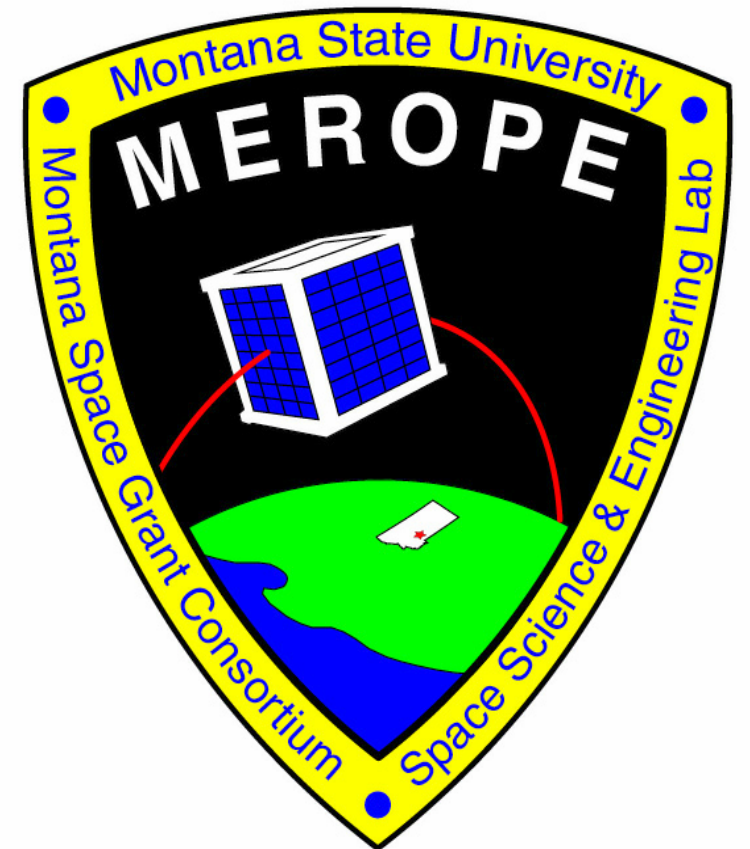


The planned title for this talk was:

**Early Orbit Operations
Performance of the
Montana Earth
Orbiting Pico Explorer
(MEROPE)**



Prof. David M. Klumpar

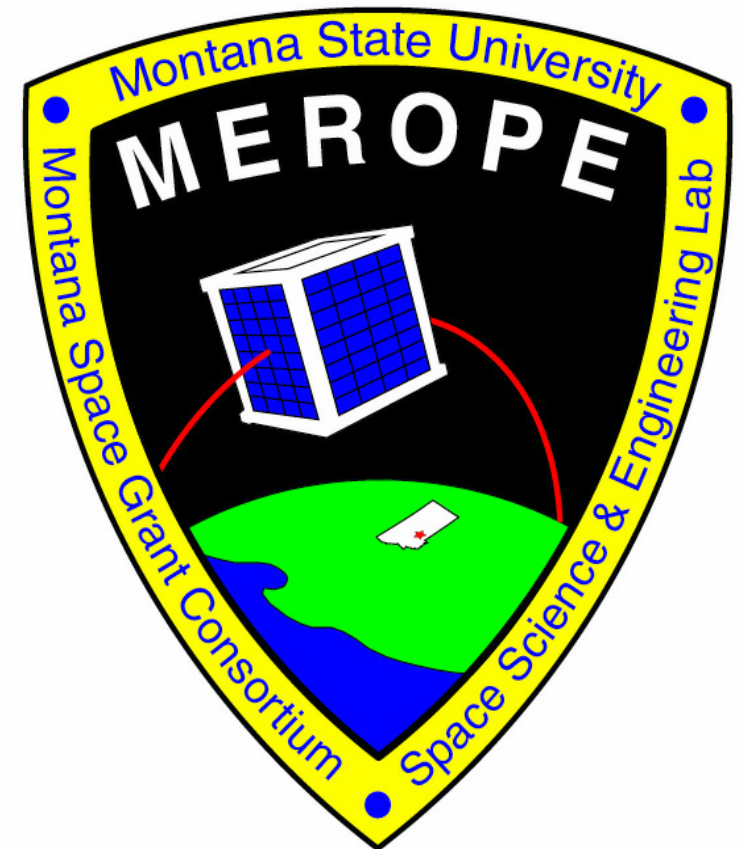
Department of Physics

Space Science and Engineering Laboratory

Montana State University

August 13, 2006, Logan Utah

Early Orbit Operations Performance of the Montana Earth Orbiting Pico Explorer (MEROPE)

