Mars Desert Research Station

2022-2023 Handbook

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The author gratefully acknowledges the hard work and dedication of the Mission Support volunteers who have contributed to this Handbook.

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IMPORTANT COVID 19 INFORMATION
Response to the Coronavirus Pandemic

The 2022-2023 field season will operate amidst the ongoing global coronavirus pandemic. It is uncertain what the state of the pandemic will be when you are traveling to MDRS and this document was written with the understanding that the status of the virus can change at any time and we will make changes to our operational plans as they are recommended by the United States' Center for Disease Control (CDC).

This field season crewmembers must be fully vaccinated and up to date for COVID prior to arrival to MDRS. This means it must be at minimum of two weeks since they received all of the required doses of the particular vaccine they have been given and that boosters have been received every 8 months thereafter. Proof of this must be sent to The Mars Society prior to your arrival on campus. There will be a new online system for submission of these documents this year.

We suggest that all crewmembers self-isolate for two weeks prior to coming to MDRS for the protection of their fellow crewmembers. In the event that this is not possible, practice social distancing and wear a mask when in public areas for the two weeks before your arrival, unless it is no longer a recommendation of your local health and government officials. At the very least, do not attend any large scale social events where COVID could be a problem.

We also suggest that crews purchase either individual or group travel insurance. Be very careful. Make sure you have a "cancel for any reason" policy that will protect you specifically for COVID 19 travel interruptions. (You may also want to look into a "high risk" policy, in case things like riding ATV's and extreme hiking are not covered in your policy.)

It is recommended that crews determine their own travel protocols from their homes to Grand Junction, CO, USA using guidelines from their home countries and the airlines they fly. Please protect your health as you travel, so that you will not be sick or expose your crewmates. You have the option of coming directly to MDRS from your travels, or you can quarantine yourselves in Grand Junction or Hanksville prior to your mission. MDRS will not cover any travel costs prior to your drive from Grand Junction to Hanksville on the day of your scheduled arrival.

We are doing all that we can to ensure the health of crewmembers once they arrive at MDRS. But we do understand that some people might live in areas where access to the vaccine is limited. Notify us immediately if you know you will not meet these requirements by your arrival and we will make a decision on a case by case basis if the risk is acceptable.

IMPORTANT: All people coming to MDRS, even those who are fully vaccinated, must send evidence of vaccination and a negative PCR (NAATs) COVID test taken no earlier than 72 hours before your arrival at MDRS. This must be done in a medical facility (no home tests) and can be done before leaving your home or upon your arrival in Grand Junction. Otherwise you will not be allowed on campus and if you travel with your crew, they will not be allowed to stay either. Proof of your test must be sent to and acknowledged by MDRS staff before you will be cleared to enter MDRS.

NOTE: We require a long PCR test. There takes between 36-72 hours to complete once you have been tests. This season we will not accept results from rapid tests of any kind, so please do not show up in Colorado and expect to get your test before driving to MDRS.

It is recommended that crews not have any contact with people as soon as they arrive in Grand Junction and that they bring or ship everything they will need for their mission, rather than doing last minute shopping in town. In addition, we are seriously discouraging any tourist like travel in the United States before your arrival at MDRS. Most importantly: Wear your masks. Wash your hands. Practice social distancing. Don't share your air. These things have been proven to reduce exposure to the virus. Please plan to travel with enough PPE for your travels to and from Utah. Disinfectants for your stay at MDRS will be available on campus.

Crews will be traveling to MDRS on Sunday or early Monday this season. Once crewmembers have been tested for COVID, it is mandatory that they avoid additional contact with people other than fellow crewmembers and that they proceed directly to MDRS. Crewmembers should practice social distancing and wear a mask when they are around other crewmembers, until they have tested negative, in Grand Junction. Be aware that most people in Hanksville are not vaccinated and do not wear masks.

Should any crewmember test positive for COVID, the remaining negative crewmembers can proceed to MDRS as planned, as long as they number 4 or more and are fully vaccinated. Training for these crews will be modified to protect staff.

The outgoing crews will be leaving MDRS by noon on Saturday. They will be required to clean the station as they have in the past, and do some preliminary disinfecting. After they depart, MDRS personnel will follow up with more detailed disinfecting. Current CDC guidelines recommend generous surface cleaning with recommended disinfecting agents as the best defense against contamination, followed by a minimum of 24 hours with no one in the area. The campus will also be locked down and no one but crew and staff will enter any of the buildings before, during or after a rotation until it is determined by the CDC that COVID is no longer a danger. The goal is that the interiors of the buildings remain virus free so it is not something that the crew needs to worry about during their rotation. Continued frequent and thorough surface cleaning is recommended throughout all missions

and crews may decide to wear masks while in sim, although they cannot wear them with the spacesuits. Spacesuits and radios will be assigned to a single crewmember for use throughout the duration of their time at MDRS.

Despite these measures, there is the possibility that a crewmember can become sick. For this reason, crews will need to check their temperatures on a daily basis. This is the responsibility of the HSO and should be reported daily to Mission Support. The report should also include any noted symptoms. This information may be coded by the crew and nothing will be published. If a person becomes symptomatic or continues to have a higher than normal temperature for several days, the crew should consult with Mission Support and may take that person to the Wayne County Health Center in Loa after reporting the situation. Should the symptomatic crewmember test positive, the simulation will be immediately cancelled and all crew should be retested and monitored until they can safely travel and/or their rotation ends. Crewmembers will be financially responsible for their own care and logistics, and must leave MDRS 72 hours before the next crew's arrival.

There will be onsite personnel at MDRS, and most training/communication will be conducted in person outside using masks and social distancing, and personal contact will be minimized for the safety of everyone. Once sim begins, MDRS personnel will not enter any building on campus except for an emergency, with the exception of the ScienceDome, which will be shared space. Anyone who works in the lab will be required to wipe down all surfaces at the end of each visit to the space for the protection of all. This procedure, and the procedures for maintaining health during the mission and disinfecting prior to departure and after arrival, will be shared with crews in training.

If any member of a crew requires a PCR COVID test prior to departing from Grand Junction, they must notify MDRS personnel of this prior to the beginning of their rotation. The nearest place to have this done is Grand Junction, and the crew will be required to drive there on their own to get the test (they may use the CrewCar to travel, and must fill the car with gas before returning to MDRS, as long as they have discussed this will management prior to their arrival).

Rest assured that we are committed to keeping all crews safe when they are at MDRS. Last season, when things were far worse for the virus than they are now, we still managed not to have a single COVID infection on campus. We want to repeat that success this season. If you have any questions, please let us know. Thank you for your understanding and cooperation. These protocols will remain in effect until the pandemic is officially declared to be over.

Mars Desert Research Station Mission Management Team

Dr. Shannon Rupert, Director
Sergii Iakymov, Assistant Director
TBA, Assistant Director
Peter Detterline, Director of Observatories/Astronomy Team Coordinator
Scott Davis and NorCal Chapter, Spacesuits
TBD, GreenHab Manager
Bernard Dubb, IT Manager
Dr. Robert Zubrin, President of the Mars Society
Michael Stoltz, Liaison, Media & Public Relations
James Burk, Webmaster and ED of TMS
Dr. Jonathan Clarke, Science Advisor
Susan Holden, MBA, JD, Steering Committee Member
Kay Radzik AIA, Advisor at Large

WHAT THE MANAGEMENT TEAM WANTS YOU TO KNOW

Top Ten Things to Remember at MDRS

1. Priorities at MDRS are "safety, sim, science, public relations, comfort" in that order. The more fidelity you can give to your sim, the better.

2. Treat (analog) Mars right. Vehicles are to be driven on approved roads only. Do not drive off the roads under any circumstances. This is why you have legs. Remember not to handle or collect vertebrate fossils. Markers of any kind cannot remain on the landscape.

3. Always buddy up. No one can be at the Hab or on EVA alone. If someone is in any building other than the Hab, they are required to have a radio to contact the rest of the crew. All buildings have radios and an intercom.

4. Do not leave anything at the Hab. If you bring it, you will need to take it with you when you leave. In addition, you must take any chemicals you bring, including chemical waste, with you when you go.

5. Do not touch the power system (solar and generator) for any reason except a safety emergency.

6. Contact Shannon first in any emergency except those involving life-threatening injury. In that case, call 911 and be sure to do what is necessary to preserve life first.

7. Treat the Hab as if it were your grandmother's home but make no changes to anything without written permission from Mission Support. This includes making no changes to computer hardware or software configurations and attaching anything (even tape) to walls, doors, or anywhere.

8. Respect the people who worked so hard to create this amazing campus and do nothing to damage our facilities and our reputation.

9. Water conservation is important as all water is trucked to MDRS. Use environmentally friendly products as much as possible while at MDRS.

10. You are working as a researcher in a unique Mars analog environment - a test bed for future investigations on Mars. Your activities should advance the goal of putting humans on Mars. Avoid purely entertaining activities. Please treat ALL of the MDRS resources as if you were on Mars. Everything there would be life-supporting and could not be replaced.

Part One: INFORMATION FOR CREW APPLICANTS

2022-2023 Mars Desert Research Station Application Instructions and Information

Please read through this document carefully and follow all instructions. Failure to follow instructions may result in your request to apply not being considered.

Greetings! Thank you for your interest in participating as a crewmember at the Mars Society's Mars Desert Research Station. We welcome applications from individuals who would like to be placed with a crew of compatible analog astronauts and from self-organized teams who would like to come to MDRS together. If you apply as a team, please read the following guidelines for self-organized crews and meet them as much as possible.

Please read through this application carefully as some procedures have changed since last year.

1) All individuals, as well as leaders/commanders/external organizers of self-organized teams, must first contact Director Shannon Rupert at srupert@marssociety.org before submitting crew applications. Crew selection has already begun as of March 2021. It is in your best interest to contact us as soon as possible. If you are invited to apply for a rotation, the application will be sent to you.

2) External directors may apply on behalf of a team. External directors may be supporting an educational team made up of students from a single department and/or course, organizing a team from a particular country, region or organization, or developing a research project requiring a single crew to complete. Be aware that any crew accepted into the MDRS program as part of any group with an external director will still be required to comply with all of the MDRS programs regulations and protocols. MDRS does not "rent" the campus to other groups.

3) Please use the following information as a guide for which positions you qualify for as a crewmember at MDRS. Only apply for those roles for which you qualify. Please note that you are only applying for these roles, and they may be changed at the discretion of the MDRS management team.

Commander: The Commander gets the glory, but they are also responsible for the overall safety, organization and management of the mission. This means that they need to be in charge from the inception of the mission, by working on the planning and development of the crew's goals and how to accomplish them.

They are responsible for the crew's logistics before, during and after the mission, although sometimes they turn some of those responsibilities over to the XO. The commander is the person held accountable for all things related to the mission, and is in command of all things while at MDRS, although they still need to respect the overall authority of MDRS staff and the HSO in health and safety matters. Commanders preferably will have prior successful MDRS experience, but can also have gained their leadership skills in their own field and/or via school and field experience. Commanders must have demonstrated leadership and experience in remote or challenging field areas.

