Successful Colonization on Mars: A Comprehensive Dust Storm Crisis Plan

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Successful Colonization of Mars: A Comprehensive Crisis Plan

"*Crises have a profound impact on people with serious mental health or emotional problems.*"

According to FEMA (2021b), "An effective national response requires layered, mutually supporting capabilities from all elements of the whole community." This presentation focuses on developing a crisis plan in hopes of highlighting the value of preventing consequences of crisis (Substance Abuse and Mental Health Services Administration, 2024, p. 5).

Intro: Responding to a Crisis

Guidance for Responding to a Crisis

In order to prevent physical and psychological repercussions of a dust storm crisis event, this presentation serves as a guide for crisis response. This resource is meant to educate citizens on Mars about the procedures, personnel, and resources to rely on in the event of an emergency dust storm. With this guide providing structure, preparation, and support, we expect mental and physical consequences of a dust storm to be reduced (James & Gilliland, 2017).

Objective of this Plan

In the event of a dust storm emergency on Mars, this plan can be referenced and implemented with the goal of complete recovery for the Mars community.

Crisis Response Roles

Dust Storm Crisis Response Team Member Titles

Dust Storm Crisis Response team members include several members, each holding a title: Crisis Team Leader, Resources Manager, Safety Officer, Logistics Officer, Communications Officer, Medical Officer, Mental Health Officer, and Evacuation Officer.

Who is in Charge?

A *Crisis Team Leader* is in charge of this team. The team leader will be someone with experience in crisis management and decision-making skills, and awareness of risks associated with crisis response burnout (James & Gilliland, 2017, p. 547). The Team Leader should possess emotional intelligence sufficient to engage their team's curiosity, motivate members to prioritize the collective goals over personal ones, enhance the capabilities of their colleagues, raise awareness about the organization's aims and aspirations, encourage a fresh perspective on tasks, and significantly shape the operational dynamics of the organization, whether directly or indirectly.

Crisis Team Member Roles

Crisis Response Team Leader – Responsible for coordinating procedures, identifying designated personnel, head of communication and decision making. This individual is the overseer of the response plan and should possess characteristics that foster guidance and care during crisis (James & Gilliland, 2017).

Resources Officer - Supports human needs, such as food, shelter, transportation and medical care by coordinating care between the Medical Officer and Mental Health Officer to ensure care for the crisis team and the organization. This team includes representatives from HR, travel department, meeting services, and the employee assistance program.

Medical Officer – evaluates citizens and provides medical stabilization, provides resources for medical attention, prioritizes further care for citizens, coordinates with the Mental Health Officer through all stages of each member's mission.

Mental Health Officer – provides fear conditioning and exposure education outside of crisis event (Lee et al., 2020), monitors citizens for signs of mental distress or PTSD (Lee et al.,

2020), offer resources for stabilizing mental and physical responses to crisis (breathing, grounding, calming), and connect citizens with resources through all stages of each member's mission.

Communications Officer – establishes internal and external communication, designates radio channel, contact point between citizens and response team, educates team on procedures should all communication go out.

Safety Officer – Oversees safety procedures, assesses and identifies risks for physical and mental well-being, educates response team on safety components during crisis, and monitors safety kits/tools requirements.

Logistics Officer – Maintains records/supply of equipment, provisions, and services.

Evacuation Officer – plans and executes evacuation, monitors environment for risk, designates safety zones and safety exits.

Files, Documents & Resources

Essential Files

A list of essential files is as follows: A printed copy of crisis plan; A list of Emergency Contacts/Key Stakeholders; Health and Safety Guidelines (FEMA, 2016); Maps identifying designated locations (triage, shelter spots, building plan for safety location, resource locations, evacuation exits and routes); Supply inventory lists; Resident lists (identifies risk markers); and a Master event log (Member Post, 2017).

Resources Needed for Crisis Plan: Supplies

The Mars Crisis Planning Team identified many supplies which are needed to implement this Crisis Plan: Safety Kits/Supplies, Dust filters/ oxygen masks, Communication devices, Clean

water/ food supply, Power generator/ devices (batteries, lights/lanterns, etc.), Medical supplies (medications in addition to triage supplies), Mental health guides and resources , Contact sheet, guide for grounding/calming, assessment forms for evaluation (The American National Red Cross, 2024).

