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THE “US VERSUS THEM” PHENOMENON: LESSONS FROM A LONG DURATION HUMAN MARS  
MISSION SIMULATION

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“Us versus Them” group dynamics have arisen and been documented in many situations, including space missions, simulated space missions, polar and military deployments. In 2007, a crew of seven researchers took part in the 100-day “FMARS-11 Long Duration Mission” (F-XI LDM) at the Flashline Mars Arctic Research Station (FMARS) on Devon Island, in the Canadian High Arctic. The purpose of F-XI LDM was to gather data for twenty-two scientific investigations while under simulated Mars conditions. Conditions included physical isolation on a remote uninhabited island, and a twenty-minute communications delay. While several studies were related to human factors and psychology, no study on communications between the crew and mission support was formally conducted. However, challenges in crew-support team interactions presented themselves. This paper is aimed at exploring crew interactions with the mission support team to identify qualitative trends from anecdotal observations during and after the mission, data collected from the crew during immediate post-mission interviews and pilot survey data taken four years after the mission. Results confirm the emergence of the well documented “Us versus Them” division that has frequently occurred between groups in isolated confined environments with remote management groups not under the same stressors. A conflict impact survey was developed by soliciting critical events from crew and support members exemplifying incidents where crew and support personnel struggled and grouped into taxonomy of categorical event types. Categories were then formulated into an online survey assessing frequency and impact (both short-term and long-term) on mission goals and crew performance. Preliminary results identified post deployment structural changes in communication protocols, changes to expected resources and support to crew communication problems were perceived as most disruptive by crew. Perceptions of impact were greater for future long duration missions by both crew and support respondents for these categories as well. Methodology for identifying relevant and salient exemplar incidents for inclusion into a more robust taxonomy of critical events will be expanded in near term additional studies. However, even with these challenges the mission was successful and all mission goals were met. Observations presented here may be useful in planning for future long duration planetary analogue missions, and crewed space missions.

## I. INTRODUCTION

In 2006-2007, a crew of seven researchers were selected from a global pool of applicants to conduct the first ever Mars analogue long duration mission (LDM) at the Flashline Mars Arctic Research Station (FMARS, Figs. 1, 2) on Devon Island, Nunavut, Canadian High Arctic (75°N, 89°W)<sup>1,2</sup>. The American/Canadian crew consisted of four scientists (one biologist, two geologists, and one computer scientist) and three engineers (two bioastronautics/aerospace engineers, and one computer technician and systems habitat expert), which included three females and four males. The crew spent four months at FMARS (F) as the 11<sup>th</sup> (XI) crew in the habitat since its construction and opening in 2000 (F-XI). The crew, F-XI LDM, conducted over twenty-two scientific investigations (Fig. 3) ranging from biology, geology, chemistry, human factors<sup>3</sup>, radiation and engineering<sup>1</sup>. Each project had an associated Principal Investigator (on either the crew or the mission support team) that coordinated the required samples, surveys, protocols and logistics. F-XI LDM spent four months in the summer of 2007 on Devon Island and were under restrictive simulation rules (no real time communications, no leaving FMARS without donning a simulation surface spacesuit, and more) during the 100-days of actual Mars surface operations.

FMARS is remote, as it is located on the largest uninhabited island on the world at the rim of Haughton Impact Crater. Because of its location, this two-story, eight-meter diameter research station is in an ideal setting to conduct a Mars analogue mission in an isolated confined environment (ICE)<sup>4</sup>. The science that can be conducted at the impact crater is similar to that what can be conducted on the Moon and Mars making Devon Island a well-known and acknowledged analogue site<sup>5,6</sup>. In addition to the delayed communication protocol between the crew and mission support, the infrastructure for satellite data transfer is fairly limited and slow, adding to the feeling of being on Mars.

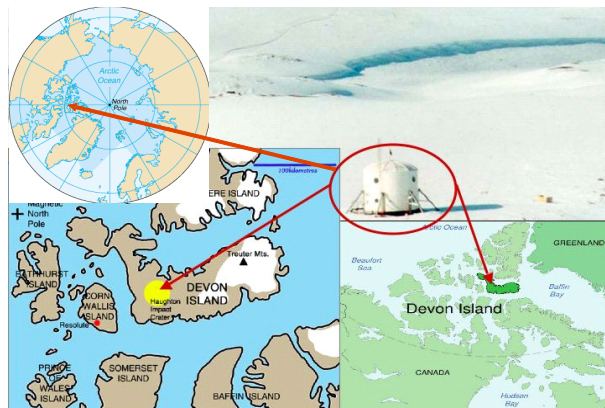


Fig. 1: Location of the Flashline Mars Arctic Research Station (FMARS), Nunavut, Canada.



