

NASA makes historic live HD broadcast from space station



BY JAMES CARELESS

Chalk up another leap for space exploration: NASA made the first-ever live HD broadcast from the International Space Station to Earth on Nov. 15. The ISS Expedition 14 crew of commander Michael Lopez-Alegria, flight engineer Mikhail Tyurin, and flight engineer Thomas Reiter actually made two 20-minute HDTV broadcasts that day. The first, at 10:30 a.m. EST, was seen live on Japan's NHK TV network. An hour later, the ISS went live again on Discovery HD Theater.

The broadcast — which featured Lopez-Alegria allowing a round globe of orange juice to float free in weightlessness until he drank it down, plus stunning through-the-window views of the Earth 220 miles below — was shown live on a giant screen in New York's Times Square and on monitors inside Discovery Channel stores.

Although the broadcast was real eye candy, the purpose behind it was serious. Because HD can provide up to six times the resolution of regular analog, being able to shoot HD on the ISS "allows us to see much more than we ever could before," explained Dylan Mathis, a Barrios Technology contractor serving as assistant mission manager for the project. "Not

As part of the first live HD broadcast from the International Space Station, commander Michael Lopez-Alegria drank orange juice in the weightless atmosphere.

only will it allow us to do better science, but HDTV helps us to show the world what we are doing and allows us to really share the experience with them."

Executed to fulfill a Space Act agreement between NASA, the Japanese Aerospace Exploration Agency, NHK, and Discovery Theater HD, the broadcast was shot using a single Sony HDW-750 HDCAM camcorder, then fed into a NASA-designed Space Video Gateway, Mathis told GOVERNMENT VIDEO. The SVG is essentially a PC designed to feed high bandwidth video down to Earth, built with "as many off-the-shelf components as we could use." It also houses an MPEG-2 encoder that compresses the incoming HD feed into a 30 MB DVB ASI video stream, which is subsequently converted into IP packets.

For last month's broadcast, "These packets were sent down to earth via our regular Ku-band satellite link," said Mathis. "First, the signals were transmitted to an in-orbit TDRSS [Tracking and Data Relay Satellite System] satellite, and from there to NASA's earth sta-

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tion in White Sands, New Mexico. From there, it was sent via fiber optic cable to the Johnson Space Center and the Marshall Space Flight Center."

For the NHK broadcast, the signal at Johnson was sent by fiber directly to Toyko. For the U.S. broadcast, a Discovery satellite truck at the Johnson Space Center in Houston uplinked it to Discovery's master control room in Silver Spring, MD.

The broadcast doesn't mean the space station has converted to HD. In fact, the four externally-mounted cameras are still NTSC box cameras similar to the cameras used in the payload bay of the space shuttle, while those inside are Sony DSR-PD100 DVCAMs. The HDW-750 was provided to NASA by JAXA (the Japanese space agency) as part of the ISS partnership. Along with the Space Video Gateway, it was a loaner, due to return to Earth sometime in the future. (The camcorder and SVG were delivered to the ISS in September when the space shuttle Atlantis visited.)

It's not just a matter of money keeping NASA from converting the ISS to HD immediately. "It will take one or more space walks to replace the external cameras, since

they are housed in sealed pan-tilt housings that aren't accessible from inside," Mathis explained. "Replacing them in the cold vacuum of space is no small matter."

To add to the challenge, today's HD cameras are quite vulnerable to space radiation, which causes their CCDs to degrade over time. "It appears that the higher the pixel density on a CCD, the more prone it is to radiation-caused degradation," Mathis cautioned. To counteract this problem, he added, NASA is evaluating HD cameras equipped with CMOS sensors, because they are less susceptible.

Although the ISS has yet to convert to HD, the live HD broadcast was a step up from its previous HD productions, which couldn't be seen until the HD tapes were returned to Earth. As for the long-term significance of this mission? Think Moon and Mars: As NASA pushes back out into the universe, it will want to send back stunning HD footage both to share its accomplishments and win public support for its ongoing efforts. For an agency constantly tacking against changing political winds, such support can be worth billions of dollars from Congress at budget time. ★

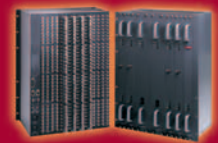
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