



January 2007

Vol. 27, Issue 4



From the Chair

Hi Everyone! Welcome to the new issue of NOVA. This month, I want to talk about one of our new Low-Budget, High-Profile Projects. At our National Conference in November, the idea of creating national projects that everyone could participate in regardless of their chapter's financial situation was suggested more than once. Our first project of this type, the SEDS National Research Paper Project, came out earlier this winter. It allowed those interested in the benefits of commercial development in space to share their ideas and discuss the possibilities of expanding space on this front. The completed paper is due out early this summer. Our next project, entitled *They Were There* is also of the paper format. The overall goal is to have students interview professionals in the space industry and compile the findings into a database that would serve as a sort of advice column accessible only to SEDS members. Time and time again, we are reminded that many professionals in the space industry are retiring very soon. We at SEDS believe it is important to learn from this generation of space explorers and keep their lessons with us as we begin our own careers. Students will be able to conduct the interviews by any means they wish: phone, email or in person. The professionals can be anyone in the space industry: engineers, scientists, political figures, organization leaders, entrepreneurs etc. It will be up to the individual student to choose someone they are interested in. The National Executive Board will provide guidance but each student will be able to personalize their interview to fit their interests and the specialties of the professional. When the project is completed it will be a valuable resource unique to the SEDS community and will give members incentive to stay active. It is also an incredible networking opportunity for members seeking jobs and internships. The official project is being revised and we are all very excited to launch it. Hopefully, it will become an ongoing activity that continues from year to year.

IN THIS ISSUE:

- | | |
|-------------------|--------------------------------|
| 1. From the Chair | 6. Letter to the Editor |
| 2. Space News | 7. Calendar of Upcoming Events |

Falcon flies to space but misses orbit

BY STEPHEN CLARK

SPACEFLIGHT NOW

Posted: March 20, 2007

The Falcon 1 rocket, a gleaming symbol of hopes to revolutionize space exploration through private industry, took its second shot at orbit Tuesday night but fell back to Earth after experiencing a problem mid-way through the ascent.

A year after its maiden flight met a disastrous end, the SpaceX booster lifted off at 9:10 p.m. EDT (0110 GMT Wednesday) from a remote launch pad on Omelek Island, part of a U.S. Army base at Kwajalein Atoll in the Marshall Islands.

Controllers lost contact with the Falcon during the burn of the second stage that would have placed the rocket into orbit around Earth.

"We did encounter, late in the second stage burn, a roll-control anomaly," Elon Musk, founder and chief executive officer of Space Exploration Technologies Corp., said in a post-launch call with reporters.

Live video from cameras mounted aboard the rocket's second stage showed increasing oscillations about five minutes after liftoff, just before the public webcast was cut off. The rolling prevented the necessary speed to achieve a safe orbit, instead sending the stage on a suborbital trajectory back into the atmosphere.

Musk speculated leading candidates for the roll control problem included a helium leak or a failure of a roll control thruster. Both would be relatively easy to fix, he said.

"Of all the possible causes, there's very few that would really take much effort to address," Musk said.

Burning highly refined kerosene and liquid oxygen, the first stage's Merlin engine produced nearly 80,000 pounds of thrust as it gracefully guided the rocket through clouds on an eastward trajectory from its launch site in the central Pacific Ocean.

The Merlin drained its supply of propellant within three minutes, and the Falcon 1 shed its first stage a few seconds later. The upper stage then fired its Kestrel engine for a planned six-and-a-half minute burn to place the rocket into low Earth orbit.

But engineers stopped receiving live radio signals from the second stage several minutes prior to its scheduled arrival in orbit.



Continued on Next Page

Continued from Previous Page

Musk said the stage reached an altitude of about 200 miles when the roll oscillation caused the Kestrel engine to shut down.

"The high likelihood is that it re-entered after less than a full orbit," Musk said.

The rolling motion could have caused the second stage's propellant to slosh outward like a centrifuge, which would lead to the engine switching off, Musk said.

The Falcon 1 was targeting an orbit stretching from 205 miles to 425 miles in altitude with an inclination of about 9 degrees. Engineers had programmed the second stage to conduct a second burn about 45 minutes into the flight to demonstrate the engine's capability to reignite.

Despite the control problem that doomed the mission's goal of reaching orbit, Musk said he was pleased with the progress made by the company since the Falcon's maiden test flight ended in failure last year.

"I think I'll characterize this as a very good day for SpaceX," Musk said. "We successfully reached space and really retired almost all the risk associated with the rocket. So I feel very good about where things are."

Much of the risk with rocket launches come from engine operations and stage separation systems, and Musk said those performed well in Tuesday's flight.

"I would say we've retired probably in excess of 90 percent of risk associated with the rocket," Musk said.