Fig. 2: The 8 m diameter research station where the 100-day F-XI LDM took place, summer 2007.

Human factors research is a critical element of space exploration as it provides insight into a crew's performance, psychology and interpersonal relationships. Understanding the way humans work in space exploration analogue environments permits the development and testing of countermeasures for and responses to potential hazardous situations, and can thus help improve mission efficiency and safety.

This paper is aimed at exploring the crew interactions with the mission support team to identify trends from multiple sources (anecdotal observations during and after the mission, immediate post mission debrief interviews, and pilot survey data taken four years after the mission) that confirm the emergence of the well-documented "Us versus Them" division that has frequently occurred between groups under ICE conditions with remote management groups not under the same stressors.



Fig. 3: Two crewmembers conducting field research outside of FMARS. Photo by Christian Lamontagne.

## II. RATIONALE FOR STUDYING THE “US VERSUS THEM” PHENOMENON

The “Us versus Them” conflict is pervasive in small isolated groups when interacting with interdependent and supporting groups. The impacts of this conflict can cause serious problems and endanger mission success by minimizing the interchange of ideas and limiting necessary communication<sup>7</sup>. Dependent groups must be able to collaborate fully to achieve the goals of the particular endeavour. Without a highly functioning collaboration, there could be powerful impacts on the mission success. The reasons for studying this phenomenon are to maintain long-term team effectiveness, cohesion and productivity, and enhance the ability of the entire team to achieve overall mission success. It is our hope that lessons learned from this mission may be applied during the planning stages of future planetary or analogue missions, to increase team functioning and mission success.

## III. METHODOLOGY

Immediate post mission debriefs were held within several months after the mission through email response and face to face interviews. The crew found that despite close ties to people on the support team, feelings of “they don’t understand what we’re experiencing, and how much they are asking of us” were perceived to have arisen quickly. While such feelings united and strengthened ties within the crew, they led to deterioration of professional and social communications with the support team, and decreased performance efficacy. For example, as the official communication protocol with the science advisory group broke down, crewmembers began directly communicating with individual scientific advisers without formal structure, leading to disorganization and confusion. Secondly, friendships between individual crewmembers and support team members put strains on internal crew relationships. These external friendships positioned individual crewmembers as on-site support advocates, policing the provision of necessary information to support in a timely fashion, and provoking tensions around criticism of external support friends. These observations were confirmed by anecdotal reports by members of the crew and support team.

In an effort to approach the dynamics of the phenomena, a decision was made to develop taxonomy of event categories with exemplars that would allow for a more systematic assessment of frequency and impact. The extreme length of time was acknowledged as a potential confound and limitation to recall, however, it was also felt that events readily recalled after such a

length of time to have persisted in affect over time could be considered highly relevant.

Attempts were made to contact all crew and mission-support/remote-science-members to solicit feedback and input into identifying critical events that contributed to conflict, miscommunication, misunderstandings or other disruptions to the group dynamics between crew and external support teams. The need for an objective systematic debrief was explained and the use of an online anonymous survey proposed. Based on respondent suggestions and prior anecdotal reports in the literature<sup>8,9</sup> events were categorized into global categories and shared back with all members. A number of exemplar events were identified that occurred during the mission to serve as anchors for each category and to provide guidance.

All members were sent the link to the online survey (SurveyMonkey.com), which provided for anonymous access to the survey. Respondents were asked to rate a basic set of six events categories (see list below) as to 1) the extent to which they believed incidents of each type were frequent for the mission, 2) their impact on short-term goals, 3) their impact on short-term team functioning, and their opinion as to the potential impact on 4) mission goals and 5) team functioning for a long duration mission (e.g., a Mars mission). All frequency responses were on a 5-point Likert scale assessing ratings of rare, occasional, average, above average and frequent. All impact responses used a 5-point Likert scale assessing ratings of minimal, low, average, above average and substantial. Demographic information included only gender and mission role (crew or mission support), as these were believed to be important distinctions that would not compromise anonymity.

The *event categories* were as follows:

1. Structurally broken communication processes (e.g., when critical mission support personnel or crewmembers fell out-of-loop to deal with personal/family/work issues, creating a bottleneck in communication processes).
2. Problems resulting from reductions/changes in expected resources due to financial limitations (e.g. cancellation of supplies; cancellation of replacement parts for damaged equipment).
3. Communication (absent, delayed, incomplete, inappropriate) regarding operational decisions BY MISSION SUPPORT TO CREW (e.g., inadequate/incomplete explanation of cancellation of supplies/equipment due to financial considerations; responses to crew decisions taken autonomously; conflicting expectations (e.g., a mission support member’s instruction to treat support non-response as ‘meteor strike that knocked out communications’, and for the team to make their own science decisions)).