Executive Officer (XO): The XO's role shifts slightly depending on the style of leadership used by the Commander. Often XO's are in charge of the logistics prior to a mission and the day-to-day schedule while at MDRS. Not all crews require an XO and an XO should never be selected simply because a person has no other role they can fill. The XO needs to be able to deal fairly and justly with all crewmembers and support the Commander's decisions in overall mission planning. An XO should have prior logistic skills and experience in small group leadership.

Health and Safety Officer (HSO): The role of the HSO is dependent on the applicant's skill level. They must have, at minimum, current first aid and CPR training and they must provide proof of this prior to their crew's arrival at MDRS. First responder training is preferred and EMT's, nurses and doctors are highly desired. This position is also responsible for the operational safety of the crew and the campus.

Crew Engineer: The role of the Crew Engineer is the most misunderstood of all the positions at MDRS. The Crew Engineer is responsible for the maintenance and monitoring of the station, its buildings and systems. The person in this position has to think proactively and be able to think like a Martian in terms of active response to the physical environment at MDRS. In order for daily activities to proceed as scheduled, the crew engineer needs to routinely monitor the equipment being used by the crew and make sure it is ready for whatever is planned. In addition, when systems fail, the crew engineer needs to diagnosis the problem and contact Mission Support with a plan for solving the problem. While the Crew Engineer generally has an engineering background, experience proactively maintaining functionally of a large facility and/or project is more important that actual engineering skills.

GreenHab Officer: This person is responsible for keeping the crops alive and thriving in the GreenHab, as well as the overall maintenance and monitoring of the GreenHab's environmental controls. GreenHab Officers can have experience in biology and/or gardening. Experience growing plants in a greenhouse and greenhouse management is highly desired. At a minimum, the GreenHab Officer must be committed to maintaining the crew crops with dedication to their survival and documentation of harvest.

Crew Scientist, Crew Geologist, Crew Biologist: The role of a scientist on the crew is to conduct research and maintain the ScienceDome and its equipment. They generally plan the crew's EVAs based on their research goals. They must have pre-approval from their home institution for any studies done at MDRS. This is particularly important if the scientist is studying human factors. All human factors research is required to be approved by the home institution's IRB, even if it doesn't require an IRB. In that case, simple proof that it was reviewed and an IRB was not deemed necessary is all that is needed for the research.

Crew Astronomer: The crew astronomer must have both experience using a telescope and a research project that has been approved by the MDRS Astronomy Team. They will work with the Director of Observatories prior to their arrival at MDRS to complete the requirements of this position.

Crew Journalist: The Crew Journalist is responsible for the daily reports and photos sent from MDRS. This included a daily Journalist Report that is a record of your crew's daily life, but they should also be the organizer for the crew's media efforts.

Crew Artist/Artist in Residence: We welcome student and professional artists in all disciplines, including but not limited to fine art, graphic art, photography, film, journalism, and writing. In order to qualify as Artist-In-Residence, you must demonstrate that you make your living in that field and the final decision on whether that person qualifies as Artist-in-Residence belongs to MDRS.

There is of course flexibility in each of these roles and you are also invited to propose another role for yourself based on crew need and/or experience and education.

3) Please use the following information as guidelines for developing a self-organized crew. Self-organized crews must meet these guidelines in order to be selected for a rotation. If you have any questions or concerns, contact us.

Please note that self-organized crews can consist of between 6-7 people. Six is a fully functioning crew. Please indicate the number of people in your team on your application. **Guidelines for self-organized crews will be strictly enforced. If you do not meet these guidelines you must address why you don't and how you will solve the loss of that component of your crew**.

Guidelines for self-organized crews:

- All must be healthy people, used to outdoor activity such as hiking and camping. They should all be people capable of eating all normal types of food.

- At least three of the crew must speak English well. At least one must be fluent.
- All teams from a single university must have a faculty advisor who will assist the team with their research proposals and also be available to the crew and Mission Support during their stay at MDRS. This person must write a letter of commitment to the rotation that must be submitted with the team's application.
- At least two of the crew should be natural scientists or natural science students. This is because the activity of the crew will be field exploration. If a crew does not have anyone who can fill the role of field scientist, along with their application they should submit a plan outlining the plan and purpose of their field activities.
- At least two members of the crew should be people who are very good at fixing mechanical or electrical equipment. This is because in the desert things frequently break down and a crew needs to have some ability to deal with such events.
- At least one of the crew should be a person capable of expressing himself or herself well in writing and be willing and able to send an account of each day's activity for publication on the Internet.
- One of them must have the maturity and judgment and experience to serve as crew commander. In order to be commander of a self-organized crew, the applicant must meet one of the following criteria:
    - Must have served satisfactorily as crew commander in a prior field season
    - Must have served satisfactorily as a crew member in a prior field season and show previous leadership experience in their field
    - Must have served satisfactorily in a leadership role in a field expedition and/or a remote location
- All crew commanders will be screened and approved by the selection committee prior to assignment.
- One person should have some medical experience, either first aid/CPR or wilderness first responder. Another person will need to have experience or a strong interest in managing crops in the GreenHab.
- One person should be reasonably knowledgeable with computer and network operations, specifically wired and wireless connectivity, router configuration and basic network commands.
- All should be people enthusiastic about space exploration in general, and Mars exploration in particular.
- All of them must be serious, responsible people. No people should be sent who like to do dangerous things for fun, or who are not careful with other people's property, or who are otherwise excessively immature.
- All crewmembers will need to spend two weeks at the station, arriving and leaving together. At least two of them should be able to drive a car legally in the United States.
- You need to choose a crew of people who can get along and work together well. There must be a minimum of six people on your main crew.

You are STRONGLY encouraged to have 2-3 alternate crewmembers. They will need to fill out an application as well. We will no longer approve an alternative crewmember after the selection process. If you find you need a replacement crewmember, it will be at the discretion of the Crew Selection Committee on who is assigned to your crew.

- The crew must all understand that they need to follow orders given to them by Mars Society's Mission Support. We do not direct all the crew's activity. Much of their research program, for example, will be self-generated. But when we tell them they need to do something, or that they must not do something, they need to follow instructions. Crews that do not follow directives from Mission Support, and in particular the Director, will be removed from the station at their own expense.

MDRS Crewmember Fees
Field Season 2022-2023

Every participant is expected to pay their deposit of $250 per person or a minimum of $1500 per crew no later than six sixty days after being awarded a crew spot. Crew fees must be paid in full sixty days after that date. If these fees are not paid, your rotation may be assigned to another crew.

Standard crew fees are below.

Professional fees are $1750 a week or $3500 for a standard two-week rotation.

Students who qualify will pay fees of $1000 per week or $2000 for a standard two-week rotation.

Experienced analog astronauts who qualify can receive a $500 reduction in crew fees for each level completed. See information on our website about our ratings program.

Crews with less than 6 participating crewmembers at the time of their rotation will still be required to pay a fee of $250 for each missing crewmember. In addition, crew members who do not show up for their rotation will forfeit their $250 deposit.

Included in the participation fee paid to The Mars Society is:

- Transportation by car to and from Grand Junction, Colorado
- All food and beverages provided during your time at MDRS
- Water, heating, electrical power, and internet at MDRS (except batteries)
- Use of science and engineering and general equipment, etc., rovers, and MDRS vehicles per established protocols
- Use of EVA spacesuits

Not included in the participation fee:

- Fuel for the trip from Grand Junction to MDRS and the return trip to Grand Junction. (160 miles one-way)
- Costs of two hotel nights for the overnight stay on Friday night before your rotation and Sunday night after your rotation.
- Cost of any hotel stay in Hanksville except as approved by the Director in an emergency
- Any medical expenses incurred as a result of your participation
- Travel expenses from your home to Grand Junction and back.
- Transportation expenses for crewmembers whose travel plans are different than the majority of the crew from Grand Junction.
- Meals not consumed at MDRS.

In order to qualify as students, applicants must be full-time students in a degree-seeking program at an accredited institution of higher learning. Students must send proof of their educational status to the Mars Society one month prior to your rotation or when requested. Failure to be pro-active about this may result in you being assessed a professional rate. For a crew that all attend the same university, a single letter from the registrar or the department chair will suffice as proof. Other documents we will accept are a current unofficial transcript and a letter from the registrar or a university for a single individual. These documents must be in English.

The $250 deposit will be due from each participant within sixty days of notification of crew selection ($1500 for a six-person crew). This deposit will be refundable after your rotation provided your crews does not damage, destroy or willfully mismanage MDRS facilities and resources. This also includes the understanding that if they do not leave the station clean and organized for the next crew, each crewmember will be charged a cleaning fee. This deposit will not be refunded should the crewmember not attend their crew's rotation. The only exception to this is if the mission dates are affected by the pandemic and/or at the discretion of The Mars Society.

Part Two: PRE-MISSION INFORMATION FOR CREWS

Pre-arrival actions checklist:

DATE DUE (mm/dd/yy)	DATE DESCRIPTION	ACTION	COMPLETED (Yes/No)
	30 days after the Official Acceptance Letter	Crew Deposits	
	8 months prior to mission	All Crewmembers' Names Confirmed	
	5 months prior to mission	Crew Fees	
	30 days prior to mission	Student Status	
	30 days prior to mission	COVID-19 Vaccination Record Card	
	30 days prior to mission	IRB	
	30 days prior to mission	Research Approval Zoom Meeting	
	2 weeks prior to mission	Kármán Line Zoom Meeting	
	2 weeks prior to mission	Media approval	
	A minimum of 2 weeks prior to mission	Astronomy Training Approval	
	72 hours prior to mission	Covid Negative Test	

Link to payment portal for deposits and crew fees:

https://app.moonclerk.com/pay/jmcxagxhouq

Please contact Sergii if you have questions or concerns.

Letters of introduction or support for travel and sponsorship:

Please contact Sergii and copy Shannon if you need such a letter.

Shipping material for your mission:

Ship materials to MDRS as far in advance of your mission as necessary to assure their arrival before your mission. Shipments of heavy items may encounter long delays in delivery and things sent express may not arrive in time for your deadline.

Currently there are two ways to ship materials to MDRS:

Via the USPS:

MDRS Crew XXX
C/O Shannon Rupert
P.O. Box 82
Hanksville, Utah 84734
U.S.A.

Via FedEx, UPS and any other non-governmental carriers:

MDRS Crew XXX
C/O Rockin Riddle Rock Shop
209 West 100 North
Hanksville, Utah 84734
U.S.A.

Be sure to let us know what you are sending and when you expect it so we can pick it up. **Remember, it is not our responsibility to care for your deliveries**, but we will do our best to facilitate getting them to you.

