RESEARCH ON INTERCULTURAL EFFECTIVENESS AND ITS RELEVANCE TO MULTICULTURAL CREWS IN SPACE

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INTRODUCTION

The planning for and managing of missions in space is changing dramatically due to, among other things, the involvement of more and more national cultures. For example, the International Space Station (ISS) currently involves a collaboration of 15 countries and it is projected that the crews that will live and work on the ISS will be made up of representatives from these different cultures. This emerging multicultural reality in space travel will present the space community with new challenges. For example, it is reported (19) that over 70% of civil aviation accidents occur as a result of human error. Researchers (7, 19) explain how the behavior and performance of flight crews is influenced substantially by national culture, and conclude that "with the increasing globalization of the aviation industry efforts must be made to understand these (cultural) differences more completely" (19, p. 21). This conclusion would appear to be equally relevant to the space industry.

In light of the need to understand better the influence of and management of cultural differences among future crews that will live and work in space, the aim of this paper is threefold. First, I will present some of the key research findings on intercultural effectiveness on earth and discuss their relevance to multicultural crews in space. Second, I will attempt to highlight some of the issues that need to be addressed in order to maximize the effective functioning of multicultural teams in space. And, finally, I will outline some of the action steps that need to be taken in order to address issues related to the functioning of multicultural teams living and working in space.

RESEARCH ON INTERCULTURAL EFFECTIVENESS: KEY FINDINGS AND THEIR RELEVANCE TO THE FUNCTIONING OF MULTICULTURAL CREWS IN SPACE

Much of the research on intercultural effectiveness derives from the study of sojourners, people who go to live and work in another culture on a temporary basis but often for an extended period of time. Sojourner groups include business personnel, military personnel, foreign students, international development advisors, diplomats, emergency relief workers and international peacekeepers. Professionally, I have had experience working with most of these groups advising on screening, selection, training, and evaluation of international personnel. My own research, however, has focussed primarily on the study of international development personnel (11, 15) but has also included the empirical study of peacekeepers (31) and diplomats (24).

Some of the key research findings on intercultural effectiveness, as well as what appears to me to be their relevance to the situation of multicultural crews in space, are summarized below.

A DEFINITION OF INTERCULTURAL EFFECTIVENESS

Intercultural effectiveness can be defined as *the ability to live contentedly and work successfully in another culture* (30). The definition acknowledges a relationship between an individual's personal adjustment and satisfaction and his/her behaviour and performance in a cross-cultural setting. The distinction is important for it recognizes the importance of factors other than an individual's technical qualifications for achieving success in another culture. Personal adjustment is greatly dependent on one's capacity to deal emotionally with transition whereas performance in another culture is more dependent on an individual's intercultural skills and knowledge**.**

RELEVANCE TO MULTICULTURAL CREWS IN SPACE

Given the plan to staff the International Space Station (ISS) with astronauts from different cultures, the success of these missions will depend on much more than technical qualifications and experience. Achieving intercultural effectiveness would seem to be an important goal of these missions for enhancing the attainment of the specific technical objectives of the space mission. Research thus far has already confirmed that a variety of psycho-social problems (including problems due to cultural differences) have interfered with astronaut performance on space missions in the past (8, 17). The consequences of a failure to achieve intercultural effectiveness in space are of a completely different magnitude than on earth where one has the luxury of being able to remove the ineffective individual.

EFFECTIVENESS VERSUS SATISFACTION

In a study of Canadian development advisors (11) it was determined that only 20% of advisors were rated by colleagues and supervisors as highly effective at their jobs whereas over 75% reported a high level of personal satisfaction on their foreign assignment. These findings are in keeping with the results of other research on international business personnel. One explanation for this finding is that expatriates derive their satisfaction from "living the foreign lifestyle" (enjoying frequent socializing with other expatriates, having servants, etc.) rather than from meeting the professional challenges. In a recent study of Canadian peacekeepers (31) it was reported that 92% of Canadian civilian police keepers in Kosovo would readily undertake a second peacekeeping mission but less than a third were rated as highly effective interculturally. Interviews with the peacekeepers identified the excitement and adventure of the assignment as being particularly motivating and satisfying.

