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PSYCHOLOGY

experiential skills-practicing aspects that Expedition training now provides.

In this regard, the Behavioral Health and Performance Group has assisted Astronaut Andy Thomas, chief, ISS Expedition Corps, in developing an Expedition core training which involves seminars, outdoor leadership training in small teams and winter survival techniques. The training program exposes Expedition candidates to the issues of leadership, confinement and interpersonal contact such as crew persons can expect on ISS flights. It consists of classroom work and workshops to provide an understanding of the importance of these issues in a historical perspective. In addition, various team exercises, taking place under stressful conditions, are used to provide practical experience in recognizing the importance of teamwork and leadership and in developing enhanced interpersonal skills.

The objectives of the training program are to develop and nurture the ability of individuals to operate in a prolonged stressful environment; sensitize crew persons to interpersonal issues and how to deal with them; enhance self-management in each individual to prepare him or her to interact under stress and possible conflict; encourage individuals to become good members of expeditions; and to develop individuals to become good expedition leaders.



Regina North

isolated and confined environments.

According to North, cultural shock is not the result of any specific demand on the individual to adjust, but rather the demand for a multitude of adjustments over a defined period of time. In general, it results from mismatched expectations based on a preconceived idea of how one should respond to a particular situation. The sources of cultural shock could be climatic, geographic, political, legal, economic, religious or architectural or relate to issues such as safety, clothing, food and work. It is also very important to understand that a similar adjustment process occurs when the individual is repatriated.

that different cultures have different expectations and responses toward leadership styles, or the use of personal space. Of course, different languages and modes of expression also impact communication and productivity, especially in

schedule," said NASA Flight Surgeon Dr. Christopher Flynn. "The ground crew is charged with maintaining those schedules. But emergencies often occur on orbit that upset those schedules, keeping astronauts awake for 20 to 30 hours at a time. So their fatigue levels change. What we don't know how to do very well yet is to take an astronaut and have him or her work for 24 hours. If that astronaut sleeps for four hours, is he or she rested? Or does the person need six or more hours of sleep before he or she is really rested again and ready to go back to work? We don't know the answer to that question."

According to Flynn, the matter of how to schedule work for ISS crews on orbit is another question. "How do you schedule work for people on orbit? Is it better to manage every minute of their time from the ground controllers – which is what is done on shuttle missions? Or is it better to give them the opportunity to complete a certain number of tasks over a certain period of time and let them organize their time? Now we tell astronauts what to do every minute of the day and that can annoy them after a while – especially on a long flight. One of the challenges that we have is to understand how to schedule work for them that's not fixed."

But the schedule can't be too loose. One person doing an experiment aboard the station that requires little vibration is going to be in conflict with another crewmember who wants to exercise on the treadmill. Ground controllers now organize time to deconflict different tasks on different days.

"How do we make a new plan for the future? That's the countermeasure that's waiting to be understood," Flynn adds.

Mission Support

In-flight support involves a wide range of activities including assisting the crews in developing their own libraries of books, music and videos that will be stored aboard the ISS. The group also manages the air-to-ground communications between the crewmembers and their families as well as the on-board ham radio communications with stations at home and patching calls through to the family members wherever they may be on the ground.

The Behavioral Health and Performance Group also sends up care packages to the crews – packages from them and from family members. The packages are sent up on the Progress and the non-crew-rotational shuttle flights.

Stephen Vander Ark, supervisor of the Behavioral Performance Group for Wyle Laboratories, has worked with the first four Expedition crews. "Our interaction with the crewmembers starts shortly after they are assigned to the Expedition crews. We meet with the astronauts and their families to let them know what our role is and what types of support are available."

Astronauts and family members fill out a personal preferences questionnaire that gives the group an indication of what types of magazines and books they want to read. Working with Russian and American crewmembers, the group is putting together a general library of items including books, periodicals and CDs. At the end of their mission, the crews will add to the collection and bring some of their personal items home.

Working with family members of the U.S. astronauts who will live aboard the ISS, the group is also putting together family photo video albums on laptop computers. The family members will be able to view the albums and add captions and audio comments to the digitized photos before they are sent up to the crewmembers.

"You have to bring a piece of your home with you," said Wood. "You may want to bring pictures or mementos to remind you of your family. Some favorite books or music may help set a more pleasant tone. There has to be that thin cord that ties crewmembers back to Earth so that they have a reason to come back. When they have a reason, they have a reason to stay sane, a reason to get their job done, and a reason to come back."



Stephen Vander Ark

outside of JSC will be set up to communicate with future crews.

"We do this to make sure that the crewmembers have the opportunity to communicate with the people who have typically provided social support for them here on Earth," said Vander Ark. "This is equally important for the family and friends as it is for the astronauts."