Resources Needed for Crisis Plan: Documents

In case the dust storm knocks out the ability to operate electronically, hard copy documents need to be in a secured location. With the backup generators and resources, ideally we would be able to still access information electronically. Encryption of medical and personal data would be important and only those with allocated permission (The Dust Storm Response Team) should access them. Having the plan and resources available immediately is crucial to alleviate stress on all individuals involved to alleviate the possible effects of the trauma (James & Gilliland, p. 595).

Resources Needed for Crisis Plan: Succession Planning

The Resources Officer is responsible for ensuring that all personnel are trained and qualified to step into leadership roles if leaders become injured, impaired, or are otherwise unable to perform their roles adequately.

Logistics

Logistics Leadership

The Logistics Officer provides centralized management of supply chain functions including whole-community incident planning and support for the timely and efficient delivery of supplies, equipment, services, and facilities. On Mars, we will need to designate adequate space to store resources, as well as individuals prepared to oversee distribution of said resources in the event of a future dust storm.

Logistics Resources

Resources necessary to be stored are food, water, clothing, basic hygiene, and first aid and medical supplies. Food can be stored as meals ready to eat (MREs). Bottled water will work for a limited time, but we must ensure that we have converters to generate water from Martian ice and the crews to maintain them (FEMA, 2020). Additionally, regularly scheduled shipments of supplies and personnel from Earth should be utilized in order to assure that when a dust storm hits, we do not need to wait for months for a shuttle to arrive.

Logistics Procedures

Procedural checklists should be maintained in a centralized location, as well as within each habitat in order to ensure things aren't missed while responding to the crisis. Building plans should be maintained in the same way, and all team members and leaders should have copies. (James & Gilliland, p. 470).

Communications

Communications Considerations

As a community, we must maintain personnel to operate radio communications and maintain the systems and equipment including satellites for effective communication between Mars and Earth. A single channel/frequency must be utilized in the event of a dust storm in order to simplify connections between team members. We must also maintain a secondary method of communication in the event that radio or satellite communication is disabled, such as electronic message boards. However, there must also be a contingency for a low-tech option in the event of total loss of power.

Communications Tools

Message boards, computers linked to central files, dedicated telephone lines, citizen and police band radios, and walkie-talkies should be accessible. A central message board should be available for announcements, bulletins, resident lists, and other personal information. Portable "to go boxes" provide vital hardcopy data (James & Gilliland, p. 469; FEMA, 2021).

Communications Considerations - Before the Storm

Prior to setting up the colony, a communications system should be established for Mars. This would involve launching satellites from Earth to catch signals from Mars, which would be sent from large antennas distributed among the surface. It is these antennas, along with several small cellular towers, that will allow for radio and phone communication on the surface of Mars. Given that communication between Earth and Mars would be interrupted approximately 30% of the time due to the positions of both planets in relation to the sun, it is important to understand that communication will be vital the other 70% of the time (Tomaswick, 2023). Eventually, the use of lasers for communication will be the primary means of communication between the planets, and the use of relay satellites can facilitate both radio and laser signals. Communication prior to dust storms would be vital because a warning system can be established on both Earth and Mars to allow preparations that will mitigate the damages the storm can cause.

Communications Considerations - During the Storm

During a dust storm, we must accept the fact that radio and laser communications will be down. It is for this reason that a warning system is established, so that the populace can begin to make preparations for the failure of communication systems. During the storm, communication will have to be by word of mouth and perhaps a signaling system. Depending on the distance between habitats, the use of powerful, battery-operated flashlights, much like those used on US Navy ships, can be used for a light-based Morse code. This will enable communication between

the habs to inform on the status of facilities, including damages and any injuries that may need medical attention. These flashlights will need to be manned by a signal team, one to relay the message that needs to be sent as well as decode the signal being sent, and one to send the signals. Additionally, there should be a runner for each signal team that can relay messages to the communications officer, who can relay information to the crisis team leader. In this way, communications can be maintained during the dust storm.