4. Communication (absent, delayed, incomplete, inappropriate) regarding operational decisions BY CREW TO MISSION SUPPORT (e.g., uncommunicated decision by crew to use motorcycle helmets on EVAs; decisions by crewmembers to contact science team members directly outside protocol).
5. Inadequate or insufficiently explicit preparation/training procedures for task completion (e.g., procedures for the “weeping cliffs” study; dealing with water contamination by diesel fumes while testing snow melting device).
6. Changes to science protocols after crew arrival on Devon Island (e.g., the Mars Time study, which was proposed after arrival; changes to communication protocols).

#### IV. RESULTS

A total of seven respondents were able to contribute to the survey: five crew and two mission support members. There were four male and three female respondents. The extremely short time frame for response (1 week) was most likely a contributor to the low participation rate. However, several remote science members indicated that they simply had not had sufficient contact with the team over the mission to fairly evaluate the events. The FXI-LDM mission used a distributed volunteer network of mission support and remote science support, so a number of support personnel had only minimal and sporadic involvement with the crew, placing a higher reliance and burden, and hence potential for positive or negative impact, on a smaller group of support personnel.

Figure 4 displays frequency results across the six categories of events. The highest frequency was seen in structurally broken communication processes.. It should be noted that 100% of high ratings on all categories were made by the crew only. At no time did either of the mission support respondents rate any of these categories as above average in frequency. Although the numbers are very small and extrapolations should be taken with a great deal of caution, the dichotomy between crew and mission support member perceptions on frequency of occurrence may underscore one source for the emergence of polarization and discord between groups. Particular attention on this factor will be included in a subsequent study.

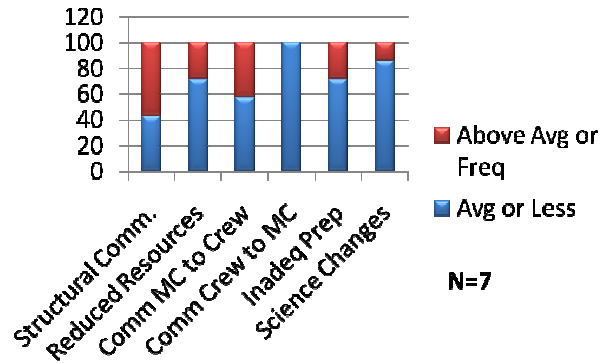


Fig. 4: Frequency of Occurrence.

For short term impact on mission outcomes, Figure 5 indicates that structural communication breakdowns, communication deficits surrounding reductions in resources and in mission support communication to crew were seen as impactful above average or substantially. For structural communication problems and those associated with reductions in resources, at least one mission support respondent shared the view of high impact. However, only crewmembers rated communication problems with mission support to the crew or the crew to mission support as highly impactful.

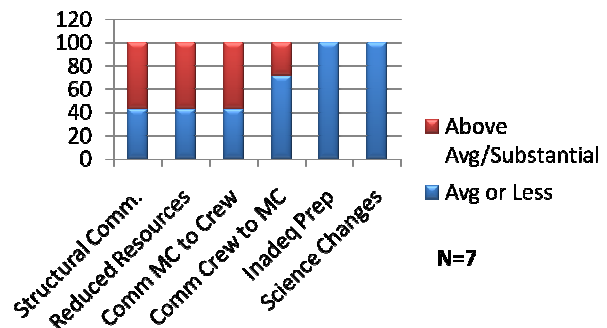


Fig. 5: Short Term Impact on Mission Outcomes.

There were three categories equally rated as having a notable significant impact on short-term team functioning: structural communication breakdowns, communication from mission support to the crew and changes in the science protocol after deployment (see Figure 6). A similar situation was seen with impact on mission outcomes: at least one mission support respondent agreed with two crewmembers’ ratings of high impact when evaluating structural communication breakdowns and communication from mission support to crew. Interestingly, the single rating of high impact for communication problems related to reduced resources was made by a mission support person.

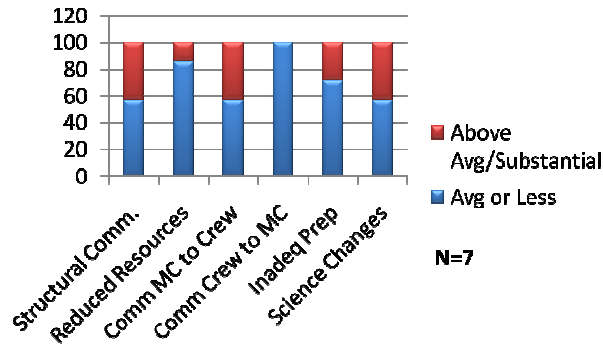


Fig. 6: Short Term Impact on Team Functioning.

