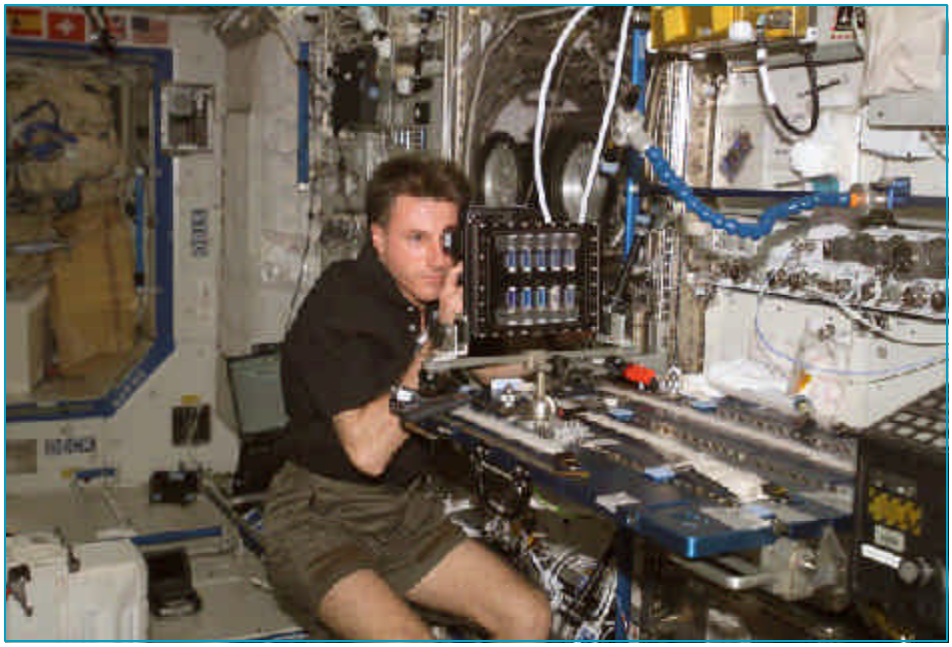
ISS Research is Serious, Exciting and Fun

By Peter Lu with Mick Culp

Peter Lu is a graduate student in the Harvard Physics Department. His advisor, Professor David Weitz, offered him the opportunity to develop a research project to be performed on the International Space Station. The project was to study the long-term behavior of colloids in a microgravity environment; i.e., monitoring the separation structure and velocity as the colloids come out of the solution without the impediment of sedimentation caused by gravity on Earth.

While at JSC to train the crew for Increment 10, Peter had some free time during which he gave a very inspiring review of his experiment to the Space Station Program Control Board. That talk prompted me to request an interview with Peter and the following resulted.



Mike Foale prepares early photography of BCAT-3 samples.

ISS PN: *Talk about the preflight preparation of your experiment.*

Peter: Dr. Weitz came to me and said, "We have this new, small experiment with NASA to understand the critical point behavior, so figure out what you need to do and make the samples." So I made samples and tested them. That was the very beginning.

Then I went to Glenn Research Center in Cleveland where I developed the photographic protocol with the Glenn folks. We were told we had a camera, samples and a flashlight. How do we turn that into a procedure they could use on orbit to get our data? We laid that out and the Glenn folks worked the details. Then I came to JSC the end of August of last year to train Mike Foale (Increment 8 astronaut). And that was a lot of fun.

Did you feel you had sufficient time to train the crew?

Oh yes. Before anything went up, you know, it's hard to know exactly what kind of problems you're going to run into. This is completely different from the previous BCAT experiments that flew like seven or eight years ago. They had a film camera and would send film back to process. We get photos down the next day. We can communicate with the crew almost immediately, saying this is right, this is better… we get feedback from them. So the procedure developed in Cleveland last summer is still in development. With the photos from Mike Fincke, he sends down "maybe we should try this in the procedure or you might want to explore …" and it's this constant dynamic process that we're going through.

It sounds like you get plenty of interaction with the crew on board.

Oh, tremendous amounts. So fast forward. In January, the thing launches on 13P. We're told our experiment will run in June; but in March, Foale did the first run of our data. Before he started he called down, which is very exciting. I was home and got to talk with somebody on the Space Station and he took a few days of data, we sent him some more photos and he wanted to talk again, so he called down again. To me it was actually cool, because he called me at home. It was 4am, and here I am at home talking to somebody on the Space Station; very exciting. So, that was pretty neat. We went back and forth and he took a bunch of photos and he worked on them with Mike Fincke during the time they were up there together.

Then Foale comes back and Fincke is taking the photos. He did all the planned stuff and then there were some problems, so he did it again. He has this Saturday Science program where he volunteers his time to research. He's been really very, very generous.

It was really interesting. I was always under the impression that you get a NASA physicist, big science experiments and it's all very complicated, all automated and you test and test it, add the bells and whistles, it works and they deliver results. Our experiment is kind of the antithesis of that. We sent up three kilograms, 10 samples, and basically it lives or dies on whether the astronauts take the pictures correctly. So far they've really exceeded what I even thought was possible. On the ground, we had plenty of time and all the brackets and we lined it up and took pictures. Yet, the stuff we're getting from space…they're doing better than we did. And that's just amazing!

With these samples, can you start over?