"It definitely could have gone a little better today, but if we've retired almost all the risk associated with the rocket, I think it is hard to characterize that (as) anything but a success, at least in my book, because this is a test launch of the rocket and not a satellite launch," he said.

Bankrolled by the fortune of Musk, a technology mogul and co-founder of the online payment system PayPal, SpaceX designed

and built the Falcon 1 rocket to significantly lower the cost of space launches and revolutionize the space industry.

The 70-foot-tall booster came within moments of blastoff during Tuesday's first attempted countdown, but computers ordered a dramatic last-second abort when the rocket's first stage Merlin engine showed signs of trouble after ignition.

Countdown software detected the engine's chamber pressure was slightly below normal, but that was likely due to chilled rocket-grade kerosene fuel being fed into the engine, according to Gwynne Shotwell, SpaceX vice president of business development.

Continued on Next Page

Continued from Previous Page

The launch team opted to load warmer fuel into the first stage fuel tanks and try again, and the countdown proceeded smoothly until clocks reached zero.

"This was a pretty nerve-racking day, to say the least," Musk said. "The rocket business is definitely not a low-stress business, that's for sure."



SpaceX officials said they remain confident in their plans to launch paying customers' payloads as soon as this year.

"We've been in touch with our customers," Musk said. "They are very excited by the results of this test, and so we feel really good."

The next launch of the Falcon 1 was scheduled for August carrying to orbit the TacSat 1 tactical research satellite for the Naval Research Laboratory. A subsequent mission to launch a

Malaysian Earth-observation spacecraft was planned for late this year.

But before those launches are given the all-clear, SpaceX will first have to study what caused the problem encountered during Tuesday's mission and fix it.

Two small NASA experiments were bolted atop the upper stage during Tuesday's launch. The Autonomous Flight Safety System was an instrument designed to detect problems during rocket launches and automatically activate a flight termination system, which would bring down the rocket before it endangers the public.

An inexpensive transmitter linked with NASA's network of tracking and data relay satellites was also aboard the rocket to beam live telemetry back to the rocket's control room.

Engineers had also planned to demonstrate the Falcon 1's satellite separation system by jettisoning a small 4.5-pound aluminum ring after arriving in orbit.

SpaceX's second launch came a year after the Falcon 1 rocket suffered a major failure during its maiden flight. Investigators traced the cause of that accident to a corroded aluminum nut in the first stage propulsion system, which triggered a fuel leak that led to a premature shutdown of the Merlin engine about 30 seconds after liftoff.

SpaceX engineers overhauled countdown procedures and added upgrades to the first stage Merlin engine to increase reliability, according to the company's Web site.

Tuesday's demonstration flight was sponsored by the Pentagon's Defense Advanced Research Projects Agency under its program to develop responsive space technologies such as low-cost small satellite launch vehicles.

Continued on Next Page

Continued from Previous Page

The booster's first stage was fitted with a parachute recovery system, allowing it to slowly drop into the Pacific Ocean a few hundred miles downrange from the Omelek launch pad. SpaceX positioned a ship to retrieve the spent rocket stage in hopes of refurbishing it for reuse on a future mission.

Musk said there should be no problems recovering the spent stage because it performed well and was dropped in the designated area.

"We'll be doing a thorough examination of that piece of hardware," Shotwell said. "It's not as easy to determine how well you did unless you can actually (recover) the hardware."

Eleven more missions are currently manifested for SpaceX's Falcon rocket family, and the contracts are valued at nearly \$400 million, Shotwell said.

In addition to the Falcon 1 booster, SpaceX is developing a much larger rocket to carry heavier satellites into orbit. Company officials expect the Falcon 9 rocket to debut as early next year.

The Falcon 1 can haul satellites up to about 1,270 pounds into low Earth orbit, while the Falcon 9 should be capable of delivering about 22,770 pounds to low Earth orbit and up to 10,000 pounds to geostationary transfer orbit, a popular destination for communications satellites, according to the SpaceX Web site.

Also on the drawing boards is the Falcon 9 Heavy, which is expected to launch more than 60,000 pounds to low Earth orbit. That version could fly by 2010.

SpaceX sells the Falcon 1 for as little as \$6.7 million, while the Falcon 9 price ranges from about \$27 million to \$78 million, according to company officials.

SpaceX is also planning to begin launching missions from Cape Canaveral, Fla., and Vandenberg Air Force Base, Calif., by 2009.

Three Falcon 9 launches are already on the books as test flights for NASA's Commercial Orbital Transportation Services program. The program aims to partner with the private sector to create spacecraft to supply the international space station after the agency's space shuttle fleet is retired in 2010.

SpaceX was awarded a contract worth \$278 million from the program in August, and the company plans to use its Dragon space capsule for the three demonstration missions.