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There would seem to be a lack of data addressing levels of effectiveness and satisfaction on space missions, especially missions involving multicultural crews. Nevertheless, Suedfeld and Steel (28) in their review of literature point out that "both to space and to the polar regions the return rate is high and the disappointment of those who are frustrated in their desire to go back is profound" (p.230). This finding however, says nothing about the effectiveness of these personnel during their missions. That people often return from isolated and confined environments feeling personally satisfied and enhanced in their lives still begs the question as to their effectiveness, and in particular, their intercultural effectiveness within multicultural crews.

THE REALITY OF CULTURE SHOCK AND THE STAGES OF ADAPTATION

Although people may be unaware of experiencing culture shock on an international assignment, almost all sojourners will experience some degree of culture shock or culture fatigue during their stay in the new culture. Research has also identified three distinct phases in the process of adaptation. An initial stage of elation is followed by a period of depression which usually gives way to renewed feelings of satisfaction. This was identified as the "U" curve theory of cross-cultural adaptation (6) and it still remains valid for sojourners today although the timing and severity of the down phase (the "culture shock" or "culture fatigue" stage) varies greatly depending on one's prior experience and pre-departure knowledge and expectations. That the experience of fatigue and stress on encountering a new culture can seriously affect performance is clear and for this reason pre-departure training sessions usually include training on how to recognize and cope with this experience.

RELEVANCE TO MULTICULTURAL CREWS IN SPACE

There would seem to be some evidence (28, 8) of similar phases taking place in isolated and confined environments (ICE). Studies tend to report, regardless of total duration, the morale and performance of crews tends to be challenged shortly past the half-way point of the mission (20). Given that cultural differences will likely add to the stress experienced by crew members, it would seem that tracking behaviour and performance over time and assisting crews in coping with the stages of adaptation is most important for the future success of the International Space Station and for a possible manned mission to Mars. Sojourners on earth are always able to find ways to get relief from the stress of coping with the new culture ;however, the options for space crews are much more limited given the "no way out" reality of missions in space..

THE REALITY OF THE EXPATRIATE GHETTO

Research on sojourners reveals the tendency of expatriates to socialize among themselves, that is, to live in an expatriate ghetto. Although this has the advantage of providing a support structure for those expatriates, it also serves as a barrier to becoming interculturally effective. The study of Canadian development advisors (11) determined that the 20% of advisors who were rated highly effective at their jobs tended to be more involved with the local people and the host culture and had made an effort to learn and use the local language. Interestingly, these advisors paid a price for they tended also to be rejected by their fellow countrymen who likely were threatened by such behaviour. Torbiorn (29) reports a similar finding in his research on Swedish business personnel working in other cultures.

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Kanas (8), Kass and Kass (10) and others identify a somewhat similar dynamic when more than one culture is involved in a space mission, simulated or actual. The astronauts of the same culture tend to form a clique and the other(s) report feeling isolated. This tends to create tension and serves to reduce effectiveness of the team. In the Kass and Kass study (10) of long duration isolation experiments in Russia, it is noted that a Russian crew member instigated a fight with another Russian who spoke English readily and who engaged in social contact with other crew members from Japan, Austria, and Canada. Clearly this "in-group/out-group" issue is important to address in order to develop team morale and work effectiveness on missions involving multicultural crews.

HARDSHIP AND SATISFACTION

Canadians posted to countries with the severest living and working conditions tend to report higher levels of satisfaction than those assigned to countries of lesser hardship (11). Faced with a difficult situation, people tend to bond together for mutual support. This serves to increase the morale and effectiveness of the team. It is this experience of camaraderie which returning soldiers from World War II and other military expeditions described as so personally enriching and so powerful in its effects.