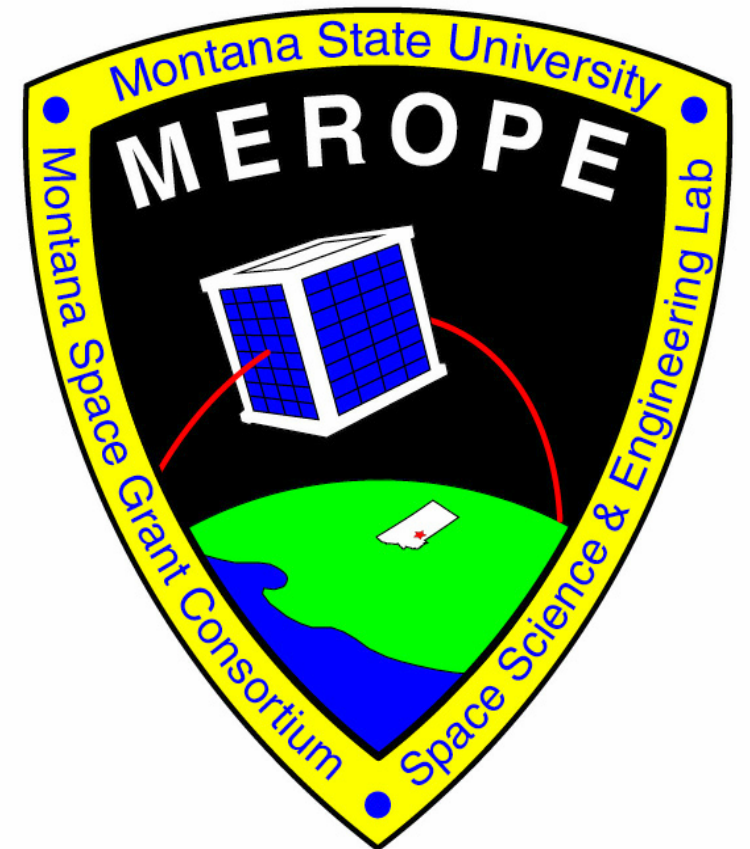


Dnepr fails during launch with multiple payloads

Published: 2006 July 26

In its second mission of 2006, a converted Russian ICBM failed early in flight, crashing downrange from Baikonur.

Early Orbit Operations Performance of the Montana Earth Orbiting Pico Explorer (MEROPE)



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MICROSAT BLITZ

Russian Rocket Crash Destroys Montana EaRth Orbiting Pico-Explorer Satellite

by Staff Writers

Bozeman MT (SPX) Jul 31, 2006

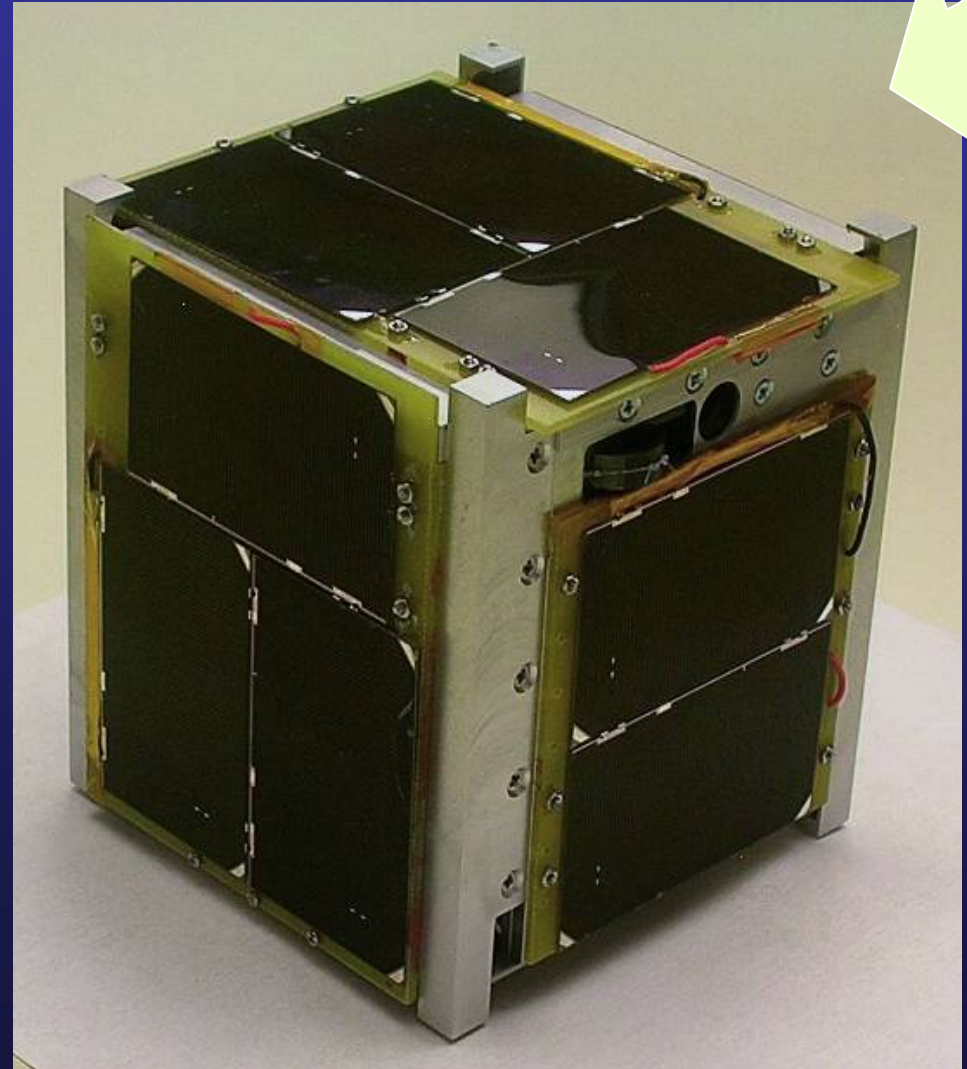
The first satellite built in Montana was destroyed July 26 when the Soviet-era intercontinental ballistic missile it was riding on crashed shortly after liftoff in Kazakhstan.