Oklahoma-based Rocketplane Kistler also won a \$207 million contract from NASA and is developing a reusable launcher and orbital spacecraft for another series of test flights by 2010.

The remainder of SpaceX's launch backlog includes six commercial payloads and two launches for the U.S. military.



Letter to the Editor

The name of our organization is SEDS, which for those that joined in the need of resume padding, and then figured out our worthwhile cause, or simply forgot, stands for Students for the Exploration and Development of Space. As a name, it is pretty good; we are students, and we want progress in the exploration and development aspects of the great 'out there'. However, the name also contains a problem: the fact that it we are students. For example, I am writing this editorial because the regular editor for the Nova is so overloaded with schoolwork that he cannot contribute an editorial for this issue.

I chose to help him because I know what it's like to be overloaded. Due to several factors beyond my control, I am currently enrolled in the minimum amount of credits required to maintain my scholarship, so I happen to have the time required to pay all the attention that is due to outside interests, such as our organization. If we are to achieve the goals of making space exploration and development not only commercially feasible, but economically and ecologically feasible as well, we cannot do it alone. We need help. Not that we are incapable of furthering the cause alone, but if we want realistic results from our efforts in a timely manner, we will need to call in outside help.

For example, if we as an organization decide that the best way to get to space would be through the Space Elevator system. OK... what does doing that accomplish if no one outside our organization cares about it? Once we reach a consensus about what we are using to further the 'E' and 'D' of 'S', we would need to get the resources to accomplish the goal of implementing the system. Even if we don't have any students working in the academic areas that would create the materials needed to implement the Space Elevator, we could at the very least try lobbying our state or federal government representatives for support and funding for research projects that would help create the elevator guide wire. Or if we do not feel capable of getting into politics to the extent necessary, we could always try capitalism: contact private companies in our areas, and see if they have any interest in our cause, and if so, how they could help through resources such as funding and manpower. To get them on board, we have to think about how these corporate entities can benefit economically from the commercialization of space. Please note, when I refer to the 'commercialization of space', I do not mean making money out of every cubic millimeter of space, but to make space viable for *all* aspects of life, from commerce, to industry, to leisure.

Even if the Space Elevator ends up being a pipe dream, and we want to help another fledgling technology become a viable way to reach space, the concepts described here still apply.

Remember, *we* are students. They are businesspeople, scientists, industrialists, and politicians. We all have our schedules nearly full. However, if we all get together and put in whatever time we can afford, viable space exploration and development is actually an attainable goal within our lifetimes.

Conference Opportunities

1. 45TH AAS GODDARD MEMORIAL SYMPOSIUM

Date: March 20-21, 2007

Location: Adelphi, Maryland

(University of Maryland University College)

Website: <http://www.astronautical.org/>

For Info: 703-866-0020

2. YURI'S NIGHT WORLD SPACE PARTY

Date: April 12, 2007

Location: Your Hometown!

Register your party today!

Website: <http://www.yurisnight.net>

For info, contact Loretta Hidalgo at

loretta@yurisnight.net

Discounts: no charge for attendance

3. NSS INTERNATIONAL SPACE DEVELOPMENT CONFERENCE

Date: May 24-28, 2007

Location: Dallas, Texas

Website: <http://isdc.nss.org/2006/>

For Info: (202) 429-1600

4. SPACE FRONTIER FOUNDATION'S NEWSpace CONFERENCE

(Former *Return to the Moon Conference*)

Date: July 18-21, 2007

Location: Washington DC

Website: <http://www.space-frontier.org/>

Projects/

Moon

For Info: krukin@spacefrontierfoundation.org

5. MARS SOCIETY CONFERENCE

Date: August 30-September 2, 2007

Location: Los Angeles, CA (University of California)

Website: <http://www.marssociety.org/convention/2006/>

For Info: MarsSocInfo@aol.com

6. X-PRIZE CUP

Date: mid-October, 2007

Location: Las Cruces, New Mexico

Website: <http://www.xpcup.com/index.cfm>

For Info: (323) 957-0729

Discounts: Volunteer Opportunities Available

Volunteers get free admission

7. PRO SPACE'S MARCH STORM

Date: March 3-7, 2007

Location: Washington DC

Website: <http://www.prospace.org/>

For Info: fjohnson@arachnerd.com

8. IEEE AEROSPACE CONFERENCE

Date: March 3-10, 2007

Location: Big Sky, MT

Website: <http://www.aeroconf.org/>

For Info: david.f.woerner@jpl.nasa.gov

E-MAIL RYAN MCLINKO AT MCLINKOR@MIT.EDU IF YOU HAVE ANY QUESTIONS.

Please send comments on the newsletter to publications@seds.org.

Students For the Exploration and Development of Space