Conducting research at MDRS:

Crews are responsible for their own research while at MDRS. While every research project needs to be declared to the Mars Society, we no longer review and approve research. We will, however, shut down any research that is deemed unprofessional or dangerous. All human factors research needs an IRB or clearance from your

institution that it does not require an IRB. That documentation needs to be presented to the Mars Society prior to your arrival at MDRS. Any illegal or unethical research will not be permitted at MDRS and anyone found conducting such research will be banned from returning to MDRS or any Mars Society facility. Attendance of the research ZOOM meeting one month prior to your mission is mandatory.

Crew Travel Logistics:

MDRS Travel Information

MDRS is located in Hanksville, UT, a small town in the southern Utah desert. All MDRS crews are required to travel to the station via Grand Junction, CO, the nearest town with good commercial air service. Having a common meeting point facilitates the sharing of the CrewCar for transportation between crews. Any crewmember wanting to arrive at the station by other transportation methods must first clear it with the director. No crewmembers will be allowed to arrive separately at MDRS without all logistics approved by the MDRS Director. Anyone not following this protocol will not be allow to stay at MDRS.

Once assigned to a crew, contact your crewmates and begin to make your travel plans. Grand Junction Regional Airport (GJT) at Walker Field in Grand Junction, is served by five airlines connecting through hubs in Denver, Salt Lake City, Phoenix, Los Angeles, Dallas and Houston. You must plan to arrive in Grand Junction on or before the Saturday preceding your mission. We no longer have any agreement with the Day's Inn, but it is a decent hotel and where the CrewCar is parked for pickup, so staying there makes sense. You are not, however, required to stay at this hotel and can make arrangements to stay anywhere you like, but this has traditionally been the place crews have stayed.

The CrewCar aka Crew Transport Vehicle is a silver/gold Chevrolet Suburban that is normally parked at the Day's Inn between crew changeovers. This season, due to COVID-19, the CrewCar will be kept at MDRS most of the time. The outgoing crew will drive it to Grand Junction on Saturday, disinfect the CrewCar and turn it over to the incoming crew by 3 pm. The incoming crew may use the CrewCar that evening. Check the section in the Handbook on care and operating of the CrewCar before you get the keys. Those instructions and restrictions about the use of the car are important.

Incoming crews will plan to leave Grand Junction on Sunday to arrive at MDRS at noon. The trip will take you about 2.5 hours without stops if the weather is good. Make sure you have notified Shannon if your arrival time changes before leaving Grand Junction.

If no one in your crew has ever been to MDRS, someone from MDRS can meet you in Hanksville and lead you out to the station. If you have been to MDRS, please proceed

to the station. Do not plan on having a final meal in Hanksville before going into sim while we are in a pandemic. Once you have arrived at MDRS, you will have to remain there until your rotation is complete (the only exception to this is if you need to go somewhere to be tested for COVID 19).

There will be no handover this season – Your crew will not learn about the station's systems, equipment, and protocols from the outgoing crew. All training will be done remotely via this Handbook and two mandatory ZOOM meetings, as well as in person both before and after you arrive at MDRS.

Two weeks later, or at the end of your rotation, the campus will be inspected on Saturday after you depart for Grand Junction. You will need to return the CrewCar to the Day's Inn and your rotation will officially be over.

Changeover Schedule:

The changeover schedule is mandatory and crews must plan their arrival and departure accordingly.

Saturday morning: Outgoing crew completes cleaning and disinfecting of all building on campus by 10 am. They return to GJ in the CrewCar and deliver it to the incoming crew at the Day's Inn at 3 pm. Arriving crew prepares for trip to MDRS on Sunday.

Sunday morning: Incoming crew arrives at MDRS at NOON and will spend the day completing their training. Timing for going into sim is dependent on completion of training.

Note on restrictions of use of Crew Car:

The CrewCar will only be used to drive back and forth to MDRS this season. There should be no shopping done in Grand Junction, and only essential travel around town. There will be no side trips to tourist locations to and from MDRS. The CrewCar is only for official MRDS use.

Once a crew has the keys they must:

1. Record mileage
2. Check gas (tank should be full)
3. Note any damage to the vehicle.
4. Do a safety check and check the oil before leaving Grand Junction.
5. When they arrive in Hanksville, they should fill the tank at Hollow Mountain. This is their financial responsibility.
6. Report the above information in that evening's Operations Report.

When a crew leaves MDRS to return to Grand Junction:

1. Record mileage
2. Check gas (tank should be full)
3. Note any damage to the vehicle.
4. Do a safety check.
5. Before turning the car over to the new crew, fill the tank with gas. This fuel is their financial responsibility.
6. Record mileage.
7. Report all of the above to Mission Support so the new crew can add it to their Operations Report.

NOTE: The following will be strictly enforced this field:

Failure to do any of the above will result in a $300.00 fine per crew. Any willful or negligent damage to the vehicle resulting in needed repairs will be the responsibility of the crew who was operating the vehicle at the time of the damage. Both crew-use vehicles have undergone extensive repairs to their undercarriage and we would like to keep them in safe condition.

Paperwork required prior to arrival

Please send signed copies of the signature pages of both the Code of Conduct and the completed Indemnity form (waiver) to The Mars Society email MDRSdocs@marssociety.org. In addition, you must send your proof of vaccination and currently college transcript to this email address **one month** prior to your mission. After submission, please make sure you have a confirmation of receipts before traveling. We will not remind you of these requirements and you will not be allowed on campus if we have not received them. Please refer to your Action Item Timeline for due dates. REMINDER: In addition, follow all COVID requirements noted earlier in this Handbook.

Food and Cooking

Food at MDRS is all shelf-stable and was selected based on research that suggests that this is what will be consumed by crews on a Mars Mission.

It's hard to eat food at MDRS if you can't cook. Shelf stable food products are not easy to use and nothing is pre-made. So talk amongst yourselves about this. Some questions:

1. Who can cook? Who likes to cook? Who hates to cook?

2. Should we eat our meals together each day? I highly recommend this but it takes time. At a minimum, eat dinner together.

3. Who has food allergies? Restrictions? If you are on a low salt diet, this is a problem you must address before you get here and will probably require you bring additional food supplies. You need to let your crew know what you cannot eat so they can work around it. For example, if a person has a salt restriction you will not be able to salt community food but each can season to their liking once it is cooked.

4. Who has food dislikes? For example, I hate canned tuna so I won't eat it. But I can just skip the meat for one meal and eat whatever else is available. It won't kill me and it won't put the rest of the crew out by making them cook an entire meal with me in mind. This is not the same as a food allergy or a food restriction and you must not make your issue a crew issue.

5. Who has a food lifestyle? Are you vegetarian or vegan? Do you prefer to eat only certain foods? Do you avoid fats or sugars? Again, this is not the same as a medical food allergy or restriction and it's your issue, NOT the crew's. Often it is our instinctive desire to eat as we always have that causes friction over food. It's two weeks. Be prepared to be flexible in your food desires. If you can't, then bring your own food and cook it yourself. Don't put that responsibility on your crew. They don't have to eat the way you do.

It is best to discuss this before you come because when there is a conflict that comes up here, it generally comes up in anger and is not easily solved. Pre-mission discussions also allow you to plan to bring additional supplies your crew may want to include that aren't on this list.

Remember that there is no alcohol allowed at MDRS. If you have a special occasion, (New Years, Christmas, a religious event) that you feel warrants alcohol, please contact the Director and request a specific type and amount and give the reason. If you don't, and you are caught with alcohol on the campus, you will be asked to leave immediately. This applies to both an individual and a crew. Recreational drugs in any form, even when legal, are not allowed at MDRS.

An inventory of what foods are provided is in the Appendix of this handbook. Crews may not get everything on the list, and some items may be substituted dependent on crew needs and availability.

Part Three: TRAINING REQUIREMENTS

Beginning with the current field season, training at MDRS will move to a hybrid online/in person format. This accomplishes two things: 1) minimizes risk of infection from COVID-19 and 2) allows for some make-up of the time lost due to social distancing of crews and the lack of any crew to crew interactions.

The main document for this training will be this handbook, with additional two additional mandatory online meetings. Once onsite, training will continue for about a half a day. Most crews are able to go into sim by Monday morning.

Each crewmember is expected to complete any additional required training, based on their crew role, prior to their arrival at MDRS. Commanders are expected to make sure all requirements are met.

Beginning in Fall 2022, we have added some basic training requirements for crewmembers in the roles of Health and Safety Officer (HSO) and GreenHab Officer. Sometimes people in these positions do not have the education and/or experience to commit to these positions in the manner that is necessary for success in those roles, so we have implemented these new requirements to further the safety and success of these missions.

For the HSO position, the person in that role should have a professional medical license such as EMT, paramedic, nurse, or medical doctor. If they do not have this experience, they must take an in-person standard first aid course that is at least 16 hours in length and be CPR certified. Wilderness First Responder and Safety in the Workplace courses are also recommended, but not required at this time. If you have questions about which course qualifies, please contact us and we will help you. Please confirm that you have these qualifications with Sergii by two weeks prior to your arrival at MDRS.

For the GreenHab Officer position, the person in that role should have professional experience in some type of agricultural crop production, greenhouse management and/or have some sort of Master Gardener qualification. If they do not have this experience, they will be required to take an online course offered by us. For this field season only, this course will be free. Volunteer experience at an in-person farm/plant nursery/plant research position can be considered in place of this course, but you will have to take and pass the exam from the course.

In addition, we strongly encourage you to design your research program around only those types of research your crew's experience and education can support. It is fine as a "hobby" project to take on something outside your expertise, but we expect all mission goals and plans to only include that research which your crew is qualified to conduct.

Part Four: MISSION SUPPORT/COMMS INFORMATION

Our goal is to create a Mission Support/COMMS structure that is more flight-like and reflective of what would take place on an actual mission on Mars. For this reason, this season crews will communicate with the onsite staff and subject matter experts instead of a Capcom. We aren't abandoning COMMS, but they will be modified so that only a core team of knowledgeable people assists the crew. Reports and photos will still be sent to Mission Support each evening and any questions/concerns/request will be answers by the core team. Offsite report editors/web assistants will forward reports to the web team each day, but not necessarily during COMMS. This will give volunteers the opportunity to still participate in Mission Support, but it will not require them to be online each night.

These procedures are to be followed anytime anyone is in residence at MDRS, whether or not they are in sim. The exception is that when no crew is at the station, the only required report is the Operations Report.