At 100 feet tall and 15 feet across, the Dnepr missile was to carry 18 satellites into orbit. Nearly 200 students, faculty and members of the public gathered at the Engineering and Physical Sciences building on the campus of Montana State University to cheer the launch from Baikonur Cosmodrome as it was relayed by live video.



MEROPE at Delivery -- May 2006

- **Launch July 26, 2006**
1943 GMT, Baikonur
Cosmodrome
- **Launch duration**
Powered 73 seconds
Unpowered ~ 60 seconds
- **Final Altitude:**
- 30 meters AGL
- **Distance traveled:**
~150 km



Launch Night -- July 27, 2006 01:43 am Baikonur Cosmodrome



Launch Night -- July 27, 2006 01:43 am
Baikonur Cosmodrome

SOUND CLIPS
Recorded sound bites at the
observing site at Baikonur during
the failed launch

DNEPR LUNCH Failure Investigation

http://www.russianspaceweb.com/dnepr_007_belka.html

The investigation

“From the beginning, investigators focused on the gimbaling mechanism No. 4, which apparently stalled in flight. In addition, preliminary data showed that one of four engines on the first stage, (Engine G) did not shut down properly.

An official statement from Roskosmos on July 29 said that anomalous deviations in the thrust vector started at the end of the first stage burn, causing the vehicle deviate from the nominal trajectory and when it exceeded allowable limits, the rocket's engines were shut down.



On the night of July 28, 2006, the "Kazakhstan" TV channel showed a crater, estimated to be 50 meters in diameter. (Later reports said the crater was 30 meters wide and three meters deep.) Apparently due to explosion and fire, which followed the impact, only few remnants of the vehicle were visible at the site, among them a two-meter pipeline.

According to a representative of Kosmotras, the launch vehicle hit the ground intact, without separation of the rocket's stages or payload section and all toxic propellant burned during the following fire. The elements of the vehicle were believed to be buried at the bottom of the impact crater.



http://www.russianspaceweb.com/dnepr_007_belka.html

Launch News

http://www.russianspaceweb.com/dnepr_007_belka.html

The alternative version

In the meantime, on August 3, 2006, the Khabar news agency reported that Kazakh Ministry of Emergencies suggested that the Dnepr disintegrated into at least two large fragments while still at high altitude. This version of events was based on the account of a local hunting inspector, who reported two explosions in two different places on the ground on the night of the launch.

On August 7, the Interfax news agency quoted a member of the Kazakh investigation commission as saying that his nation's emergency ministry officials found a fragment of the payload fairing from the Dnepr rocket, some 25 kilometers south of Baikonur.

Dnepr History

Victims of circumstances
Six commercial successes; one failure: OURS

A complete list of Dnepr's missions:

| Date | Status | Payload owner |
|---------------------|---------|-----------------------------------|
| 1999 April 21 | Success | Carried UoSat-12 |
| 2000 Sept. 26 | Success | |
| 2002 Dec. 20 | Success | - |
| 2004 June 29 | Success | - |
| 2005 Aug. 24 | Success | - |
| 2006 July 17 | Success | - |
| <u>2006 July 26</u> | Failure | <u>BelKA</u> as a primary payload |

Despite nearly 50 years of launch to orbit activity, launch remains a risky business and failures remain a reality. As satellite developers we must accept this, and move forward.