RELEVANCE TO MULTICULTURAL CREWS IN SPACE

Palinkas and Browner (21), studying the effects on people of long duration stays in isolation uncovered the same relationship between hardship and satisfaction: the more severe the environment, the better the outcomes, both personally and professionally. The relevance of this finding for multicultural crews living and working together on the International Space Station is not readily apparent. The ISS environment may not be perceived as one of hardship, but it is certainly dangerous and this may motivate the astronauts to work hard on overcoming the cultural differences between crew members and enhancing cooperation and team spirit. On the other hand, the monotony which often characterizes space missions (17, 28) may tend to exacerbate conflict due to intercultural differences.

HEADQUARTERS VS. FIELD

One of the recurring findings in the studies of sojourner groups (14) is the difficulty of communication between personnel working in the field and headquarters managers. Overall, field personnel report that they do not feel understood, supported, or trusted by headquarters' managers. They feel that managers at headquarters are out of touch with the reality of the field and make decisions and give directions that inhibit rather than enhance their effectiveness.

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Similarly, crew-ground communication has been identified in several studies (8,9,28) as problematic. As Suedfeld & Steel point out (28), "the crew's relationship with the parent organization can be strained when mission controllers....micromanage its activities" (p. 237). Kanas and colleagues (9) identified "the displacement of negative feelings" from crew members to mission control personnel as a critical issue that needs to be addressed since "mis- communication between crew members in space and mission control may negatively affect work schedules and lead to inadequate responses during emergencies" (p.1). Given the planning underway to recruit and send multicultural crews into space, the danger of displacement and mis-communication with mission control is likely to increase substantially. Given this reality, countermeasures will need to be developed.

PROFILE OF SKILLS FOR INTERCULTURAL EFFECTIVENESS

Over the past 50 years, there has been extensive empirical research on trying to identify the skills, knowledge, and attitudes needed to live and work in another culture (4,13). Recent research continues to replicate previous findings and thus serves to confirm the validity of a set of general traits and skills needed to be successful in another culture. Traits such as, relationship building, respect, tolerance for ambiguity, flexibility, realistic expectations, initiative, self-confidence and others are consistently identified by researchers as part of the skills profile needed for success in another culture. Building on this research, the recent work of Vulpe and colleagues (31) has succeeded in establishing a very detailed description of the actual behaviour of interculturally effective people. Accordingly, the case can be made that we know a lot about what it takes to be effective in another culture, at least in terms of the personal skills and traits associated with intercultural success.

RELEVANCE TO MULTICULTURAL CREWS IN SPACE

The literature on psychology and space reveals a definite concern with identifying and measuring the skills and traits, "the right stuff", needed to live and work effectively in space (17,23). Related literature (20,25) dealing with performance in ICE environments concludes (as does the literature on intercultural effectiveness) that the "right stuff" may vary according to the demands and context of the situation. Therefore, perhaps the most important point to make here is simply that the emerging reality of ***multicultural*** crews living and working in ***small groups***, in a ***confined*** and ***isolated*** space, and perhaps for a ***long duration*** will necessitate a more in depth look at the variety of skills needed for ensuring success in space. If McFadden and colleagues (18) are correct in their conclusion that "astronauts are highly screened on the basis of past attainment, but not... on aspects related to teamwork and interpersonal concerns" (P. 904), the challenge of establishing valid selection criteria is a substantial one. The intercultural effectiveness literature and its practical applications to date should be helpful in this regard.

THE CHALLENGE OF ASSESSMENT

Despite the substantial success achieved in identifying the traits and skills needed to be effective in another culture, there remains the challenge of being able to accurately assess people on these criteria. There are many reasons for this state of affairs but the failure of established psychological inventories to predict behaviour and performance in another culture is a major stumbling block. Currently this author is testing an instrument (*The Intercultural Living and Working Inventory*), which measures intercultural skills and knowledge and readiness for international assignment, to further validate its power to predict behaviour and performance in another culture. Other approaches which show promise involve behaviour-based assessment techniques (16).