1. All operational COMMS must go through Mission Support using the Mission Support eList (mdrs-mission-support@marssociety.org). All COMMS must be text; send no attachments except photos, which need to be sent as jpegs.
2. The COMMS window is from 7:00-9:00 pm MT. Crews must submit the day's reports and photos via email each day.
3. At the beginning of the COMMS window, the onsite person on duty will send a sign on to the Hab to let them know that they are ready to receive reports. Included in this email will be a weather report and notes about anything Mission Support requires of the crew.
4. The crew must acknowledge the sign on as soon as it arrives with a return email letting Mission Support know that COMMS are nominal and they are ready to send reports.
5. During the COMMS window, Mission Support personnel will review the crews' reports.
6. The person on duty will relay comments/questions/suggestions to the crew on their reports. Crew should rewrite reports according to these edits if it is absolutely necessary for the integrity of MDRS.
7. The person on duty will send the sign off promptly at 9:00 pm MT. It will include information on the status of reports and requests for any missing reports, as well as the status of the EVA requests.
8. The crew's daily responsibilities include submitting all reports, including any special ones (Mission Plan, Summary, etc.) requested by Mission Support. They will also be responsible for submitting six-eight photos representative of their day's work. One of these photos should be selected by the crew as the Photo of the Day.

During the first few months of the field season, COMMS protocols may change as needed, including but not limited to changes in report templates, protocols and reporting requirements. Please be flexible.

Reporting Requirements

Daily posted reports:

1. Sol Summary
2. Journalist Report and/or Commander's Report
3. GreenHab Report
4. Operations Report
5. EVA Report (if EVA was done)
6. PHOTOS! 6-8 of your best
7. Photo of the day (sent full size)

Weekly posted reports:

1. Research Report. One should be sent mid-mission, the other at the end of the mission.

One time posted reports:

1. Crew biographies, photos and mission patch (should have been submitted prior to rotation)

2. Mission Plan (due first Monday of your rotation)

3. Mission Summary (due final Friday of your rotation)

4. Mid-rotation video (encouraged)

5. HSO Pre-Mission Checklist (due first day of your rotation)

Reports that will not be posted:

1. HSO Report (as needed)
2. EVA Plan (the COMMS prior to an EVA)

Report templates can be found at:

crewdocs.mdrs.marssociety.org

username: crew
password: hanksville

NOTE: Duties are separated and defined below for Mission Support Personnel and MDRS Crews. All persons active with MDRS are responsible and required to read and understand both sets of duties.

COMMS Responsibilities for the Crew

General Email Procedure

1. We require email sent as text. Title and subject line each report with: Crew Number, Report Name, and Date. E.g.: Crew 191 Operations Report 21Jan2023

2. If sending an email regarding a new subject please start a new email. Do not reply to a previous matter or an existing thread.

3. ALL email should be sent to the mission support elist at mdrs-mission-support@marssociety.org.

Write your crew reports using the official crew report templates, using a text editor or Microsoft Word. Be sure and save a copy on your computer in case you need it for your own purposes after the mission. Bold and Italics are ok but fonts will be ignored and converted to what is used on the website. Do not use excess formatting.

General Report Submission Procedure

All reports are to be forwarded to Mission Support during COMMS. Reports are to be text within an email with photos as attachments.

General Photo Formatting Procedure

Our standard format for pictures is as follows: 800 x 600 pixels, 300 dpi. Minimum. Do not make them too small.

Picture naming format is:

(Crew Number, date)

EXP.

123-12/22/2021.jpg

General Video Procedure

Here are the instructions to upload videos for the MDRS (Mars Society) youtube site:

1. Sign out of all Google / Gmail accounts.
2. Go to: https://drive.google.com/a/marssociety.org/#my-drive 3. Sign in with these credentials:

Username: mdrs.videos@marssociety.org Password: MDRS.Rocks!

4. Click on MDRS_Videos folder
5. Click on Folder for your crew #
6. Click the Upload button (next to the red "Create" button) and select Files... then select the video file you are uploading.
- Note: Feel free to create new subfolders here if you are uploading a lot of videos.
7. Once your video is uploaded, send an email to **mdrs-reports.gp@marssociety.org**

- Subject: Crew Video Uploaded
- Body: leave empty or feel free to provide some notes on the video

You don't need to provide the link to the video(s), since we know where they are. The Web team will post the videos online within 24-48 hours.

You may be prompted for additional information, sign-in, call back with code, etc. If so, then you will have to coordinate obtaining a Code from Google via someone with a phone, e.g. CAPCOM

RAW VIDEO**:** We would love to have access to any raw video footage shot during your rotation. Please upload to our dropbox:

https://www.dropbox.com/request/yEz1u5pMBFaElR9FHWyG

COMMS Responsibilities for Mission Support Personnel

Duties of the onsite person on duty

There is a two-hour communications window for us to assist the crew in their mission. This is done asynchronously via email. At 7:00 p.m. Mountain Time we contact the crew at MDRS, send a weather forecast, gather the day's reports and review them, and respond to EVA requests. COMMS concludes at 9:00 p.m. Please be

aware of time zones and when time changes between daylight savings and standard time.

All MDRS communication first goes through **mdrs-mission-support@marssociety.org**. Crews are signed onto this eList during their rotation and taken off after they leave MDRS. Mission Support personnel are kept on this eList all season.

Review Reports

Reports that we receive will be reviewed for accuracy and possible legal matters. For example, in an HSO report the crew can't state the name or gender of the patient. Pictures can't show legal or MDRS policy violations. Watch for this because they will happen. Then they will be forwarded to the editing and web teams for posting.

Questions and Concerns from Crew

Any questions and concerns by the Crew during the COMMS window require a quick acknowledgement from the person on duty, who should then forward the matter to the appropriate person on the Mission Support team.

COMMS Daily Example

Send a sign on email with weather forecast. Review reports and work with the crew if changes are needed. Respond to any crew questions/requests sent to you during COMMS and at the end of COMMS send a sign off that includes letting the crew know of any reports you did not receive and whether or not their EVA(s) are GO or NO GO.

Beginning and end of sim duties

There are some extra tasks that take place at the beginning and end of SIM.

Crews usually arrive at the MDRS on Sunday and depart 15 days later on Saturday. Each crew trains with staff when they arrive at MDRS. At COMMS, we need to make sure the crew takes care of some additional tasks when they show up at MDRS and leave MDRS.

Begin SIM: At the beginning of SIM please verify with each crew member that they are able to receive and send via mdrs-mission-support@marssociety.org

Update the web team (webmaster@marssociety.org) with any crew member's name and email address who needs to be added to Mission Support email list.

Ensure the crew has turned in their crew biographies, photos, and mission patch (if they have one) to the web team. If they haven't, make sure that is done as soon as

possible. Crews have been asked to send these to the web team prior to arrival. The HSO must also send a Beginning of SIM Report upon arrival.

Remind the crew that their Mission Plan is due on Monday.

End of rotation: On the last Friday before the crew ends their SIM a Mission Summary Report is to be sent to Dr. Robert Zubrin at zubrin@aol.com and Mission Support.

The Mission Summary Report is a summary report of the mission suitable for general distribution to the Mars Society which is 500 to 1500 words, (with a few photos and graphics if you choose), submitted in MS Word format. If Robert does not remind the crew of this report on Wednesday, please make sure the crew know it is due Friday at COMMS.

A complete Food Inventory is also required. This is sent to the crew on Thursday night and need to be completed by Friday night COMMS. Please remind the crew this is due by the end of the day on Friday. Mission Support will also remind the crew that they will need to check out early on Saturday and cleaning should begin **before** Saturday morning.

Duties of the Weather Reporter

The Weather Reporter will send a very carefully crafted weather forecast for Hanskville, Utah each day that a crew is in residence at MDRS. This should generally include all weather warnings, and give the crew an overview of how they should plan EVAs not only for the next day but for several days to come. This will begin with a careful analysis of the next day and should include a morning, afternoon and evening forecast of the temperature, precipitation and wind speed. A summary three day forecast with the daily high and low temperatures, wind and precipitation predictions should follow.

Duties of the EVA Officer

The EVA Officer will generally be one of the on- site Mission Support personnel. They will review all EVA plans for safety and suitability to EVA objectives. They can also advise crews on EVA locations if the crew is unsure of where to go. This must be done in time to allow the crew to plan for the following day's activities, preferably before the end of COMMS.

Duties of the Report Editor/Web Assistant

In this position, an offsite volunteer will have access to the Mission Support eList to edit the crew's reports, had the appropriate web tags and forward them to the web team. They will need to do this within a day after the reports are submitted.

Communications Between Crews and Onsite Personnel

We are experimenting with a new type of COMMS between crews and onsite personnel this season. Because many of our Mission Support people have not been to MDRS, the biggest hurdle we have encountered with Mission Support is that crews have questions the person on duty during COMMS cannot answer. In the past, onsite personnel have either answered these questions for the crews during COMMS which isn't ideal, or via radio communication, which violates the asynchronous COMMS rule.

To reduce this problematic communication, we will be implementing a chat type COMMS protocol that will give onsite personnel the ability to communication with the crews asynchronously about anything they need help with. The radios will be reserved for emergencies only, and/or anytime the internet is down. The crews will have a HabCom station on the lower deck of the Hab where they will have a desktop computer hardwired to a separate internet connection that will be used for official MDRS communications only. The chat will be open continually and crews can contact the Outpost at any time on that computer. This chat can also be monitored by Mission Support personnel. This system is expected to be up and running by the beginning of 2023.

Part Five: CAMPUS OPERATIONS

A note about caring for MDRS: You would not want to go to Mars with anyone who did not treat the infrastructure and equipment that keeps you alive with the utmost care. You are here because you want to experience what it would be like to be on a mission to Mars. Be gentle with the equipment and facilities. Treat everything at MDRS with as much care as if your life depended on it.

General Operations

Appearance/cosmetic alterations
No permanent modifications can be done to any building, equipment or furnishings without written permission from Mission Support. In addition, no temporary modifications, such as taping things to the walls, floors and ceilings are allowed.

Communication Systems

Basic Internet Information
There are three internet systems at MDRS. One (HudgesNet) supplies the Robotic Observatory. A second (also HudgesNet) supplies the Outpost. A third (Starlink) can be used throughout the campus by both crew and staff.

The information below refers to the system used by the crews.

Crews will have access to the internet via the HabCom computer, located on the lower deck, at all times. This computer is to the used for official MDRS communications only and access is hardwired to that computer only. Between 7 and 10 every evening, the wifi will be turned on and crews have access to the internet on their own computers. Any off campus communications should be done during these hours.

Water
We get our water at MDRS from the tested well within the Hanksville municipal water system. There is no need to boil it before use. Particulates that may have been introduced during the transfer process are filtered out of the system before use by the large triple filter system near the rear airlock. This system takes out sediments, runs the water through a charcoal filter to remove any impurities, and then sends the water through a UV sterilization chamber before use. Crews do not need to check or change any filters in this system. Please ask if you are concerned about your water filter. It is recommended that you use the smaller handheld Britta filter pitcher if you don't like the taste of the water.

There are three different water tanks. The 550-gallon static tank (outside on left side of the rear airlock) supplies water to the Hab. There is a separate 300-gallon

tank in the GreenHab that is used to water the plants and is not connected to the Hab water system in any way. There is an additional 550-gallon water tank at the Outpost for staff.

