Columbus Laboratory begins testing at Neutral Buoyancy Lab

A mockup of the European Space Agency's Columbus Laboratory, one of the agency's contributions to the International Space Station, recently made a splash at the Neutral Buoyancy Laboratory. Although not slated for launch until 2004, the ISS integration team conducted an Extravehicular Activity verification for the module in January 2000, well in advance of required tests.

The Columbus Laboratory is a pressurized, habitable module that will be attached to Node 2 of the station during assembly flight 1E. It is designed as a general-purpose laboratory which can support a variety of user disciplines, including materials and fluid sciences, life sciences, and technology development.

Alenia built hardware components for the mockup last summer for testing in its pool. To save money, the JSC integration team combined that hardware with a NASA-built Columbus trainer. Rothe Joint Venture had the tricky task of building the mockup and ensuring it could be integrated with Alenia's hardware in the short time before testing began. According to Raymond Aronoff, RJV Engineering, new technology aided them with the finished product.

"We were able to analyze the 'as built' mock up using our laser tracking system to compare that data against the CAD design at Alenia," said Aronoff. RJV is the only company at JSC using that technology. "This allows us to know exactly where there are any variances in the design. If the crew has any concerns or hindrances during the testing, with just a little research, we can determine if the actual flight hardware will present the same scenario, thus quickly sharing information and suggestions to the design group half way around the world."

"The mockup has a dual use," explained Heather Mitchell, technical manager for Columbus, EVA Project Office. "It was built for verification testing, but will be used as an NBL trainer as well. The module, and most of the outfitting hardware such as the outer debris shields and EVA aids are built once. We will use them again for flight crew training. We will have to return the Alenia- built mockup hardware to Italy. Therefore, we will need to build the training versions of these components once ESA has finalized the design of these components."

It is unusual to have this level of testing and crew procedures outlined this far in advance of a launch but having results early is very useful and will help ESA prepare for Columbus' Critical Design Review this fall.

"Originally, we did not intend to come (to the NBL) because Alenia has its own facility," said Bernard Clymans, senior configuration and AIV systems engineer, Module Projects Division, ESA. "However, when we examined the feasibility of a real EVA test, we saw that, because of its size, Alenia's facility was not quite sufficient."

Compared to Alenia's facility, the NBL provides a more realistic configuration of the ISS including a space station robotic manipulator system mockup and higher fidelity EVA hardware, such as EVA suits, foot restraints and tools. Due to limited space and support equipment at the Alenia facility, only a few unsuited divers can participate in testing. However, the spacious NBL can host several full-suited crewmembers with their support divers as well as the possibility for Alenia guest divers to participate in real-time viewing of crew testing.

"At the NBL, we can test the interfaces between the elements and use suited crewmembers," added Ulrich Thomas, ESA Columbus resident engineer and deputy launch package manager. "Neither of these benefits would have been possible at Alenia's test facility."

For both the ESA and NASA teams, the test itself was very valuable and a model of early program verification testing in the NBL on a multinational level.

"For us, it was very important from a task operations standpoint to verify with our baseline," said Peter Granseuer, COF Flight Operations, ESA. "Having the opportunity to run these tests here has been very beneficial and reassuring." ■

NASA JSC Photo JSC2000-00602 by Robert Markowitz

ESA representatives visited the NBL as part of the design verification testing for the Columbus Laboratory (in back). Shown, from left, front, are: Raymond Aronoff (RJV), Ulrich Thomas (ESA), Renzo Turino (Alenia), Robert Adams (USA), Riccardo Bosca (Alenia), Pedro Duque (ESA astronaut), Andrew Manning (Lockheed Martin); back: Scott Todd (RJV), June Huhn (NASA), Fernando Ramos (Boeing), Peter Granseuer (ESA), Simona Ferraris (Alenia), Gregor Woop (ESA), Bernard Clymans (ESA), Luca Agliati (Alenia), Hans Peter Leiseifer (ESA), Heather Mitchell (NASA). Not pictured: David Wade (RJV), Kevin Montgomery (Johnson Engineering), Christine Kovich (Lockheed Martin), and Frank Hartung (DASA).

Simple decisions, serious implications:

Backpacking and extended hike concerns

JSC SAFETY ACTION TEAM

By Keith Tischler

Articles on camping and hiking frequently address the importance of logistics preparation with regard to safety. Such examples typically include adequate and appropriate clothing for foul/extreme weather, water purity and availability, food selection and sanitation, and evaluation of weather conditions before departure. These hints are helpful for the beginning camper and those with moderate experience. However, as with many sports, backpackers/hikers with moderate experience are at an even higher risk of putting themselves in jeopardy than many beginners by continuing on as conditions deteriorate, primarily due to poor decision making.

Two such examples clearly demonstrate this subtle yet significant hazard. The first reflects the risk to a group losing less experienced hikers as conditions deteriorate. This results in people "slipping through the cracks." The second example illustrates a series of poor decisions leading to a bad situation, analogous to the chain of poor decisions resulting in aviation accidents.

In 1991, I joined a group of 30 University of Wisconsin students for a spring break backpacking trip down into the Grand Canyon. About two-thirds of the group were experienced wilderness backpackers. The descent to the Colorado River occurred in a single day, after which we set up camp. Several of the campers (primarily those less experienced) chose by exhaustion and preference to sleep under the stars and not pitch a tent.

That night it rained, soaking the exposed hikers and gear with water just above freezing. The descending snow line was visible in the canyon and stopped approximately 500 feet away from the campsite. Given the cold, wet gear and potential for hypothermia, the group opted to move up to a less remote site and hike out the following day. The author encountered two less experienced hikers lagging behind and decided to remain in back with them as the other hikers seemed unaware of them.

After about five hours, the group had pulled ahead with no sign of waiting for the two exhausted novices who were beginning to panic. We had plenty of gear, fuel, and food, so I calmed the two hikers and convinced them that, if exhaustion and nightfall necessitated, we could camp. Being fined for camping outside of a designated campsite should not be a concern given the circumstances.

Just after nightfall and 11 hours later, we hit the main trail and encountered one person walking back a quarter of a mile to see if we were near. The group had set up camp three hours earlier. No one had bothered to keep track of the two least experienced hikers. The risk of fatality was real. That day eight mules had been lost off the icy trail and two hikers had frozen to death below the rim.

The second example occurred on a hiking trip in Yosemite Park, California, via a ridge trail to El Capitan massif. Two other experienced hikers and I made a series of poor decisions driven by goal fixation. The trail to El Capitan was 12 miles one-way. We left late and discovered the road to the trailhead had been closed, adding four miles round-trip to the hike. We had brought a small amount of water with us because we planned to use a campsite well, but that turned out to be inaccessible.

After a leisurely lunch break, we continued and at mile six could see El Capitan, relatively close (by line of sight only). Intentions to turn back fell away as we could see our goal. We pressed on, running low on water but passing several streams we could drink out of if necessary. However, there was no way to treat the water to avoid getting sick.

At 6 p.m., we reached the halfway point. We found our way back in the dark with great difficulty, finally breaking down and drinking untreated stream water. We reached the parked car at 1 a.m.

We were very lucky and escaped the experience with no sickness and only sore feet. It could have been much worse – the lesson being establish limits beforehand and stick to them regardless of the temptation to modify your plans. ■