

Psychological Health Maintenance on Space Station Freedom

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The scheduling of crew rotations for up to 180 days on Space Station Freedom presents a special challenge for behavioral scientists who are tasked with providing psychological support for the crews, their families, and mission flight controllers. Preflight psychological support planning may minimize the negative impact of psychological and social issues on mission success, as well as assist NASA management in making real-time mission planning decisions in the event of a significant social event (for example, the death of a family member). During flight, the combined psychological, emotional, and social stressors on the astronauts must be monitored, along with other aspects of their health. The Health Maintenance Facility (HMF) will have the capability of providing preventive, diagnostic, and therapeutic assistance for significant psychiatric and interpersonal problems which may develop. Psychological support will not end with the termination of the mission. Mental health professionals must be part of the team of medical personnel whose job will be to facilitate the transition—physical and mental—from the space environment back to planet Earth. This paper reviews each phase of mission planning for Space Station Freedom and specifies those factors that may be critical for psychological health maintenance on extended-duration space missions.

Introduction

THE scheduling of crew rotations for up to 180 days on Space Station Freedom presents a special challenge for behavioral scientists who are tasked with providing psychological support for the crews, their families, and the mission flight controllers. It is essential that mission planning take into account the psychological well-being of the crew, both as individuals and as a group. This task requires that we think of the crew as participants in a complex social "system" that incorporates not only the crew and the environment of Space Station Freedom, but also all of the individuals and groups who interact with them throughout the duration of the mission. All of the participants in this social system will have dramatic impact on the health and psychological well-being of crew members.

Investigations conducted on isolated groups in various analog environments have yielded remarkably consistent results. Individuals making up such groups routinely experience homesickness, anxiety, boredom, and in some cases, depression.¹⁻⁵ Sleep disturbances are the most common physical complaint,^{2,3} followed by the development of numerous psychosomatic manifestations. Many of these symptoms will have significant impact on the individual's and the group's ability to perform effectively tasks assigned to them. Interpersonal issues may also seriously impair the performance, productivity, and health of crew members.

In order to provide the most comprehensive psychological support, as well as to identify problems and develop appropriate countermeasures, it will be important to evaluate all phases of the mission—preflight, inflight, and postflight. This paper describes current and future planning for psychological health maintenance on Space Station Freedom during all mission phases.

Preflight

The components of a psychological health maintenance program for extended duration space missions are discussed in Ref. 6. The following subsections describe the current status of efforts at the Johnson Space Center for planning and implementing psychological and social support for Space Station Freedom.

Psychosocial Support Planning

The goals of psychosocial support planning are twofold: 1) to support healthy individuals in abnormally stressful environments or situations, and 2) to promote and protect the health and facilitate the performance and productivity of flight crews. These goals can be accomplished by identifying and reducing potential stressors, and by identifying existing behaviors and resources or assisting individuals and families in building new coping skills and establishing new support resources.^{7,8}

Preflight psychosocial support planning will include the development of individualized "support plans" for crew members and their families. Figure 1 is an outline of such a plan. The purpose of these plans is to minimize the negative impact of psychological and social issues on mission success, as well as to assist NASA management in making real-time mission planning decisions in the event of a significant social event (for example, the death of a close family member).

Currently, a great deal of effort and preparation is underway to identify potential strategies to manage psychosocial problems during an extended-duration mission. It is thought that the process must be "individualized" for each crew member, because each family's needs will be different. Phases of the process will include the following: 1) premission questionnaire to families (launch through nine months), 2) personal interview with astronaut and family (launch through three months), 3) final support plan for all crew members complete (launch through one month), 4) inflight intervention log (during mission), and 5) postflight debrief (one to two months postflight).

Crew Psychological Training

The focus of crew psychological training (CPT) is primarily educational. There is a large literature available on the psychological and physical effects of isolation on individuals and groups. It is thought that by focusing initially on an intellectual appreciation of potential problems and their impact in

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Crewmember: _____		Launch date: _____	
Mission: _____		Return date: _____	
FAMILY		CREWMEMBER	
Family members	Availability	OPERATIONAL PREFERENCES	RECREATION:
Spouse		PROBLEM	Music:
Children		Death	Reading:
Parents		Illness	TV/Video:
Others		Serious inflight problem	Hobbies:
Comments:		Spouse	HABITABILITY
SOCIAL SUPPORT NETWORK		Children	Food pref:
Friends:	Religion:	Property	Privacy needs:
School	Professionals	Finances	STRESS MGMT
Other family	Astronaut Office	Preferred contact: <u> audio </u> video	Biofeedback
		time preferred:	other:
		frequency:	INTERVENTION PREF.
		COMMENTS:	crewmember:
			mission control:
			family:

PREFLIGHT CHECKLIST

☐ preflight questionnaire
☐ preflight interview
☐ mission database

FAMILY: ☐ social support network complete
☐ preflight financial planning
☐ child care provisions
☐ coordination with mission planners
☐ disaster plan complete

Comments: _____

INFLIGHT INTERVENTION LOG

Date	MET	Nature of problem	Consult	Intervention	Outcome

POSTFLIGHT DEBRIEF

Fig. 1 Summary psychosocial support plan.

analog environments, CPT will be more acceptable to astronauts who tend to be wary of psychology and psychiatry in general.

The training course will have two phases: the first will occur during the initial year of an astronaut's training. Emphasis will be placed on group experiences in analog environments and basic interpersonal communication skills. After crews are assigned for Space Station Freedom, the training will focus primarily on the interpersonal issues that develop between and among crew members, with an emphasis on developing group problem-solving strategies for coping with operational demands.

Training course objectives are the following: 1) to provide an understanding of group and social processes that may negatively impact individual and crew performance during extended missions, 2) to assist space crews in developing problem-solving strategies, and 3) to train individuals and crews in state-of-the-art stress management techniques.

Resource Management and Team Development Training

Team development training has been an effective technique for enhancing crew coordination in the aviation environment.⁹⁻¹² Foushee¹² noted that a review of aviation accident statistics suggests that most problems may be caused by the flight crew's "inability to coordinate skills into effective courses of action." In other words, although individual proficiency may be high, many flight activities require a coordinated group effort. This will also be true in the space environment. Line-oriented flight training (LOFT) and cockpit resource management programs (CRM) provide training in the aviation environment that may facilitate crew communication and coordination. Some of the techniques used in this type of training may be applicable to the space environment as a method for fostering team development among crew members, which in turn may facilitate crew performance.

The tasks of Space Station Freedom crew members will be considerably different from those of an airline crew, but the approach suggested in the LOFT and CRM programs might be adapted for spaceflight training.

Space Station Freedom Habitability Issues

Issues related to habitability have been reviewed elsewhere.⁶ The subject is mentioned here because of its critical importance to crew performance and productivity on extended missions. Whenever operationally and economically feasible, habitability issues should take high priority. It is easy for engineers and managers to underestimate the importance of habitability factors in their mission planning. In the short-term, they are likely correct: High motivation and short missions can certainly combine to minimize the effects of an environment that is not conducive to efficient and comfortable living. However, on tours of duty for Space Station Freedom, some of which will last 180 days or longer, attention to the environment will be a significant factor in maintaining crew morale and motivation, and by extension, crew performance and productivity.¹³⁻¹⁵

Inflight

Health Maintenance Facility

During flight, the combined physiological, emotional, and social stressors on the astronauts must be monitored, along with other aspects of their health. The health maintenance facility (HMF) planned for Space Station Freedom will provide inflight medical and psychiatric treatment for crew members. Specific medical equipment, psychopharmaceuticals, and laboratory support necessary for the appropriate diagnosis and treatment of emotional disorders (particularly any that would constitute a medical emergency) are currently being incorporated into the HMF operational configuration. Psychiatric diagnostic and treatment issues have been reviewed elsewhere.⁶ Crew members will have the availability of state-of-the-art stress management techniques, and those crew members who choose to use them will experience the appropriate training preflight.

Inflight Consultation

The chances of development of an interpersonal, emotional, or behavioral problem inflight are not insignificant. In particular, behavioral problems, including psychosis, may be the result of an accidental toxic spill in the closed environment of the station; interpersonal conflict may reach a point where intervention is required to minimize mission consequences. Psychiatric and psychological consultation will be made available on call to both the flight crew and flight surgeons who will be monitoring the general health of the astronauts inflight.

In addition, mental health professionals will also play a role in providing inflight support to the families of crews for whatever problems may arise.