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It would appear that the same situation applies to the screening and selection of astronauts. The various tools which have been and are still used to screen candidates have not been validated for their usefulness in predicting behaviour and performance on mission. Given the added challenge of establishing a more comprehensive profile of skills needed to live and work effectively as part of a multicultural team in space, it can be argued that the screening and selection of astronauts offers fertile ground for future research.

THE ROLE AND IMPACT OF INTERCULTURAL TRAINING

Although studies attempting to evaluate the impact of intercultural training remain inadequate for "proving" its effectiveness in equipping people with intercultural skills (12), there is a need to prepare and assist people in being able to live and work effectively in another culture. Evidence abounds with respect to the multiplicity and variety of problems which people encounter on entering a new culture. Many types of intercultural training, from the very didactic to the very experiential, have been tried over the years. The recent emphasis in cross-cultural training, and in the field of training more generally, has been to identify the behavioural competencies needed for success and to then design training programs aimed at acquiring these skills. This new behaviour-based approach to intercultural training provides trainees with the opportunity to learn about and actually practice interacting with people from different cultures. One of the benefits of this approach is that it makes easier to measure skills acquisition and thus may permit a more scientific evaluation of the effectiveness of intercultural training programs.

RELEVANCE TO MULTICULTURAL CREWS IN SPACE

No one is likely dispute the enormous importance of training and preparation for missions in space. Traditionally, much of the pre-departure training and preparation has focussed on physical adaptation and technical/professional competency. But assisting astronauts to deal with interpersonal conflict, to develop collaborative team skills, and to be able to adapt management and leadership styles has been increasingly recognized as an important component of pre-departure training (10,17). Once again, the multicultural reality of future teams in space will necessitate training and preparation for dealing with problems that may arise due to cultural differences among crew members. Also, if mission control is essentially an extension of the multicultural team in space, they will need similar training.

MONITORING AND SUPPORT

Anyone who has had responsibility for recruiting and managing expatriate personnel will readily speak to the importance of monitoring performance and providing support to employees and staff posted abroad. Too often people are sent into other cultures and left to fend for themselves. Failure rates, as measured by early return, are estimated from 15% to 40% for American business personnel, and of those who stay, less than 50% perform adequately (1,3). Often the reason for early return has to do with family adjustment problems. In a study of Canadian technical advisors posted to Egypt (14) over 90%, including spouses, identified the need for in-country support services (such as on-arrival orientation, seminars, counselling, etc.) to help them adapt and be effective while living and working in Egypt.

RELEVANCE TO MULTICULTURAL CREWS IN SPACE

Research on space and psychology, including the extensive research on ICE environments also identifies monitoring and support as vital for achieving successful outcomes. In fact, this may be an area where international sending agencies could learn something from the space community. Manzey and colleagues (17) address this issue in detail, emphasizing the need for in-flight support to track and address the emotional state and well being of astronauts, as well as monitoring performance efficiency. Additionally, they highlight the importance of family support (as does Suedfeld and Steel) (28) highlighting the fact that the "family" aspect of in-flight support has often been neglected. The sending of multicultural crews on long duration space missions only serves to re-enforce the importance of monitoring and support.

DEBRIEFING AND RE-ENTRY

Although research on expatriates has found that re-entry culture shock is often more severe than the culture shock experienced in adapting to the foreign culture, few international agencies or companies offer their employees any systematic debriefing/re-entry program on return. The opportunity to learn from the employee's intercultural experience is lost and the need to assist employees and families to re-adapt to the home culture is ignored. Returning personnel often express frustration because they feel their international experience is not exploited by their employer and the difficulty of their re-entry on themselves and their families is unacknowledged. (2,27). This is often cited as one of the reasons why many returning expatriates actually resign from the companies which sent them to work internationally.

