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**Richmond: We have a problem**

*Expertise and equipment from Metro Vancouver-based Macdonald, Dettwiler and Associates Ltd. help NASA salvage International Space Station mission*

Richard Chu

It was nearing 4 p.m. on Tuesday, October 30, when Richard Rembala got a call from NASA mission control. The space agency had a problem on the International Space Station.

Rembala is the technical lead engineer for the Canadarm2 at Richmond-based Macdonald, Dettwiler and Associates Ltd. (TSX:MDA), and NASA wanted to know if the Canadarm2 could be used to repair a solar array that had been torn as it was being deployed early on October 30.

The array generates electricity for the space station.

NASA engineers asked Rembala, who is based out of MDA's Brampton, Ontario, space missions group, whether the Canadarm2's reach could be extended by connecting it with the space shuttle's inspection boom, which is used to check for damage to the shuttle's re-entry tiles.

Rembala said NASA had two options.

"On this inspection boom, there are two locations where the arm can pick it up. Normally, the Canadarm2 can only grab on to the middle grapple fixtures, and the one at the end is specially designed for the shuttle arm. So one of the options was: can the station arm grab the fixture it wasn't designed to?"

By grabbing the boom at the end with the Canadarm2, NASA could reach the torn solar array. If the array couldn't be repaired, NASA might have had to jettison it and threaten further development of the station.

By Tuesday night, Rembala and his team concluded that the Canadarm2 could be connected to the end of the boom, but it would likely damage one of the boom's two grapple fixtures.

NASA engineers therefore decided Wednesday morning to go with option two: make do with extending the arm's reach with half the boom's length and hope it was long enough to reach the damage.

"That's when the real discussions started happening with MDA," Rembala said, "because now [we had to] provide new software files for NASA.

"We also needed to do structural analysis to figure out the types of loads [the arm would be subjected to] to see if the astronaut could generate forces that could damage the arm."

Ten MDA software developers at the Canadian Space Agency in Montreal and at its Brampton facility had about 24 hours to write and test the new Canadarm2 files that would help astronauts control the arm with the boom attached.

To repair the array, astronaut Scott Parazynski had to be at the end of the inspection boom rather than at the end of the Canadarm.

“You want to be able to control how the arm moves relative to the astronaut,” Rembala said. “Normally it would be at the tip of the arm, but the tip was very different from where the astronaut was.”

MDA staff worked throughout the night to have the software tested at its Brampton facility, which has an exact replica of the Canadarm2’s computer to ensure the software would upload and execute correctly. Throughout Friday, November 2, Rembala’s team was finalizing the structural analysis, which determined that it was relatively safe to have Parazynski at end of the inspection boom attached to the Canadarm2.

With their work done, Rembala said MDA engineers got up early the next day, tuned in NASA TV via the Internet and watched the operation live.

“It’s rewarding to know that we and Canada were able to support this repair operation.

“If it wasn’t for our hardware, the boom, the Canadarm, the Canadarm2 and the mobile transporter, if any of those weren’t present, NASA would’ve been in a real bind to deal with the problem.” •

rchu@biv.com