Water is delivered to the static tank from a 125-gallon tank located in the HabCar. Crews are required to transport their own water from Hanksville. Crews need to plan for their water use seriously because no additional water will be delivered to a crew except in extraordinary circumstances. You will be instructed on how to make a water run upon arrival and your crew will be expected to fill both the static tank and the GreenHab tank. **It is important that while transferring water from the delivery tank to these tanks you keep the tank, area and hoses clean and free from dirt, mud and other materials.**

How to transfer water to the static tank: Fill the tank from the well at Hollow Mountain. Be sure to drive the Habcar up to the faucet from the right and along the wall to the left of the door, so that you are facing away from the door and not blocking people from entering the store. Use the white detached hose in the car to fill the tank from the faucet.

The pump you need to pump water from the transfer tank to the static tank is inside the transfer tank. Pull the free end of the blue hose in the transfer tank and put it into the static tank. Only insert it as much as possible to keep it stable and if it is dirty clean it with a Clorox wipe first.

Remember that this is your water supply, so keep that hose off the ground!
Plug in the pump to the power cord outside the Hab, monitor as the water is transferred, and unplug pump when the transfer tank is empty and/or just as it begins to suck air, or if the static tank is filled. Do not allow the pump to run without water flowing through it.

The static tank water is pumped directly into the Hab. In October 2022, we installed a completely new water system in the building and removed the old system. Instead of a second tank in the loft and a small on demand pump, we have a larger pump with a holding tank in the mezzanine above the rear airlock. This removes most of the possible routes of contamination from the system and allows minimal water use at night without the pump running. The only problem we currently have with this new system is that if the water gets below a certain level in the static tank, the pump will continue to try to pressurize the system until it loses pressure and prime, and is permanently damaged. As this is being written we are looking for ways to solve this unanticipated problem, so if you are not instructed on what to do, please inquire upon your arrival to the station.

Inside the static tank are two very important things, the heater and the pump. Make sure that the heater is always working, otherwise the static tank will freeze and you won't have a very good day. There is also a heating tape on the pipes from the tank

to the interior of the Hab and during the winter you need to make sure this is plugged in and operating correctly.

Keep the Hab temperature at 70 degrees F at all times during cold weather to prevent freezing. The pipes should all be wrapped and heated but if the pipes freeze wait until 10 a.m. and generally they will thaw. If it is very cold (well below freezing), you can ensure your pipes don't freeze by running a small amount of water through the system every 2 hours (day and night). Every 2 hours takes a toll on the crew so take shifts.

Power

Power is supplied to the campus by a 15kW solar array augmented by a 10kW battery bank. A 14kW propane generator supplies additional power as needed. It and the propane tank it uses are to the north side of the ScienceDome. Crews are not to touch any part of the power system without explicit permission from the director. Crews who do will be walked off campus.

Simply put, here is how our system works:

Solar panels supply power to the charge controllers.
Charge controllers supply power to batteries.
Batteries power the inverters which then deliver AC power to the Hab.
The default for batteries on the systems is 75%, but we decided to go with 80%. Once the SOC (state of charge) goes below 80%, the generator should autostart, but in the history of this system we have not been able to get this to happen, so we manually run it at night and turn it off in the morning. We will notify crews if this changes, as we are still convinced that we can fix this issue, but it hasn't happened as of this writing.

The remote access modem to the power control system has been relocated from the upper deck to the Robotic Observatory. It is a small powered black box that should never be unplugged. Without it, we may not be able to solve our solar control system problems. It is not an issue for crew power consumption or internet use.

Propane Tank

Propane for the Hab and GreenHab is located in a 1000-gallon tank next to the shed at the Outpost. The pressure gauge is located underneath the metal top cover. The gauge records % propane remaining in the tank, not psi. A request for a delivery of propane should be made when the tank reaches 40% or when either of the Outpost tanks are almost in the red zone, whichever comes first. Propane levels are no longer reported by the crews.

Heat/AC

The main source of heat for the Hab is a forced air propane heater (new in October 2002) located above the shower room and bathroom. When operating, it will show

the fan on “AUTO” and the main switch as “HEAT” on. Do not use “COOL” ever as this is a furnace and it does not have AC. Do not use “ON” for the fan either. Check and change air filters as needed (generally every crew should change this filter during the winter months). There is a circuit breaker for the furnace that is labeled “Furnace”. Do not adjust the thermostat, located on the upper deck for any reason. It is programmed and any attempt to change it will result in a shutdown of the system. You will be cold, and staff will be cranky, so just don’t do it!

There is a second wall mounted ductless propane heater on the lower deck for when temperatures get really low or if the power goes out. It is easy to operate and generally safe, as long as crews do not position combustible material near it. It should be used whenever crews feel the lower deck is uncomfortably cold. It can be left on during the night. Again, and I stress, be sure that no one puts anything near to it while it is in operation.

The GreenHab has a propane heater than should not be adjusted unless you are asked to do so. The thermostat is on the wall nearest to the Hab, and this regulates the heater automatically. The temperature is set by staff throughout the season to reflect the growth cycle of the plants. Please do not operate the fan when you feel it is too hot in the GreenHab. Open the door for awhile to cool the interior of the building.

Both the Hab and GreenHab have wall mounted swamp cooler units, which provide cool air by using the evaporation of water across a fan. These units, in high temperatures, will use considerable water. Be sure to check with Mission Support to make sure the water has been turned on to these units before using them. Both have remote controllers, or can be controlled at the unit and operating them is relatively simple. They can be operated in “Fan only” mode, but they will not have any ability to cool beyond blowing air. They should not be used to simply circulate air on the upper deck as they act counter to the system designed into the Hab’s architecture. They can be used for a short period of time to vacant smoke if a crew burns their food.

The ScienceDome has a wall mounted Dual Split Heat/AC unit that is to be adjusted by management only. This unit was installed for the protection of the power system’s batteries, not crew comfort, so please do not touch it at all. If it has been operating during your mission, and appears to have malfunctioned in some way, please notify Mission Support.

Fuels

There are four propane tanks on campus, all but one located in the vicinity of the Outpost. The Hab and GreenHab are serviced by the 1,000-gallon tank, while each of the two fifth wheel trailers in the Outpost is serviced by separate 250-gallon tanks. The final tank services the propane generator outside the ScienceDome. Propane is delivered by Blackburn Propane in Bicknell. Propane powers our heating systems,

water heaters, stoves and the generator. The tank level gauges are on top of each of the tanks. A propane resupply should be requested any time a tank gets below 40%.

Generator oil and supplies are kept in the RAM and the generator will be checked and maintained regularly by management when the generator is in use.

The HabCar is generally refilled by management. Anytime the HabCar is below ¼ it must be fueled. If a crew is using it and it goes below this level, they need to contact the Outpost immediately.

The Crew Car is refueled at the crew's expense. Oil should be checked by every crew the first time they use either car. Car oil is kept in the RAM. There are several types of oil stored there, so be careful to get the correct blend for the machine you are putting it in. If you have any doubts, please ask for help.

The ATV's are run on ethanol free gasoline, which is purchased at Stan's Chevron. The gas cans are kept next to the old engineering shed at the Outpost. Please check with staff to make sure you have the correct gas if using the ATVs. ATV oil is kept in the RAM. ATV oil must be checked and gas tanks must be full every time they leave the campus. Again, make sure you have the correct gas and oil before using it.

Street-legal Vehicles

MDRS has two large SUVs for use off campus. The HabCar is a Ford Expedition that is mainly use to haul water to MDRS, and is also used in rare instances as a PEV (Pressurized Exploration Vehicle) if a crew needs to conduct a long-distance EVA while in sim. The HabCar is in good condition but has some operational flaws (dashboard flashes on and off and windows don't roll down) but it is well-maintained and safe. In 2020 the suspension was completely replaced, so please use care when driving on dirt roads, as we would like to not have to replace it again.

The CrewCar (or Crew Transport Vehicle) is a Chevrolet Suburban used to transport crews to and from Grand Junction. The CrewCar is in good condition with only minor issues (the rear driver's side window sometimes acts quirky) and seats 7 people and luggage. This vehicle also has had extensive undercarriage work done to it, so it also needs to be treated with care on dirt roads.

Both vehicles are valuable to our program and need to be treated with respect. On Cow Dung Road or any unpaved road, the maximum speed limit for both vehicles, regardless of conditions, is 15 MPH. You may have to drive even slower, as this road is unpaved and washouts are common. Driving on this road must be done using extreme caution and crews must be aware of the road conditions at all times. Any crew found not respecting this speed limit will be grounded from using any of our vehicles, and will need to find their own way back to Grand Junction at the end of their mission (that's how serious we are about this). On paved roads, crews must follow all laws and rules of the road.

Both vehicles are AWD and 4-wheel drive. The HabCar is in AWD all the time, while the CrewCar has both, as well as 2-wheel drive. The CrewCar should be driven in 2-wheel drive unless there is ice, snow or mud on the road. Then it can be driven in AWD. Both should be driven in 4-wheel drive ONLY if the conditions require it. This generally means thick mud or sand. Unless the snow is very deep and on top of ground that isn't frozen, you should not need 4-wheel drive. If you do need 4-wheel drive, please stop the vehicle, put it in N (Neutral) and shift to 4 H. Wait until the gears have settled and then move forward. There will probably never be a need for 4 L, unless the mud is very deep. Use 4L only as a final effort to avoid getting stuck. Again, put the vehicle in N, shift to 4L, wait until the gear settle (this will be very pronounced in 4L) and then move forward. As soon as safely possible, shift back into 4H and/or AWD/2-wheel drive. Using these special gears on roads that are dry will destroy them. Again, a reminder here that on any unpaved roads, including Cow Dung Road, the speed limit for both vehicles is 15 mph.

The newest addition to the MDRS fleet is a 4x4 Mercedes van named Luna. It is currently being used by staff for MDRS related work.

Tunnel System

There are tarp-covered metal mesh (cattle panel) tunnels connecting the Hab, ScienceDome, Musk Solar Observatory and RAM. The tunnels are covered by heavy tarp material, but this may be damaged in high winds, so the crew engineer must monitor it for damage and add additional zip-ties as needed. Repair of these tunnels is mandatory and if a crew decides not to repair any new damage that occurs during their mission, the tunnels will be considered breeched and crews will no longer be able to use them to travel unsuited between buildings. Use of the tunnels during sim is limited to quickly walking to your destination, because on Mars these structures between habitat spaces will not have redundant life support system, and won't be residentially safe.

Cleaning Materials

There are three vacuums at MDRS. There is an Oreck upright on the upper deck that must only be used on that deck, a shopvac on the lower deck and one in the ScienceDome. These are to be kept in their respective work areas and not moved anywhere else, and they must be cleaned at the end of each rotation. Do NOT throw away the filter in the shopvac's. Clean it by banging it gently on an exterior surface until the dust is removed, then replace it. There are brooms/dustpans in each building. There is a commercial mop and bucket set on the lower deck for use in all areas, and it is important that both be cleaned after each use. Cleaning supplies, in general, are kept on the lower deck or under the sinks. When not in sim, crews should fill sinks with warm water and add a liquid cleaner, then thoroughly wash all surfaces clean of mud and dust. When a crew uses up a cleaning supply, they should request a replacement via Mission Support.