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The debriefing of personnel is probably another area in which international sending agencies could learn something from the space community. Certainly, the study currently being implemented by Kanas and colleagues (9) is exciting in this regard. As part of the investigation they have designed "a new culture and language questionnaire which assesses the subjects' experiences with people from other cultures and their facility in speaking other languages". The work of Kass & Kass (10) is also noteworthy with its focus on debriefing, including review and analysis of interculturally-based problems. With respect to re-entry assistance, it is not clear from the space literature what support, if any, is given to returning astronauts and their families. Interestingly, in the Space Psychology Workshop hosted by the Canadian Space Agency in Banff from January 24-25, 2002, the initiation of a study of the post flight life of astronauts was highly recommended by the participating group of experts.

SOME KEY ISSUES TO ADDRESS TO ENHANCE THE EFFECTIVENESS OF MULTICULTURAL CREWS IN SPACE

SCREENING & SELECTION

What is required at this time is to better understand the impact of the various environmental, organizational, and individual factors on the performance of multicultural crews in space. More specifically, there is a need to establish a common set of criteria and procedures for screening and selecting astronauts from the different cultures participating in the ISS. Suedfeld & Steel (28) report that the European Space Agency has already acknowledged the need for common standards and procedures and is attempting to develop a standardized selection procedure for its program. This will no doubt be a challenge as there are likely some important cross-cultural differences in this regard. For example, it is reported (17) that the Russian space program emphasizes team selection believing that crew compatibility is essential for mission success whereas NASA focusses more on assessing the strengths and weaknesses of individual astronauts**.** Although some (17) argue that the empirical research shows homogeneity of group members to be best for ensuring compatibility, there are others who argue the benefits of heterogeneity. Marilyn Dudley-Rowley, Chief Scientist at OPS-Alaska, an extreme environments research firm, has presented data showing that homogeneous groups experience more interpersonal problems than did heterogeneous groups. In her view, "people of different backgrounds have more to teach one another over the long haul than do people who are alike" (5). Clearly, in the search to establish a common set of selection procedures, this is an issue which will need further investigation.

INTERCULTURAL TRAINING

Assuming that we come to understand the effects that multicultural crew composition has on behaviour and performance in space, Palinkas (20) raises the important question: "Are there existing forms of training used in other contexts that can be adapted for training multicultural crews (or)... do the special characteristics of these missions, crews, and environments require new technologies for training..?" (p. 49). The field of intercultural training has been evolving over the last 50 years. A lot is known about the problems one encounters on trying to communicate across cultures and how training can help to overcome these problems. Although existing intercultural training programs may well need to be modified to be more applicable to the situation of multicultural crews in space, there is good reason to be optimistic that this can be achieved**.**

MONITORING AND SUPPORT

What types of monitoring and support would help minimize negative impacts and maximize the effectiveness of multicultural crews in space? The need for psychological in-flight support to ensure optimum well-being and to prevent performance overload is discussed at some length by Manzey and colleagues (17). Data from the long duration space simulation experiments conducted by Kass & Kass (10) apparently demonstrated that "internal and external supports do make a difference in the crew's abilities to cope with boredom and to build relationships among the crew" (p.4). Given the planning underway to staff the ISS with astronauts from different cultures, it would seem critical to know how to monitor and support these crews for dealing with problems arising from cultural differences.

DEBRIEFING AND RE-ENTRY

As mentioned earlier, a study of the post-flight life of astronauts would be useful. If such a study included a debriefing aspect, this would contribute to identifying the positive and negative impacts of multicultural crew composition and, as well, to clarifying the types of support needed to cope with intercultural problems. Studying the post-flight life of astronauts would also help to identify longer term impacts, particularly on personal and family relationships, and would hopefully identify the type of interventions needed to help returning astronauts and their families re-adjust to everyday life.