Communications Considerations - After the Storm

After the storm, the main priority for the communications system is to initiate a cleanup of all antenna sites. It can be assumed that dust will accumulate on the antenna surfaces, which will disrupt communication. While cleanup is being conducted, the signal teams can continue to be utilized for communication between the habs. For communication among the civilian population, the communication officer will be responsible for distributing relevant information about recovery efforts and timelines. This could be accomplished by utilizing runners to relay communication to each habitat until power is restored. Once power is restored, radio and cellular communication can be utilized to spread information to the habs. After the storm, communication to Earth should also be established as quickly as possible by sending repair crews along with the cleaning crews to each antenna so that any damage can be repaired more quickly. It is this communication that will be essential in requesting supplies and personnel that may be needed from Earth for continued recovery efforts.

Procedures

Pre-Crisis Plan Procedures (BEFORE)

The CRT conducts periodic drills in order to measure and maintain readiness for a dust storm crisis. These educational drills are designed to measure readiness and deficits to dealing

with a real-time crisis. These drills also get the CRT familiar with accurately assessing *mobility* within individuals (James & Gilliland, 2017, p. 48-49).

Education and Preparation

The Mental Health Officer will have established resources and practices to implement during a crisis event. For example, this Officer should demonstrate an ability to function during difficulty while coping with stress/loss, grounding and physical symptom management, etc.

Residents will have exposure to emergency dust storm procedures incorporated in dust storm drills and simulation (Agoura High School, 2022).

The Logistics Officer will continually keep records and logs of supply inventory and safety related resources.

The Crisis Response Team will regularly meet for planning, communication, and evaluation of crisis response protocol (James & Gilliland, 2017).

Crisis Plan Procedures (DURING)

1. Identify warning signs of dust storms; monitor intensity and impact; assemble the crisis response team; activate crisis response procedures.
2. Notify Mars residents of emergency dust storm impact; establish connection between local emergency response resources; coordinate safety locations, evacuation/transport, and facilities management.
3. Make crucial decisions about actions related to crisis response, safety, and recovery; monitor and establish efficient communication, account for residents, maintain communication with outside resources; document events during crisis.

4. Evaluate the physical/mental status of residents; procedures for loss; evaluate supplies and resources needed, further medical or psychological care, and safety; note growth areas.
5. Implement restoration; mental and physical health rebuilding and support; establish contact between health and psychological service agencies; incorporate growth components into future drills and training (James & Gilliland, 2017, p. 600 – 604).

After a Crisis - Plan Procedures (AFTER)

The CRT is responsible for Psychological First Aid (James & Gilliland, 2017, p. 606); Crisis worker and citizen debriefing (James & Gilliland, 2017, p. 632 - 633); Implement restoration procedures; mental and physical health assessment (PTSD/ Dissociation, etc.); rebuilding and support (James & Gilliland, 2017, p. 165); establish contact between health and psychological service agencies; incorporate growth components into future drills and training (James & Gilliland, 2017, p. 600–604; Agoura High School, 2022, Emergency operations plan [PDF].

Assessment

Reason for Assessment

The well-being of the Mars crew is paramount especially because this crew works in such an extreme environment. We cannot understate the importance of proactive mental health care and the need for ongoing support throughout the duration of their stay on Mars (FEMA: National Response Framework [NRF], 2021).

Health Assessment of Mars Inhabitants

A comprehensive mental and physical health assessment is needed before, during and after any crisis scenario on Mars, but also for the sake of ensuring well-being. For example, the

health effects of a dust storm can depend on the size of the dust particles, the duration of exposure, and whether individuals have pre-existing lung conditions. It's important to follow guidelines from reputable sources like the American Lung Association and the American Thoracic Society for detailed information on protecting lung health during such events.

Before a Dust Storm

The medical team should monitor pre-existing health conditions that may be impacted by dust storm exposure and establish resources for further medical assistance. The CRT ensures that each Martian resident completes a Baseline Mental Health Evaluation. The Mental Health Officer and Medical Officer conducts initial physical and mental health screenings for all personnel. In addition, each resident completes Stress Management Training, so that they have adequate coping strategies for stress and isolation. By having a baseline assessment for each individual, ongoing Triage Assessments will be more informative when they are completed during and after future crises (James & Gilliland, 2017, p. 59).