It is required that crews follow the COVID 19 disinfecting protocols as directed by the CDC.

Cleaning Fee: There is a $200/hour cleaning fee for crews that do not successfully check out at the end of their rotation.

Hab Operations

Hot Water Heater

Hot water is produced from a 6-gallon propane RV water heater located above the rear airlock on the lower deck. For the most part, crews will not need to do anything to it while at MDRS. If the campus is being shut down for any length of time, the gas should be turned off and the system's power turned off. If the campus is closed in winter, even for a day, the tank should also be drained to prevent freezing.

Bathroom/Shower Room/Toilet Area

The toilet is a porcelain RV model with a foot pedal for flushing. There is a holding tank below the toilet that must be emptied by the crew engineer only when it is completely full. Never empty the holding tank when it is not full as it will clog and smell badly.

Using the toilet is easy. For urine, just go and then **gently** hold the flush pedal until the bowl clears. For solid packages, you may first want to fill the bowl with a little more water. Hold the pedal down a little bit and the bowl will fill without the flap opening. Once you have the desired amount of water, go and then flush. Remember, you do not have to slam your foot on the pedal, please use gently.

DO NOT PUT TOILET PAPER OR ANY NON-BIOLOGICAL WASTE IN THE TOILET. All toilet paper goes in the waste bins in the toilet room. The open waste bin is for wet tissue, the lidded waste bin is for soiled tissue. Remember this is burnable waste, so do not put any non-burnables in these bins. Also, do not wait until the bins are stuffed full to change the trash bags. It is easier to burn this waste if the bag is changed when it is loosely full and not compacted.

Crews must clean the toilet daily. Use toilet bowl cleaner or a general cleaner like Mr. Clean only. DO NOT PUT BLEACH IN THE TOILET. It will destroy the seals.

How to know if the toilet is full: Shine a light down into the toilet while holding down the flush pedal. Waste should be higher than the holding tank and beginning to fill the bowl before it is emptied.

To empty the toilet (this is only done by the crew engineer): Pull the holding tank handle, located to the right of the toilet, GENTLY and slowly upward. Once the valve is open, allow 1-2 minutes for the tank to empty. When it is mostly empty add some

water to flush it out by holding the flush pedal down for about a minute. Then close the lower tank handle by gently pushing it down. Continue adding water once the value is closed until you have 2-3 gallons in the tank. While you are adding the water, also add 4 oz of the digester. Do not add digester to the tank between emptying. Under normal use, the toilet will not smell bad. If it does, consult with Mission Support. It does smell bad temporarily when you empty it.

Please keep the toilet room and shower room clean. Showers should be as short as possible and crews should schedule a shower for every few days, not every day. Normal environmentally friendly products can be used.

Lower Deck
Suits must be in mission ready condition at all times. This means they should be correctly put away and be charging. Helmets need to be kept in their protective bags at all times when not in use.

A HabCom station has been set up near the rear airlock. It holds our HAM radio station and iMac for COMMS. Please never remove or move any of the equipment on the deck from the way you found it upon arrival.

Door Locks
There are locks on both outer and inner airlock doors. These doors should remain unlocked (all 4 of them) during the day for safety reasons. During high winds you may want to secure the exterior doors to prevent them from being blown open. If you are uncomfortable sleeping with the doors unlocked, secure one on each door, but not both. In other words, you should only need to unlock one lock per door in an emergency.

Upper Deck
No shoes are allowed on the upper deck. Each person is required to bring a pair of slippers to use going up the stairs and on the upper deck. The floor is carpeted with carpet tiles and must be vacuumed on a regular schedule. Please check the vacuum bag if the Oreck upright is not working properly. Also remember never to take the Oreck anywhere—it stays on the upper deck at all times. If you spill something on the carpet, wash it immediately with warm water and dish soap. Any stains on the carpet will result in a charge of your deposit for replacement.

Staterooms are furnished with mattresses that have full covers over them. These protective covers must stay on at all times, and you are required to bring a sheet to cover the mattress before use. If you want to borrow a pillow from us, you must bring a pillowcase to cover it during use. Any staining or soiling other than general use will be charged to your deposit. The same goes for permanent stains on either of the bean bag chairs. We want you to be comfortable, but we can't afford to continually replace these things due to carelessness on the part of a crew.

Kitchen

List of kitchen appliances available at the Hab: full size four burner propane stove and oven, electric kettle, bread maker, slow cooker, microwave, small refrigerator, coffee maker. Dishes to serve a crew, and pots and pans for large crews are also available. Crews may bring disposable dishes to use instead of washing dishes if they prefer.

Dishes must be washed by filling both sinks with the least amount of water required for the task (one soapy for washing, the other clean for rinsing). Do not wash or rinse dishes using a trickle of water as it can damage our systems.

Food at MDRS is all shelf-stable and was selected based on research that suggests that this is what will be consumed by crews on a Mars Mission. Food is kept in mouse proof cabinets and no food should be left out where rodents may help themselves. Crews will be required to inventory their food reserves on the final Friday of their rotation, so that food for the next crew can be packed before the new crew arrives on Sunday.

Garbage/Trash/Rubbish

Crews need to separate burnable from unburnable trash very carefully. Separating the trash is the hardest thing for crews to do, but it is important. Burnable material will be burned in the burn barrel, located at the Outpost. When a bag of burnable garbage is ready for burning, crews may contact Mission Support and place it in the rear airlock and we will retrieve it and burn it**. Burnable trash must be clearly marked with the letter "B" in Sharpie.**

Number ten cans (the big ones) must be flattened before being put in the trash. Remove the unopened end and crush. We have an electric can opener so this should not be a problem. Once crews have a full bag of unburnable garbage, they should put it in the rear airlock for transfer to town. **Unburnable trash must be <u>doubled-bagged</u> and clearly marked with the letters "NB".**

Keeping burnable and non-burnable trash separate has been a challenge for crews. Both food and plastics are to be considered non-burnable. Each deck of the Hab and all of the other building have both a "Burnable" and "Not burnable" trash container. If a crew does not properly separate their trash, they will be asked to separate it a second time, which is not a pleasant experience, so pay close attention to what you are doing the first time.

GreenHab Operations

The GreenHab houses crew crops and research plants. It is automatically heated by a temperature-controlled propane furnace and manually cooled by a swamp cooler, which is rarely uses as it is ineffective as a cooling mechanism and the moving air damages plants and increases evaoporation. We are working to automate the two

systems together. The swamp cooler operates as a fan, but it is not effective for cooling as a fan. Opening the door to the GreenHab is far more effective if cooling is required. In spring, once the temperatures are high, crews can request the water be turned on the swamp cooler for active cooling. There are three large LED lights on a timer system that are used for supplemental light during the winter for the crops. Supplemental light times will be determined by the GreenHab Manager or the Director. Solar blocking screens are used to lower heat early and late in the field season. Crews are responsible for keeping all plants watered and healthy, under the direction of staff. They are also responsible for replanting and harvesting of crops as required.

Water for the GreenHab comes from two sources: 1) a frost-free faucet outside the GreenHab but inside the tunnel, and 2) a tall blue water tank inside the GreenHab. This container will be filled by staff between rotations. Do not use the outside faucet except in an emergency. Water from this faucet comes from the Hab and every time it is used, we lose a liter of water back into the soil which then bubbles up in the clay and resembles a leak. Make sure to use the short hose on the blue tank to fill your cans. Never hang a watering can on either faucet.

There is a GreenHab notebook for crews to make notes during their tenure as GreenHab Officer. The most important thing to record is the mass and identification of any harvested material, as that is being tracked for a research project. Only the GreenHab Officer can harvest crops. Once they have been harvested, they must be weighed on the scale in the GreenHab and both what they were and what they weighed must be recorded in the GreenHab notebook as well as in the GreenHab Report. Failure to do so will jeopardize our research so please be aware of the importance of this action and do it consistently.

ScienceDome Operations

The ScienceDome is a basic geology and biology lab and should only be used for scientific research. **No engineering, exercise, 3D printing or any other non-lab use is allowed without permission.** The building also houses our power control center.

Instruments available for use by crews: autoclave, two lab ovens, a small incubator, dissection scope, two microscopes, mechanical balance, microwave, small refrigerator, laminar flow hood, grow tent, stirring hot plate, and scientific freezer (-20 degrees).

The lab has some general lab supplies, but crew scientists are encouraged to bring their own rather than assume we have something they will need.

No chemicals are provided to crew scientists. Everyone should bring their own, and be aware that any and all remaining chemicals and/or waste needs to be taken off campus when they leave.

Beginning this year, the lab will be shared by crews as interns and staff will be conducting research that requires lab experiments. Every attempt will be made to use the lab when the crew is not using it (which will be predetermined by commander and staff) but everyone needs to be respectful of each other's research. Never move, disturb or alter another person's research. Always clean glassware and tables/benches immediately after lab work and do not leave anything spread out between work in the lab. Due to COVID, each time a person leaves the lab they will be required to wipe down all surfaces with a disinfectant, which will be provided.

RAM Operations

The RAM is a separate building (made from the fuel tank of a Chinook helicopter) that serves as an engineering bay. Tools and engineering supplies are kept in the RAM, tools to the east and consumables on the west. The RAM is powered by a 30-amp service and all of the rovers are parked at electric charging stations on the east side of the building. Tools taken from the RAM for use in other buildings should be returned to their proper place after use.

MDRS Observatories Operations

The MDRS Observatories include both the Musk Observatory and the MDRS Robotic Observatory. The Musk Observatory is used for solar observing only. The MDRS Robotic Observatory is for nighttime imaging, and is used by both Crew Astronomers and students. MDRS Crew Astronomers have top priority however. To use either observatory requires online training, which must be completed a minimum of three weeks prior to arrival at MDRS.

To begin, go to the observatory page on the MDRS website: http://mdrs.marssociety.org/mdrs-observatories/ and follow the instructions to go to the online training site. The training site will guide them through the necessary steps to use both observatories. When approved, Observatory Director, Peter Detterline will contact the Crew Astronomer and MDRS Director Shannon Rupert.

MUSK OBSERVATORY

The Astronomy Box is kept in the Musk Observatory. The Astronomy Laptop is kept downstairs on a shelf in the hab. No one enters the Musk Observatory wearing a spacesuit. At the beginning of their mission Crew Astronomers are required to take an image of the Astronomy Box and the Musk Observatory from the doorway with the cover off the telescope, and send those images to Observatory Director, Peter Detterline.

