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Shuttle Camera Brings Firm Into Focus

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Two minutes and 47 seconds into the July 4 launch of the space shuttle Discovery, NASA engineers at Cape Kennedy realized four pieces of external foam on the fuel tank had fallen away and may have punctured the ship's heat shield tiles.

But they were able to determine the tiles were intact – and the mission was still on track – thanks in part to film footage from three small cameras assembled by Pasadena-based Ecliptic Enterprises Corp. The cameras were mounted on each of the shuttle's solid rocket boosters and on the external fuel tank.

This five-year-old company, founded by space industry veterans, has made a name for itself as one of the premier providers of inexpensive imaging systems for rockets and spacecraft.

Ecliptic Enterprises' cameras have been used on several shuttle missions, on numerous privately funded rockets and on rockets used for military spy missions. These small "RocketCams" have sent back to Earth footage of the powerful and explosive forces at work during launches, detailed telemetry and sensor analyses, as well as spectacular views of earth in the "rear view mirror."

Now, in its boldest gamble yet, Ecliptic Enterprises has been selected to provide cameras for an upcoming National Aeronautics and Space Administration mission to crash-land a rocket into the moon to search the resulting debris for evidence of water. The cameras will be mounted on an accompanying spacecraft that itself will crash into the moon a few minutes later.

NASA officially classifies the mission, now scheduled for late 2008, as "high risk." But if it succeeds, the images sent back could provide the proof scientists are looking for that the moon contains significant amounts of water locked up in its polar regions. It also would cement Ecliptic Enterprises' reputation as a company using largely off-the-shelf equipment as a way to slash the costs of onboard rocket and spacecraft imaging systems.

"Ecliptic's contracts are on a fixed-price basis: you look the product up in a catalog, order it and off you go. It's how the commercial world works, but not how the space business has worked so far," said Jeff Krukin, executive director of the Space Frontier Foundation, a non-profit advocating for commercial activity in space. "If they are successful, they could change the way the private space sector does business, making it cheaper for everyone."

Deep space dreams

That indeed is the long-term goal of Ecliptic Enterprises' founders, all of whom came out of either NASA or the private aerospace sector.

“We want to do things commercially in the space arena beyond geosynchronous orbit where most commercial space business takes place today,” said Rex Ridenoure, Ecliptic Enterprises chief executive. The majority of the satellites currently are orbiting at an altitude of roughly 22,000 miles and travel in synch with the Earth’s rotation, so that their position remains stationary relative to a fixed point on the ground.

“We are now at the point where we can prove that it can be done.”

Indeed, the company, which has revenues of under \$5 million, managed to turn a slight profit for the first time last year, Ridenoure said.

But to get to this crucial point has not been easy. Ridenoure and his fellow space entrepreneurs have had to endure one business failure, find a product that they could make money with while pursuing their long-term goals and then gain acceptance in an industry dominated by multi-billion-dollar aerospace giants.

The business failure was a company with the now-ironic name of Blast Off Corp., founded as part of the Idealab technology business incubator in the late 1990s. Its goal was to put together the first commercial lunar mission early this decade.

But the company ran out of money when Idealab’s flagship company, E-Toys, became one of the earliest and most visible casualties of the dot-com bust. Even as Ridenoure and his colleagues were searching for other sources of funding, Blast Off was forced to close in March 2001.

Within weeks, however, they did find another funding source. Billionaire Peter Sperling, founder of the for-profit University of Phoenix Inc., and a commercial space aficionado, stepped in, pledging to keep most of the Blast Off team intact.

But Sperling attached conditions to his financial largess, chiefly that the new company take incremental steps that would lead to profitability as quickly as possible. That, according to Ridenoure, meant developing or finding a product that could return that profit in short order instead of pursuing the longer-term goal of private commercial spaceflight.

Crosslink connection

As it happened, Ridenoure’s colleagues came across a Colorado company, Crosslink, that had developed the RocketCam and had actually deployed it on several shuttle missions. Crosslink’s owners were looking to sell their company; Ridenoure and his fellow engineers pounced on the opportunity, persuading Sperling to put up the cash for the purchase, which Ridenoure declined to disclose.

“All this went down very quickly,” Ridenoure said. “Within three weeks of closing the doors on Blast Off, we found Crosslink; three weeks later, we had a purchase agreement and two weeks after that we re-opened our doors.”

The new company sported a new name: Ecliptic Enterprises. Ecliptic is the astronomical term for the geometric plane in which most of the planets orbit the sun.

With the RocketCam already functioning, Ecliptic Enterprises was able to continue putting the cameras on the shuttle rocket boosters and lined up several commercial and military space launches. The Ecliptic team made improvements to the RocketCam, including converting it to digital technology. The camera itself is a four-inch-long tube with a lens, mounted on a platform about the size of a brick.

Ecliptic also developed a master control box for the cameras and other sensor equipment used on various space launch vehicles.

But the shuttle part of Ecliptic's business was soon put on hold when the shuttle Columbia broke apart on its landing approach in February 2003. The resulting two-year hiatus in the shuttle program prompted Ridenoure and his team to step up their efforts to land private-sector contracts.

Ecliptic also used that period to develop a product called RocketPod, a shoebox-sized payload container that could be mounted on a rocket. RocketPod allows small secondary payloads to hitch a ride on a rocket intended primarily for some other mission.

"With RocketPod, small companies and university research programs that have just one or two simple instruments that they want to get up into space now have a means to do so," Ridenoure said.

One RocketPod customer is Garvey Spacecraft Corp. in Long Beach. Chief executive and president John Garvey said he plans to use the RocketPod as the primary container for small payloads his company plans to launch into space. The first test payload is set for early 2008; if that's successful, Garvey said he expects the two companies to team up on more payload launches.

"By going small, you have inverse economies of scale. Less resources needed, less time to develop and less mission analysis that must be done," Garvey said.

Crash course

That's the same rationale that NASA is using on its upcoming lunar crash landing, which is actually a supplementary part of a larger mission to place an orbiter around the moon.

NASA's principal investigator for the mission, Anthony Colaprete – a space scientist at the NASA Ames Research Center in Mountain View – said the decision to include this lunar crash component of the mission came a few months ago, just 30 months before the launch date. Most NASA space missions spend years in the development stage.

"We've had to do everything on a very compressed time scale, with limited resources," Colaprete said. In addition, because the mission was labeled "high risk," – meaning a high probability of failure – NASA officials suspended some of the rigorous testing that must be done on some of the equipment. That testing can take a year or more and add millions of dollars in manpower and other costs to the equipment.

That opened the door for consideration of Ecliptic's RocketCam as the supplier of the main cameras for the mission. One of the competitors was aerospace giant Raytheon Corp., which Colaprete said came in "orders of magnitude" higher in terms of cost,

largely because it would have developed its own cameras instead of buying the equipment off the shelf as Ecliptic does.

In the meantime, now that the Discovery shuttle has landed safely, more shuttle missions are coming up, ones in which the video monitoring of the launches is now regarded as one of the top mission priorities after the Columbia disaster.

The global exposure that the RocketCams are receiving as a result highlight the value of Ecliptic's cameras, both for NASA and the private sector.

“Imagine you're a passenger on a sub-orbital vehicle. Wouldn't you want a video record of your journey that exceeds the capabilities of your handheld equipment?” Krukin said. “Also, if you're the space vehicle owner, you'll want extensive video of the vehicle's performance, especially during testing.”

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