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Needed space station crew activity investigations

Experiences in long-term flights on space stations have provided evidence that the longer the space mission, the more important become psychological factors, the required knowledge about these factors, and their changes. During the flight, when psychological monitoring is most important and needed, it becomes mostly difficult.

The methods used should be objective, non-obtrusive, non-disrupting, mission related, useful for crew itself (immediate expert-system based feedback) as well as that they should be neither tedious nor artificial nor abstract, so that they will not be avoided but accepted by the crew. There is a heightened need for new measurements and methods which are objective, reliable, computerized, continuously, or at least repeatedly, applicable in order to achieve – in a perfect setting - monitoring of nearly all behavior and performances during a mission.

Irrespective if and how psychological monitoring is to be fully understood, it must first be viewed as an essential support tool for the crew, parallel to the technical monitoring systems e.g. of fuel and water quality. Rigorous selection of the crew favors those who are tough, enduring, well-trained, performance-oriented, and unaccustomed to “needing” the help of psychologists. Although these participants are honest in subjective self-evaluation, they tend to exhibit repression. This requires re-thinking, and re-evaluation of psychological methodology. Presently, psychological monitoring focuses usually only on performance in special and common tasks, for example docking training, or have a scientific background.

We still only have limited methods to objectively monitor all the indicators mentioned. Sensitive observation and private conversation based on a trusting personal relation between ground and crew remain the most important. Likewise, the monitoring of group cohesion and group conflict should focus on the group dynamics, cultural life, events, group activities, sub-group separation.

For an autonomous decision making of the crew, an independent computerized support system on board could be a great assistance not only for technical problems.

There are first successful and promising attempts in video face emotion analysis. Voice frequency analysis is a very promising approach for space psychology. Voice cross analysis could indicate the common and individual amounts of communication but also the emotional states and reactions of the speakers. A wireless group structure monitoring could provide information about the dynamics of the crew structure during the mission. Work sample analysis represents an already well established method and is used as a routine monitoring. Really mission relevant skills (e.g. the hand controlled docking of a space craft on a space station or catching a free flying object by means of a hand controlled robot arm) are refreshed and trained during the mission, thus, providing information about the proficiency of the operators and about their actual motivational state. If this professional monitoring is associated with a physiological strain assessment, an indirect monitoring of the psychophysiological state is provided. It seems possible to implement features of embedded testing of fundamental cognitive functions into these refreshment trainers. However, areas such as automated daily duty analysis, analysis of the cooperation quality during shared duties, analysis of readiness and progress in coping with expert-system feedback or learning new things (e.g. the language of crew mates or new skills) as well as a spare time use analysis are currently only at the proposal level.