MDRS ROBOTIC OBSERVATORY
This is fully automated, and no one enters the observatory without consent from the Observatory Director. This may occur from time to time. The MDRS Director will be apprised of this in advance and of the procedure.

ASTRONOMY REPORT
The astronomy report should be submitted only when the observatory is used. The Observatory Director will assign an Astronomy Support person to the Crew Astronomer for the duration of their mission. The Astronomy Support Person will respond to CAPCOM regarding any questions or problems encountered in using the observatories.

The Outpost

The Director lives on campus in a fifth wheel trailer located just off the station to the south. The residence is privately owned and is NOT part of the MDRS available to crews. Crews may enter only with permission of the Director. Unauthorized entry is not allowed. In addition, the Director has one rover (Sojourner) for her use only. It is parked at her house and it not to be used by crews.

The fifth wheel trailer next to Shannon's is for interns, grad students and other staff, such as the assistant director. It was purchased for this purpose by the Mars Society and while it is not privately owned, it is to be respected as a private residence for the people who are living there and should only be entered by invitation.

The Outpost is not visible by crews while they are at MDRS and during EVAs staff remain inside their homes for the duration of the crew's outside activity. Staff are not allowed on the station during a simulation except for emergencies or required work operations. In other words, once a crew is in sim, the number one priority of staff is to avoid any contact with the crew.

ATV's
The ATVs have been retired and will no longer be used by crews unless they have permission based on research activities they have done in the past.

If you are given permission to use the ATVs (and for the Honda), the following information is useful:

Ethanol free gas (obtained at Stan's Chevron in Hanksville) is the only gas to be used for the ATVs. There are four 5-gallon red 'Jerry' cans that hold gas for the ATV's. ATVs must be full of gas at the beginning of every EVA, just like the rovers much have a full charge.

ATV 4-stroke oil is kept in the RAM. Only this oil must be used in the ATVs. Oil must be checked every other use of an ATV.

We have 4 ATVs. The red Honda is the only 4x4 model. It is also a manual machine. There are two blue Yamaha 350s, which are automatic and one Yamaha 300, which is has two gears. It is recommended that beginners use these machines. All of the Yamaha's are 2x4.

Rovers

We have 5 Polaris Ranger EV's at MDRS. They are named after the Mars rovers. Sojourner is assigned to the Director and is not for crew use. The remaining four, Spirit, Opportunity, Curiosity and Perseverance, have been modified so crews can use them with the spacesuits. They are two seaters and 4x4. Crews will be given instruction on their use when they arrive at MDRS. These machines must be plugged in at all times when not being used, and they must have a 100% charge before they can be used for an EVA. They handle very poorly and correct use and speed is imperative for safety. At any time during an EVA that the charge gets to 60%, crews must immediately return to the campus without stopping. The max range of these vehicles is 50 miles per charge in perfect conditions (70 degrees F, flat terrain, M gear, two-wheel drive). Crews will be able to go anywhere allowed at MDRS with them as long as they do not treat them poorly. If you push them to perform at their highest speed at all times, regardless of gear, you will run them down in a manner not safe for their range. Drivers are highly encouraged to focus on the view and not speed in order to enjoy the EVA more and save the rover from misuse. A broken rover may be towed with an ATV or the HabCar depending on where the breakdown occurs. Extreme care should be used in towing regardless of the vehicle used. Towing should only be attempted with permission and/or participation of staff. Many people assume these machines are just glorified golf carts, but they are not. We have had one driven off an embankment and it was totaled. Cause was speed. We have had another roll on its side. Cause was speed. Am I making my point here?

Three rovers used by the crews are parked on the east side of the RAM, while a fourth is parked on the east side of the GreenHab. Plug/unplug them at the vehicle, not at the power box, which should never be opened by crews. Remember to only use the emergency brake sparingly, such as when needed in the field. Never use the emergency brake when parked on campus and try your best to park where you do not need to use it in the field.

Spacesuits and Helmet Care

We have 6 spacesuit simulators that are two piece and have a backpack and a helmet. This current generation of spacesuits is more rugged than in the past, and as a consequence they are a bit heavier. The backpack straps are very adjustable, and it is important that each crewmember be assigned to a particular backpack throughout their rotation in order that each person is comfortable with their spacesuit. These six two-piece suits are located in the EVA room. These suits are

four years old and were refurbished prior to the field season. The heavy older neck rings have been replaced by bright red 3D printed ones that are half the weight of the old ones.

There are 5 exploration suits of a one-piece design. Four are Gen 2 and one is the original prototype. They also have highly adjustable frames, but each crewmember should try both of the two types to determine which one fits better for EVA use. These 5 suits are also currently stored outside the EVA room. All suits are refurbished prior to the field season each year.

Spacesuits should be charging at all times. When not in use, helmets must be stored in their protective bags. It is important that the helmet faceplate is cleaned only with the provided materials: a spray cleaner and a soft cloth. Never use paper towels to clean them. Never apply toothpaste, dish soap, Windex, or any other chemical (including defogging agents) l to the faceplate. Nothing is to ever be attached, no matter the method, to the space suit helmets.

These current suits were designed and built by the NorCal Chapter of the Mars Society. The NorCal Chapter continues to support their maintenance and repairs, so any issues will be forwarded to them and they will contact the crew to resolve the issue.

The same care rules apply to all suits. Spray cleaner (Plexis) and soft cloths are the only materials to be used/applied to the faceplate. Each person will be given a soft cloth and a headset to use throughout the mission. If you run out of Plexis, or your headset breaks, please let Mission Support know immediately, so they can be replaced.

Communication Systems at MDRS

There are intercoms in all buildings at MDRS. This wireless system is used to communicate between buildings and can be used to contact everyone in an emergency. They are very easy to use and provide consistently good communication for everyone.

Each building is also equipped with a set of walkie-walkies. Crews use Channel 22 to talk to each other between buildings if needed and staff use Channel 19 to talk between their homes. All radios on station should be set to Channel 22, while staff have radios set on each channel.

We have a complete ham radio station set up on the lower deck of the Hab for those who are licensed and can use it.

The radios used for EVAs are part of our new EVA communication system and are considerably more expensive that our other communications systems. The following was written by Marc Levesque, who designed and installed this new system.

As of October 2022, MDRS has a new radio communication system. The centerpiece of the system is a field repeater located on Hab Ridge above the station. This repeater operates at 30 watts on a Very High Frequency (VHF) frequency pair licensed to The Mars Society by the Federal Communications Commission. It does not require an amateur radio (ham) license for its use. The repeater's location greatly expands radio coverage for EVA teams for safely remaining in contact with the Hab.

Along with the repeater, MDRS crews will use new VHF handheld radios transmitting at 5 watts to the repeater and 1 watt on team-to-team frequencies. Each crew member will be issued a radio, headset, and radio chest harness as part of their EVA gear for the duration of their mission. The radio battery should provide sufficient power to operate for a few EVAs, at which point it should be recharged. The base charger will flash when the radio's battery is recharged and ready for use. The radio with battery should not be left on the charger beyond this, as it will affect the battery's life.

The care and appropriate operation of the assigned radio equipment is the responsibility of each individual crew member during their mission. Any damage to item should be reported immediately to the crew's designated Communications Officer.

Handheld Radio Operation

1. Do not use the antenna as a handle. It has a thin wire inside that could easily break, rendering the radio useless.
2. Never transmit on the radio without an antenna attached.
3. Always attach the radio securely in the chest harness.
4. Put on the headset, turn the radio on, and adjust the volume.
5. Change frequencies using the channel knob. Be sure the radio is set to the correct channel before transmitting. The frequency list is below.
6. When transmitting on Channel 1, stand facing the direction of the repeater. Your body may block transmissions otherwise.
7. When transmitting on Channels 2 through 7, face in the direction of your team member for the same reason.
8. Think about what you are going to say before you key the radio. This will shorten your transmission time.

9. Be brief. Avoid unnecessary information. Acknowledge messages sent to you.
10. If using Channel 1, press the Talk button on your headset and wait one or two seconds before speaking. This allows the repeater to open up for transmitting. Hold the Talk button in for a second after you finish speaking to avoid clipping the end of your conversation.

Channel List

1. MDRS repeater
2. Team to Team MDRS
3. Team to Team Purple
4. Team to Team Yellow
5. Team to Team Red
6. Team to Team Blue
7. Team to Team Green

Part Five: EVA PROTOCOLS

General Rules
Pressurization/depressurization in the airlock is a minimum of 5 minutes each way, although crews can choose their own time. Less than 5 minutes in not allowed.

Two mission related EVAs per day is the maximum allowed without special permission. More than one EVA must be mission justifiable. On Mars, you would never even do a single EVA each day as EVAs will be planned to collect information that will need to be analyzed before another EVA will be planned. The reward for each EVA (research return) must outweigh the risk, AS IF YOU WERE ON MARS.

There is no longer a need for any crew to do routine engineering EVAs. However, emergency engineering EVAs can be done if first approved by the director. A radio call and/or chat call is sufficient to do this.

Do not schedule any EVA activity until 30 minutes after dawn or later than 30 minutes before sunset for safety reasons.

We do not allow night EVAs of any kind. This will not happen on Mars.

Length of time and distance on EVA must be justified by EVA goals. As a general rule, 1/3 of your EVA time should be spent traveling to your research site and 2/3 of your EVA time should be spent doing your research at that site.

An EVA team should not outnumber the people who remain at the Hab. If an EVA goes horribly wrong, the remaining crew will need to rescue them.

An EVA team cannot split into two groups in the field. You must all remain at the same location, within visual view of each other.

Vehicle Rules
Do not use the rovers within a 1-km radius around the HAB, with the exception of the training EVA to the Marble Ritual. Schedule walking EVA's any other time.

Vehicles must stay on marked MDRS approved roads only. This is federal law. Any evidence of off-road use, accidental or not, will result in a loss of driving privileges for the remainder of your rotation.

When turning around on the roads, do not drive off of them in a circle. Instead turn in the road, being careful not to "break the berm" or the raised edges of the road. This may require a three (or more) point turnaround. Park on the side of the road as close to the berm as possible but do not park off the road when going off exploring on foot.

We do not allow EVAs when mud and/or snow are present. It generally only takes a day for things to dry out enough for safe travel, and delayed due to the outdoor conditions will also happen on Mars. If you muddy a vehicle, you will be responsible for cleaning it before you leave.

Please do not attach cameras of any type to a moving vehicle or spacesuit.

Never take your vehicle's keys with you when you leave the vehicle. If you are not going out of sight, simply leave them in the ignition. If you are traveling where you will not see them for some time, leave the keys somewhere on the vehicle where they cannot be easily found. Suggested places are the front grill or the back tire which does not face the road.

If using ATVs: No double riders on the ATV's regardless of the circumstances. Anyone towing a rover with an ATV must be out of sim for safety reasons and they also need to be very careful not to tip the ATV on top of them by pulling too fast or hard. The HabCar can also be used to tow rovers on Cow Dung Road.