Absolutely, and that's the next thing. This time we took photographs of all samples at scheduled times to make sure we didn't miss whether separation ultimately took place. We scheduled an hour, a day, a week, a month and two months. But it turned out there's a lot of activity going on within the first couple of days, so when we restart the experiment we're going to be focusing our efforts there. We never anticipated we'd be able to detect structures in that first couple of days, but it turns out the photos are very good; and if the photos

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Editor's Page

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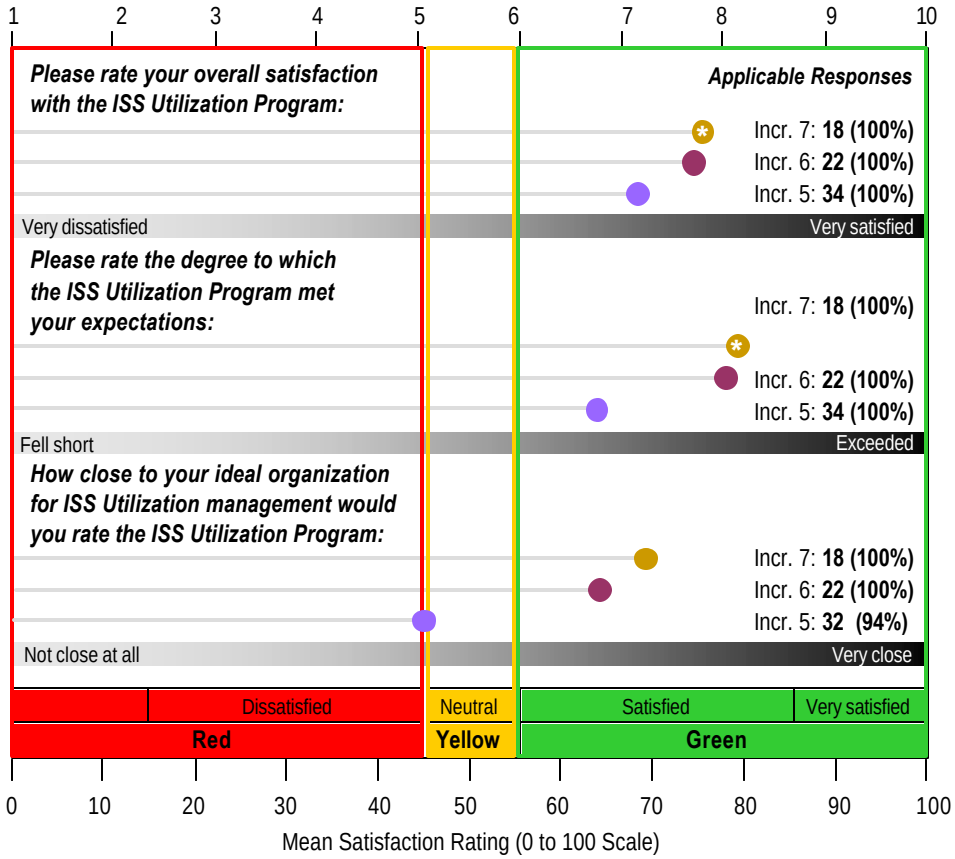
Despite budget cuts and workforce downsizing, the ISS Payloads Office is maintaining its focus on customer satisfaction and continued process improvement. The chart below shows the top-level results of the Customer Surveys through Increment 7. Though the survey delves in some detail into a Principal Investigator's or Payload Developer's experiences with ISS integration and operations processes, the chart shows just the responses to the questions used by the developers of the American Customer Satisfaction Index (ACSI) to rate unlike industrial and government entities by their ability to satisfy the needs of their customers.

The three questions are listed on the left with the aggragate responses from customers from Increments 5, 6 and 7. The results show a sizeable improvement from Increment 5 to 6 and a smaller but positive change from Increment 6 to 7. Statistical assessment tells us that only the change in the third question is significant in the latest comparison.

The right-hand column is a list of ACSI rankings for varied industry and government organizations. Added to these scores are the Organizational Satisfaction Index (OSI) scores for ISS Utilization for Increments 5, 6 and 7. The OSI is a mathmatical approximation to the complex ASCI. Before you ask, we are wrestling with the cost benefit of having an actual ASCI developed. However, an accurate comparison with Wal-Mart seems far less important than knowing whether we are improving against our own past performance.

Increment 8 interviews are nearly complete, so we'll have an update next time. Thanks to all who have taken the time to participate in these surveys.



* *No statistically significant change from previous Increment.*

INDUSTRY RANKINGS	*Score**
Amazon.com	84
ISS INCREMENT 7 OSI	77
Retail Industry *(aggregate)*	75
Wal-Mart	75
ISS INCREMENT 6 OSI	73
Federal Government *(aggregate)*	70
NASA/Glenn Research Ctr	67
Airlines *(aggregate)*	66
McDonald's	64
Federal Aviation Agency *(commercial pilots)*	64
Internal Revenue Service *(tax filers)*	63
ISS INCREMENT 5 OSI	60
National Science Foundation *(grantees & applicants)*	58

**Source: American Customer Satisfaction Index (ACSI) 2004*

The *American Customer Satisfaction Index (ACSI)* is a long-standing organizational cross -comparison index for customer satisfaction. We use an OSI calculated from methods that approximate ACSI.

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are lit properly, we can see much, much smaller scale structures than my expectation.

Are you pleased with the overall experience?

In April 2003, we were first given information about the experiment and we were getting data less than a year later from the Space Station; which, from what I'm told, is ridiculously fast. I would have a hard time imagining things could be better. Now all we want is more data.