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Tuesday, June 10

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510-53

072700

**Session TA5**  
**Room 5**  
**8:30 - 11:30 a.m.**

**Cultural and Gender Issues  
in Long-Duration Flights**

## PSYCHOSOCIAL ISSUES DURING LONG-DURATION INTERNATIONAL SPACE MISSIONS

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### INTRODUCTION

Psychosocial issues will play an important role during future manned long-duration international space missions. In order to improve the chances for mission success, these issues must be identified, and their impact on space crews must be characterized.

### METHODS

To explore these issues, a review was made of anecdotal reports from space and studies involving space simulation environments. This review included our survey of 54 astronauts and cosmonauts who had flown in space and our 135-day isolation study in the Mir space station simulator in Moscow. Based on this work, a number of important psychosocial issues were identified.

### RESULTS

Crew heterogeneity, as manifested by differences in gender, cultural background, and work experience and motivation, is one such issue. Unless these differences are understood and accepted, they can lead to crew member withdrawal and territorial behavior, scapegoating of individuals who are perceived to be different, and subgrouping along demographic or functional lines. A second issue pertains to commonality in language and dialect. If crew members cannot understand each other, this can result in confusion, conflict, and inadequate response during times of danger. A final issue relates to leadership roles, especially those that are task-oriented (instrumental) or supportive (expressive). Both roles are important, but if one is ignored or used inappropriately, competition for leadership position and role confusion can result. All of these issues can negatively affect crew morale, compatibility, and cohesion. They also can lead to intra-crew tension, which may affect performance or be displaced to outside individuals on the ground, thus causing problems in crew-ground communication.

### CONCLUSION

Based on anecdotal reports from space and simulation studies on Earth, a number of psychosocial issues have been identified which may play a role in the success of future long-duration international space missions. These issues need to be further characterized in the space environment, and we are hoping to do this during our ongoing study of crew member interactions during several of the current NASA/Mir missions.

## PSYCHOSOCIAL ISSUES IN CREW SELECTION: FINDING THE RIGHT MIX OF THE RIGHT STUFF

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### INTRODUCTION

Historically, attention to psychosocial issues in the selection of space crews has been severely limited. There is now three decades of experience putting groups of individuals on top of rockets, shooting them into oftentimes an unknown and extreme environment, and expecting them to deal with close confinement, isolation, and physical and mental challenges found in no other environment on earth. Regarding crew selection, we can now conclude with some confidence that the time has come to move from simply ruling out psychopathology towards identifying those individuals who are best suited to maintain maximal health and performance under these conditions.

### DISCUSSION

Current evidence clearly indicates problematic areas in which group functioning has been compromised to some extent. These include communication breakdowns, interpersonal dissension, conflicts over authority and control, and individual differences in response to environmental stressors. A renewed focus on psychosocial factors is beginning to yield significant information regarding optimal crew size, gender mix, composition, leadership structure, and the necessary interpersonal skills required for effective group performance in extreme environments. A broad overview of the issues surrounding the effects of isolation and confinement on group functioning in the space environment will be presented for discussion.

## CULTURE, GENDER AND MISSION ACCOMPLISHMENT: OPERATIONAL EXPERIENCE

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### INTRODUCTION

This presentation is an operational view of cultural and gender issues relevant to long duration spaceflight. Current and past space missions, including those of the NASA-Mir Program, are reviewed in terms of crew and organizational experience in these areas. Cultural adaptation is learned by both the individual astronauts as well as the organization as a whole. However, the principal cultural challenges occur at the organizational level, because the multinational crewmembers find considerable commonality through their shared aviation and spaceflight sub-culture. Within this environment, gender issues are clearly connected to cultural differences and reflect the evolution of gender roles within society at large.

### RESULTS AND DISCUSSION

Current methods of pre-flight preparation and inflight support are detailed, including cross-cultural training and activities for deployed personnel. Short flight is compared with long flight; crew-level issues are compared with those of the wider organization; and \*lessons learned\* are reported. The presentation concludes with a look forward at issues relevant to the International Space Station.

## INTERPERSONAL TENSION IN MULTICULTURAL CREWS

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### INTRODUCTION

Future manned space missions are likely to result from collaboration of several space organizations and involve multinational crews. It is generally assumed that the likelihood of interpersonal tension increases as a function of crew heterogeneity, but specific questions related to cultural diversity have so far been a neglected area of research.