It is notable that the potential impact on long-duration mission outcomes was clearly weighted substantially heavier than perceptions of impact on the existing mission (see Figure 7). Five out of the seven members (four crew and one mission support respondent) rated structural communication breakdowns as potentially significantly impactful. Although slightly fewer participants rated communication problems regarding reduced resources and communication problems to and from mission support as likely to be significantly impactful, a similar pattern of both crew and mission support endorsement was seen. However, only crewmembers rated inadequate preparation as likely, while only a mission support respondent rated changes to the science protocols as likely to be impactful.

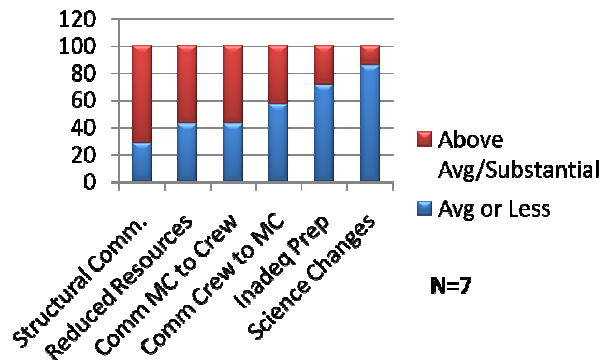


Fig. 7: Potential Impact on Long Duration Mission Outcomes.

Evaluations of impact on long duration team functioning was also elevated for structural communication breakdowns, communications regarding reduced resources and communications from mission support to the crew (see Figure 8). Of less concern were crew to mission support communication deficits, inadequate preparation and science changes. The same

proportional joint concern was displayed across both groups on those items rated as potentially impactful.

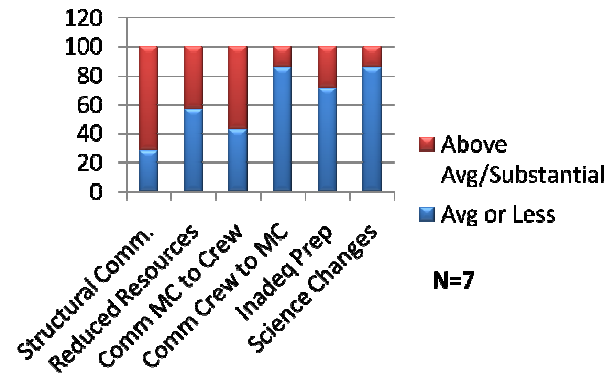


Fig. 8: Potential Impact on Long Duration Team Functioning.

## V. DISCUSSION

The largely qualitative data from anecdotal, post mission debrief and the survey suggest several areas of both joint concern and of disparate perceptions. Differences in the frequency of occurrences of problematic events can contribute to rapid polarization and disintegration of communication lines. The challenge for support personnel is to maintain a shared perspective with remote team members who are isolated from the myriad details, distractions, responsibilities, and activities inherent in everyday normal existence. Isolated and confined groups have persistently demonstrated a tendency to magnify and more heavily weigh events (both positive and negative) than groups embedded in a non-isolated social milieu. Appreciation of this inherently different perspective will be necessary to maintain cohesion and effective communication relationships with long duration teams.

The fact that several of the event categories were perceived by members of both groups to represent a higher potential for significant disruption to mission outcomes and team functioning for missions of longer duration is a clear signal of the importance in identifying those factors that contribute to the “Us versus Them” emergent mindset and developing effective countermeasures.

## VI. APPLYING LESSONS LEARNED

The lead author was recently involved with mission control operations for a human/robotic Moon mission simulation led by a team at the University of Western Ontario<sup>10</sup>. In August and September 2011, a crew of two “astronauts” and up to 10 field support personnel were

deployed to Mistastin Crater in Labrador, Canada. Crewmembers and field support personnel worked in mission control on lead-up missions in September 2010 and June 2011, and many of the mission control team members had previous field experience in settings similar to those experienced by our “astronauts”. Thus, both teams went into the lunar mission simulation with a good understanding of what would be experienced both in the field and in mission control. A few “Us versus Them” situations arose, but were diffused more quickly than on F-XI LDM. This may have been because both teams better understood what the other was experiencing. A subsequent extension of the survey developed for this paper will be similarly utilized to assess conflict and emergent polarization for these groups in the near future.

## VII. CONCLUSION

The separation of a team working in an isolated confined environment from a management or mission support team will typically lead to some degree of “Us

versus Them” tension and potential decrease in working efficiency. The F-XI LDM crew and mission support experienced this phenomenon during a 100-day Mars simulation in the high Canadian Arctic. However, even with these challenges, the mission was successful and all mission goals were met. The F-XI LDM experience shared many features with previously reported “Us versus Them” situations. These similarities argue for precautionary measures on future space missions and simulated planetary missions.

## ACKNOWLEDGMENTS

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