCCAMMON/UNIV. OF WISCONSIN WS

## Your Space...

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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## Future...

We are hoping to include Feature Articles provided by the Science Community in future issues of the Rocket Report.

Next Quarterly Newsletter will be issued in early July.

## Upcoming Events

### June

SRPO speaks at ESA Sounding Rocket and Balloon Symposium.

Earth Science Technology Office Symposium – SRPO presentation