### METHOD

Behavioral observations and questionnaires administered to crew members in actual and simulated missions in space, aircraft, diving environments and expeditions in remote areas were the assessment tools used.

### RESULTS AND CONCLUSIONS

Studies from actual and simulated space missions (Santy et al., 1994; Sandal et al., 1995) and multinational airlines (Helmreich & Merrit), indicate that cultural factors that might negatively affect interpersonal compatibility include language problems, differences in need for privacy, contrasting norms and values, and prejudices. Also, conflicting views regarding appropriate gender behavior have been reported. Culturally based tension might be explained partially in the light of contrasting values, reflected in dimensions as power distance, collectivism, and masculinity. General group processes leading to clique formation and "scapegoating" of deviant members might also provide an explanatory framework.

## PERSONALITY AND COPING IN EXTREME ENVIRONMENTS

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### INTRODUCTION

A previous research program at NASA used the Personality Characteristic Inventory to evaluate personality predictors of performance in an aviation environment. This assessment battery includes scales measuring negative and positive aspects of expressivity and instrumentality. Three personality profiles were identified that differentially predicted performance. Interpersonal sensitivity combined with strong achievement motivation was consistently associated with superior performance. This profile was referred to as the "Right Stuff". Poor performance was linked to profiles typified by low interpersonal sensitivity and a hostile, competitive orientation ("Wrong Stuff"), or low interpersonal sensitivity combined with low achievement motivation ("No Stuff").

### METHOD

The Personality Characteristic Inventory was used in our own studies to investigate relationships between particular personality profiles and coping in extreme environments. Groups of individuals were assessed in the following conditions: isolation in hyperbaric chambers, a polar expedition, military training, and submarine missions.

### RESULTS

Study 1 (N=18) examined whether particular profiles predicted types of self-reported coping during isolation in hyperbaric chambers. The results indicated that the "Right Stuff" profile was associated with low anxiety and high well being. Study 2 (N=15) assessed possible differences in personality profiles among polar expedition members. The findings demonstrated that most participants were characterized by the "Right Stuff" profile. Study 3 (N=46) evaluated the relationship between personality profile and endocrine activation during military training, and found that the "Right Stuff" profile was associated with lower endocrine activation. Study 4 (N=56) examined relationships between personality and self-reported stress and endocrine activation during submarine missions. Those with the "Right Stuff" profile experienced relatively less stress due to interpersonal factors, and lower endocrine activation.

### CONCLUSION

The results supported the predictive efficacy of the Personality Characteristic Inventory profiles for astronaut selection.

## APPLICATION OF EXPEDITION AND POLAR WORK GROUP FINDINGS FOR ENHANCING PERFORMANCE IN SPACE

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### INTRODUCTION

Planning for the construction and operation of the International Space Station and future trips to Mars requires a consideration of psychosocial, cross-cultural, and gender factors as the crew lives and works together in carrying out their mission. Prolonged isolation and confinement exacerbated by monotony and boredom can lead to increased interpersonal and intrapersonal tension, with effects on group cohesiveness and work performance. Open antagonism directed toward fellow crew members or Mission Control, and social withdrawal and isolation have been documented. Social interactions and task performance of expedition teams and small work groups in polar and other extreme environments have been viewed as an analog to the performance of groups in space; examination of these findings can be informative for space mission planning.

### METHOD

Data on personality characteristics, stress and coping patterns, group processes, and work performance were collected on two Soviet-American expedition teams, and a number of polar work groups. The composition of each group differed in terms of nationality, gender, and experience level of individual members. The intervals at which data were collected and the particular measures used varied for each group, depending on the specific questions of interest.

### RESULTS

Evaluation of the Soviet-American expedition teams indicated differences across national groups in the specific motivation for participating in the trek. Cultural factors were also evident in the attitude of male team members about various aspects of the competence of their female team counterparts. Variations in the experience level of national co-leaders were associated with problems in group cohesion and task effectiveness at times of external stress and danger. Studies of polar work groups have demonstrated that individual differences in personality characteristics are highly important in how individuals cope with isolated environments. High achievement orientation, narrow interests and a low need for stimulation, a repressor or denial coping style, low stress reactivity, and low anxiety and bodily concerns were characteristic of those who performed better in isolated environments.

### CONCLUSION

Recommendations for countermeasures to enhance work performance during space missions will be proposed, based on the review of findings from different types of polar expedition and work groups. The focus of these recommendations is on increasing the cohesiveness of the social network during long-duration space missions as a major means of improving daily living and task effectiveness.