OTHER ISSUES: GROUP INTERACTION, GROUND-CREW COMMUNICATION, STAGES OF ADAPTATION

Other issues, such as group interaction, ground-crew communication, and stages of adaptation on long duration space flights, are also important to address. Once again the evolving multicultural reality of space missions will undoubtedly challenge existing knowledge and assumptions with respect to achieving successful missions in space. Different languages and cultures, longer stays on ISS, the enormous demands of a mission to Mars necessitate studying what is needed to ensure effective team work, good relations and communication between ground and crew, as well as exploring the time effects on multicultural crew performance and behaviour.

THE EFFECTIVE FUNCTIONING OF MULTICULTURAL CREWS IN SPACE: ESTABLISHING AN ACTION PLAN

It should be noted that any and all steps of this proposed action plan would ideally involve a cross-cultural collaboration. All countries that are involved in the ISS should come together to establish a set of **common standards and procedures** for the selection, training, support, and evaluation of multicultural crews living and working on the ISS.

STEP ONE: SURVEY RESEARCH

Survey research needs to be conducted to identify current policies, practices, and procedures among all participating countries involved in the ISS with respect to the selection, training, support, evaluation and debriefing of astronauts. The aim of such a survey would be to identify the key similarities and differences between national policies and procedures with the goal of discovering best practices and ideal standards which promote successful outcomes for the ISS and other collaborative endeavours in space.

STEP TWO: UNDERSTANDING THE EXPERIENCE OF MULTICULTURAL TEAMS IN SPACE

Research needs to be designed to study the behavior and performance of multicultural crews in space. The study being undertaken by Kanas and colleagues (9) and the work of Kass and Kass (10) is on target, but much more research is needed to understand the effects (positive and negative) of culture on crew performance and behavior.

Step Three: Establishing a Profile of Skills

A profile of the skills and traits needed to be an effective member of a multicultural crew living and working in space should be established. To achieve this goal, various methods might be utilized, such as, reviewing past related literature, monitoring individual and group interactions during space flight, and debriefing returning astronauts. More reliable empirical results would be had by testing and interviewing astronauts acknowledged for achieving a high level of personal and professional success and comparing their results with to those judged to be much less effective. It is encouraging that some research along these lines has already begun to identify empirically the traits needed for success in space (18,23). But much more rigorous research is required to build a comprehensive profile including identification of specific intercultural skills needed for success. As Suedfeld & Steel (28) report, various traits have been identified for success in space but they "have been tested, if at all, only in relatively gross ways" (p. 241).

Step four: Test and Validate Methods for Assessing Skills and Traits Needed for Effectiveness

To date there is no instrument which has been validated for predicting behaviour and performance of astronauts as individuals or as teams in space. Manzey and colleagues (17) argue that because the "assessment centre" method has been proven reliable and valid for selecting and training managers in industry, this method involving simulations, group exercises, paper and pencil tests should be used for screening and selecting astronauts. The assessment centre method has the enormous advantage of providing samples of the behaviour of individuals in interaction. It is, however, artificially contrived and to what degree it would predict group behaviour in space is unknown. Research to test its potential in this regard would be valuable, but it is also important to continue efforts to identify or develop an instrument that could predict an individual's potential to live and work effectively as a member of a multicultural crew in space.

Step five: Design Training and Support Interventions to Promote the Effective Functioning of Multicultural Crews in Space

Although there are different opinions on whether homogeneous or heterogeneous crews perform better in space, current planning to send multicultural teams into space necessitates dealing with heterogeneity due to cultural differences. Given this situation, it would seem that pre-flight preparation and training and in-flight support targeted to deal with the misunderstandings and conflicts that may erupt due to cultural differences is absolutely critical for the success of future missions in space. Fortunately, there is a body of research and practice to draw on, as reviewed and discussed in the first part of this paper. Without doubt, the unique environment (isolated, confined and involving small groups of 3-6 people) in which multicultural crews will live and work will require some new approaches to training. Much of the intercultural knowledge and training methods developed over the past 50 years for other purposes can be modified and adapted for use in preparing and supporting multicultural crews to communicate effectively and work productively during long duration space missions.

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