During a Dust Storm

During a dust storm event, Mars team members should seek to remain indoors if possible, and keep windows and doors closed. They should also utilize air purifiers and set air conditioners to recirculate indoor air. If any team members are outside, they will be instructed to cover their nose and mouth with a mask and seek shelter immediately. The CRT monitors for signs of acute stress or panic. The CRT also taps into support networks in order to facilitate communication with family and support teams on Earth. This ensures that certain protective factors are available to reduce the impact of trauma. Through a crisis, the CRT establishes clear points of support for crisis counseling so that residents can obtain immediate psychological support and counseling services.

After a Dust Storm

Responses to dust storm crisis should implement these efforts and approaches (Practical Guidelines, 2024): Consider person-centered approaches to addressing needs; Build awareness and effort to avoid harm; Evaluate and intervene from a holistic viewpoint; Promote individual and community strengths, resiliency, and support; Monitor factors that may increase risk of crisis consequences like PTSD; periodically assess and address substance use patterns, social withdrawal, distress, conflict, etc. (Lee et al., 2020). The CRT conducts follow-up evaluations in order to identify any long-term effects of the crisis. The CRT distributes information about available, ongoing recovery programs, designed to address any identified mental health issues. Most critically, residents should be surveyed periodically to ensure they are aware of ongoing physical and mental health support and resources (James & Gilliland, 2017, p. 66).

Additional Requirements for Assessment

The CRT will need several elements in order to carry out a comprehensive and competent assessment program (James & Gilliland, 2017, p. 603-607). These duties will be built into the roles of the appropriate CRT member:

1. Documentation: The CRT is responsible for record keeping including detailed records of all assessments and interventions;
2. Data Analysis: The CRT analyzes data to improve future mental health support strategies;
3. Privacy and Confidentiality: The CRT ensures privacy and confidentiality for all team members. This includes Confidentiality Agreements that ensure all personnel understand the importance of confidentiality;
4. Secure Data Handling: The CRT implements secure methods for storing and handling of all personal data;

5. Review and Update: The CRT conducts a regular review to update the assessment procedures based on new research and feedback.

Intervention

Before the Dust Storm

Proper planning and organization prior to the storm are important, but also the realization that the process may not be linear when the crisis occurs (James & Gilliland, 2017, p. 49). Knowledge of how to act within the crisis should be well-versed and adaptable to any point within the crisis. The CRT will designate the Medical Officer as the primary CPR/Mental Health First Aid trainer with the Mental Health Officer as the secondary trainer. Each resident will be trained in CPR/Mental Health First Aid to prepare for any potential crisis or dust storm on Mars. This will aid in the preparation for a dust storm crisis as well as equip the inhabitants with skills and confidence to assist if needed. Constant assessment of systems like electrical, communication, water, air, and housing will continually be taking place and updated. Preparation for shutdowns where needed and evacuation plans will be in motion.

A small team will be identified through training (by the CRT) that can assist in triage counseling with the Mental Health Officer. They will be trained on the Triage Assessment Form and the Triage Assessment Form for disaster relief workers (James & Gilliland, 2017, p. 67). This team will be ready to engage with residents during and immediately following the dust storm.

During the Dust Storm

Safety for all residents is the primary concern during the dust storm crisis. Distribution of emergency resources: food, air, water, masks, and medical supplies will be allocated during the immediate crisis.

Mental health services need to be immediate to help stabilize the residents. During the crisis the main concern will be to get people to safe spaces and provide support.

After the Dust Storm

After assessment of all damage to the buildings and systems in the community, reconstruction and restoration will be necessary. Community recovery plans will go into effect. Post disaster evaluation and assessment for services will continue after the dust storm crisis.

All residents will be evaluated with the Triage Assessment Form. Based on the severity of symptoms in their cognitive, affective, and behavioral domains treatment plans will vary. All individuals will participate in at least 2 group therapy sessions following the dust storm crisis. These groups will address the crisis and their emotions following the event which has been beneficial in lessening the likelihood of PTSD (Boscarino, et al., 2006). Continual evaluation of residents and assessment will be to ensure they are receiving the proper support and resources necessary for their optimal well-being.

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