Conclusion

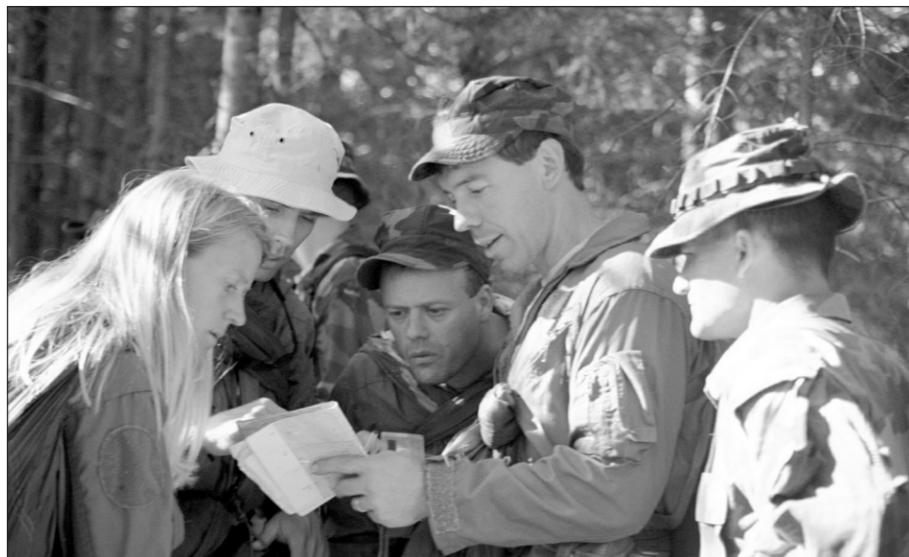
Looking to the more distant future, the preparation of crews for potential missions to Mars will entail a very different process of preparation, selection and training for two reasons. First, the duration involved is much longer – up to three years perhaps – and, secondly, the communications timeline.

"You put those two together and it mandates having a much more autonomous crew – a crew that is much less dependent on the ground for information on how to repair things," said Holland. "Real-time conversations will be next to impossible to have. Information will have to be exchanged in packets."

"We'll need a crew that will be able to maintain its own schedule. That will necessitate a change in roles for ground control members. Some very different ways of business will take place versus current operations that have a very interdependent air-to-ground team."

Holland also says that crewmembers and their families will need a lot more preparation in developing and practicing coping skills before going to Mars. Despite these hurdles, Holland finds hope in the history of past explorers.

"When I think about a mission to Mars, I think of the early explorers who, when they left sight of land for the first time on the seas in the little boats that they had, they really didn't know if the Earth was flat or not and whether or not they would drop off of the edge of the planet. It was remarkable what they did. They went out there not knowing what they were going to encounter. They were away from land without any communications capability. So I think we need to recognize that as difficult and as novel as a Mars mission would be that, from a psychological perspective, it's not novel to the human race to do this type of activity. There may not be a history of it, but it has been done and been done successfully. So I think that's a source of positive thought and inspiration." ■



NASA JSC Photo 2000-06639 by Bill Stafford

Team interaction and leadership skills in extreme environments become crucial issues when considering long-term space flight. Exercises, such as outdoor survival training shown above, help expose and educate astronauts to these situations.

The study of the historical record of various expeditions has shown that the leader of any long-duration expedition characterized by confinement, isolation and group living must fulfill a unique role. The leader's ability to fit this role is seen as being important, if not critical, to the success of the mission. The personality and leadership style of the commander sets the tone for the whole group.

As important as leadership is follower-ship or teamwork – the ability to work as a team and stay motivated. Long-duration flight, confinement and close personal contact place unique stressors on participants that are not found on short missions. This will be especially true for the crews that comprise the ISS participants since they will include members from throughout the world.

Cross-cultural training plays an important part in crew training for extended ISS missions. The crews take generic cross-cultural training classes on site. They are then given seminars in advanced cross-cultural problem-solving techniques using scenarios that have occurred in flight or on the ground.

Regina North, a behavioral scientist with United Space Alliance in the Space Flight Training Division in the Mission Operations Directorate, gives classes in cross-cultural training to JSC and Marshall Space Flight Center personnel. She says

Workload

In isolation situations, participants must have meaningful work to perform; situations in which "make work," too little work, or meaningless tasks are scheduled



Christopher Flynn

will have a demoralizing effect on the participants. U.S. experience on board the Mir station, as well as in other confined, ground-based settings, has highlighted this fact. Conversely, when someone is very interested in a task,

motivation is high to overcome any difficulties to see it through to completion.

Two concerns are interrelated: providing crewmembers with meaningful work and ensuring that they do not get fatigued. Fatigue is a major issue that could potentially compromise health and human performance.

"What we do now for long-duration flight to combat fatigue on orbit is to make sure that there is a work schedule and a rest