Strategy for the Management of Inflight Psychiatric or Interpersonal Emergencies

A flowsheet outlining the general strategy for management of inflight psychological or psychiatric problems is detailed in Fig. 2. This figure is only a general outline of the planning currently underway to manage behavioral problems inflight. The basic philosophy is to minimize intervention from the ground. The commander (CDR) of a particular Space Station Freedom crew is the individual responsible, in most cases, for bringing a problem to the attention of ground support personnel. The CDR is likely to have made initial attempts to solve the problem within the crew, or with the individual crew member involved, before deciding to consult with mission support personnel.

It is also possible that the crew flight surgeon may notice a problem, either during medical consultation or while observing crew activities. In that case, the flight surgeon may intervene directly, and he or she may choose to involve behavioral consultants at any time.

It should be mentioned that the type of intervention outlined in Fig. 2 will be reserved for "mission-relevant" problems (i.e., problems that may have mission impact in the opinion of the CDR or flight surgeon). It is very possible that situations, such as minor problems or feelings, may develop during a tour of duty on space station Freedom for which such a formal process is contraindicated. We are planning on assigning one individual from the psychological support group for each mission, who will be available to any crew member at any time for informal discussions, consultation, etc. This informal process is currently being developed and may be even more important on a day-to-day basis than the one outlined in Fig. 2.

All management strategies will probably be further delineated and tested during the extended-duration orbiter (EDO) Shuttle missions. These missions will last from 16 to 28 days, and they will be the first opportunity to evaluate and implement plans for long-duration missions.

Inflight Biobehavioral Research

There is much that is not known about human adaptation to the space environment. In particular, the psychological and behavioral responses of astronauts have claimed little research attention in the U.S. space program to date. The Soviet space program has completed some work in this area, but there is a considerable amount of research that must be done in the areas of astronaut selection, crew selection, psychophysiology, performance and productivity, and interpersonal and group dynamics.

Space Station Freedom offers a unique opportunity to research these issues and to develop the essential preventive and countermeasure techniques to facilitate human psychological adaptation to the space environment.

Postflight

Psychological support does not end with mission completion and return to 1 g. Mental health professionals should be part of a medical team whose job will be to facilitate the transition, physical and mental, from the space environment back to Earth.

The mental health components of a postflight recovery program should be integrated into a comprehensive medical rehabilitative approach. Our Soviet colleagues have had considerable experience in the rehabilitation of cosmonauts who have spent many months in space. It would be useful to catalog some of the experiences that crew members and their families have undergone after being reunited at the end of a six-month

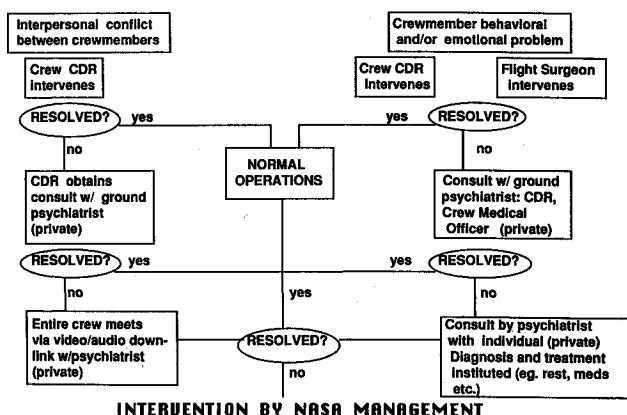


Fig. 2 Management of interpersonal and behavioral problems.

to one-year space mission. Some anecdotal information has been published¹⁶⁻¹⁸ and might be particularly useful in planning.

Military families must frequently deal with the issue of separation and reunion.¹⁹ Each family handles this in its own way, depending on the level of maturity and the specific circumstances of that particular family. The return of a family member who has been absent for an extended period of time places a great deal of stress on all family members, who must readjust roles initially when the individual leaves on the mission, and again, to accommodate that person's return. Emotional conflict is not uncommon, despite outward enthusiasm for a reunion. Why is it important to deal with this issue? NASA flight crews have duties and responsibilities postflight; even more important, they must be able to function effectively between flights or tours of duty. Family problems and conflict might seriously handicap the returning crew member's ability to reintegrate into family and work. The goal of mental health planning at this stage of the mission is to minimize the negative aspects of that transition, thus diminishing the professional cost (in terms of performance and productivity), as well as the human cost (in terms of happiness and well-being).

Summary

This paper has only briefly discussed issues that are relevant to psychological health maintenance on the Space Station Freedom. Although some efforts have been initiated to provide the necessary operational support for extended missions, there is much that still needs to be done in this important area.

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