EVA Planning

You will be required to request permission for your EVAs the evening before you execute them. EVAs should be divided into 1/3 time driving, 2/3 time walking and exploring, unless your EVA goals are specifically different enough to support another time schedule. Your goals should determine who is going on the EVA, not some set schedule that you have set up for your mission. Do not waste a scientist's time in the field by having them go on an exploration EVA in any area they are not interested in. You should also not schedule EVAs for the same time period(s) each day unless your research requires it, as the light changes throughout the day and will allow for a different perspective of the landscape at different times. Think about what you want to accomplish, how best to accomplish it, and plan accordingly. You need to list the time you will be out on EVA in your request. It is important that you stick to the time you request. If you need to delay an EVA by an hour, you need to let Mission Support know you are delaying it, and you cannot then extend your EVA time by an additional hour. Be sure you are back at the Hab when you say you are going to be back. The Director will go on a rescue mission if you are even 5 minutes late if HabCOM has not heard from you. We do not dictate your daily plan at the station, but once you submit an EVA plan you need to stick to it with no variation. For example, do not decide mid-way through an EVA that you still have time and you are done with what you came to do at the place you said you were going to do it and so you decide amongst yourselves to go check out another site. Don't walk beyond and/or in any other direction that what you stated in your EVA plan. Those are safety violations. If you were to have an emergency at another site, and someone went out to help but could not find you, you could put someone's life in jeopardy.

You are allowed to break sim to go to the bathroom on EVA if needed. It is not a violation of sim as we will have a solution for it on Mars.

MDRS Map and Coordinate Systems

There are two official MDRS maps. The newest map is what has been physically provided for you and must be used for all travel at MDRS. It shows the roads at MDRS where you can legally travel. It has also been divided into 9 sections and should be used for EVA planning. A small laminated version must be taken on all EVAs and large laminated copies are in the Hab.

An older map may be used to supplement your science goals, but should not be used for any reporting. This map is available as a digital download only, please request the URL from Mission Support if you would like it. Please do not use it for any EVA planning or reporting as there are many changes between it and the new map.

Note also that the older map is in UTM NAD 27 (CONUS), while the newer map is in UTM WGS84. Beginning with the 2022-2023 field season we will use WGS84 only on reports and in datebases. All documents prior to November 2022 are recorded in NAD 27 and need to be converted if they are to be used in anyone's research.

Part Six: SHORT GUIDE TO MDRS ROADS

Under no circumstances are any vehicles allowed beyond the berms of these roads.

There is one major road on the MDRS campus area. That is Cow Dung Road, and it is the road that you drove into MDRS on. Cow Dung Road ends at the Burpee Dinosaur Quarry wood fence, which is identified on the map as the "Special Region" at the far north end of the road. This road is one you can generally drive at a higher speed (Gear High (H) in the rovers), but some years the road is so bad that there are parts where you must drive much slower than in the past. There are many exciting places to explore along Cow Dung Road. Basically, you can stop at any point along this road, travel in any direction and find something amazing. Exploring off the road by foot at any point along this road is rewarding.

There are four roads branching off Cow Dung Road that can be driven on. These are generally driven in Gear Max (M) as they are not maintained at all. They are:

Road 1101. The road to Barainca Butte. This road is not on the map. It is very rough and should only be walked, as much of it was washed away in recent heavy rains. It is a beautiful road that goes past Barainca Butte and into the Labyrinth. From the Labyrinth you can see Highway 24 so don't go that far if you want to avoid seeing cars. To the north of Barainca Butte is an amazing Marslike area that extends north and east to Robert's Face**. (NOTE: THIS ROAD IS NOW CLOSED TO MDRS VEHICLES)**

Route 1104. The next road to extend off Cow Dung Road is Galileo Road. This road is marked with a route marker on the left side of Cow Dung Road as you approach. The road appears unpromising at first as it covers grasslands, but then you drop into an area of amazing Marslike terrain. Galileo Road is one way to view the Summerville Formation at its end. Midway, you pass one of two entrances to Candor Chasma. There is a small dome butte that rises above the valley. Travel to the east along the south side and you will be following Galileo Road. The entrance to Candor is right before you begun traveling the straight road through the grasslands. Or you can continue south on the road until you come to the stream that is Gateway to Candor. Park there and travel on foot on the road on the other side of the stream to find the second entrance to Candor. Or explore to the northwest on the red cliffs. The BLM has closed this road past the stream bed to foot travel only, so do not drive any further. In addition, the road that branch off the east most part of Galileo Road to the north (1105) is no longer a legal road and all vehicle traffic there is forbidden.

Route 1572. From Cow Dung Road at the entrance to Galileo Road, travel north to the next road, named Brahe Highway. Brahe Highway turns towards the west and

also has a route marker a few hundred feet before the turn. This road goes up through the Mancos Shale to an overview where you can see Skyline Rim and all of the San Rafael Swell. MDRS travel is restricted beyond the turnoff for Copernicus Highway (Route 1575) unless the crew has a specific goal. Then they should request further travel in their EVA Plan. The remaining terrain on this road is not Marslike but rather lunar in appearance.

The final road that extends off Cow Dung Road is Gateway to Lith. This road does not have a route marker. Crews are permitted on this road only as far as the north side of Lith Canyon (which can also be accessed via the quarry). The east (right) branch of this road, going to Green Mars) is closed to MDRS crews unless a specific purpose is stated in your EVA request. Use only the west (left) branch of the road to access Lith Canyon.

Copernicus Highway (Route 1575) branches off Brahe Highway to the north near "The Moons" (not labeled as such on the map). This road takes you through a canyon past the place where the Mancos Shale and Morrison formations meet and down into a Marslike valley west of Lith Canyon. Crews are advised that unless they have a specific objective and some advanced driving skills, they should not use this road.

Route 1103 is a walking route from the Hab to Hab Ridge. Walk from the Hab north along the ridge until you find the road near the North Hills that you can walk to get a spectacular view of the MDRS campus.

In addition to the roads, this map has nine labeled sectors that crews can use to indicate where they are travelling around MDRS. These sectors are based on the hemispherical sectors assigned to Mars.

Part Seven: HEALTH AND SAFETY

The greatest danger you will face at MDRS probably won't be the occasional snake, scorpion or cougar in the field. By far the greatest number of accidents have been ATV/rover accidents, followed by overexposure to the elements and exhaustion, followed by trips, falls and cuts. Notice that all of these are generally the result of human error. ATV/rover accidents are always caused by excessive speed and unsafe traveling conditions. Overexposure to the elements and exhaustion are often caused by the person being affected not telling their crewmates that they are too cold, too hot or too tired. Trips, falls and cuts are often caused by a person being too tired, or trying to do something too fast.

SLOW DOWN! GET ENOUGH SLEEP! Even an experienced field scientist will only complete about 50% of the goals they set for the mission. That's just how it goes on Mars. Do not push yourselves beyond what is healthy. Remember that on Mars your mission will be the most successful if it is boring and moving forward at a speed that your crew can maintain. Yes, you may only have two weeks here, but your primary mission is to simulate conditions as if you were living on Mars, so your mission won't move at the lightening pace of a Mercury, Gemini or Apollo mission. Think MIR, think ISS, and then slow it down even further. Martians will live everyday just like you and I, but their day-to-day routine will be different. They will get enough sleep, they will not constantly be going and going until they make mistakes. For the most part, Mars is going to boring. And that is good, because that means everyone is safe.

No names, gender or other identification concerning medical matters should go into published reports. You can send specific information in an emergency situation to Mission Support. So in a report you would write: "We had a crew member (no name) crush their finger during EVA…" but when reporting it to Mission Support or staff during an emergency you can write: " Joe cut his hand with a razor blade and we got the bleeding to stop but are going to the hospital in Richfield for further treatment. He takes blood thinners."

In addition to slowing down and getting enough sleep, be sure to drink plenty of water. Many crewmembers come from much lower elevations that MDRS and the effects of the higher elevation (headache, tiredness, dizziness and shortness of breath) can be ameliorated by keeping yourself hydrated. Drinking enough fluids also limits the nasal discharge and stuffiness you may also experience due to the much drier climate than most are used to experiencing.

For all crew health emergencies: Dial 911. They know where we are and can get someone out here or tell you where you should take them. When you first get to MDRS, find out who on the crew has the best phone reception. That person should be charged with making the call should it be required or everyone should

know where that person's phone is to make the call. A second person should physically contact Shannon at the same time 911 is being called.
All buildings at MDRS have safety equipment and first aid kits installed. At the beginning of your mission, your HSO will be required to locate and inspect each piece, and notify Mission Support immediately if something is missing or not functional. A list of that safety equipment is in the HSO Beginning of Sim Report, which is located in the Appendix of the Handbook.

Some other important information:

The nearest treatment is available at the Wayne County Community Health Center:
128 South 300 West Bicknell Utah 84715
435-425- 3744

911 will be able to tell you if they are open or transfer you to the hospital in Richfield.

In a life-threatening emergency, you may be airlifted to St. Mary's Hospital in Grand Junction.

Some other contact numbers:

Wayne County Sherriff (9-5 M-F)
435-836- 1308
Richfield Dispatch (if Sheriff office is closed)
1-800- 356-8757
Wayne County Emergency Services Director Jeri Johnson
435-836-1319 or 435-691-0436

Part Eight: PHILOSOPHY OF THE SIM, OR HOW TO BE A MARTIAN

MDRS was conceived as a space simulation testbed. The idea was to create a scientifically relevant operational habitat for researchers to test what we will need to know in order to successfully complete a human mission to Mars. We welcome missions with other objectives, but a majority of rotations at MDRS are done in sim. As the only permanent analog station with a two-decade history of continuous year-after-year operations, we want crews to contribute to this valuable body of knowledge and so the practice of a simulated space mission continues.

It makes no sense to come to MDRS and do a sloppy sim, filled with exceptions to the rules and reasons not to adhere to mission protocols. The most violated sim rules at MDRS are going out at night in the tunnel to stargaze and/or take night photographs from outside. Sorry, that's cheating. Another thing crews do to diminish the rigor of their sim is to use COMMS we wouldn't have on Mars. Synchronous COMMS of any kind (Zoom, Messenger, Skype, video chats, phone calls) and use of Earth-based logistic programs such as Google Earth, which will not be available on Mars, are another way crews weaken their sim. The purpose of coming to MDRS is to experience and learn from a simulation, not alter it every time you find it inconvenient.

One thing to remember is that EVAs should not be the focus of the sim. Early on, analog astronauts would use time on EVA as a measure of their experience, and the obsession with EVAs began. We seem to have moved on from using time on EVA in such a way, but crews need to remember that on Mars, no one would go on an EVA unless:

1. The EVA had a purpose. No EVA would happen on Mars to just go out and check out the terrain. If you are exploring, which is fine, you must have an exploration plan. Why are you going to that particular area? What do you hope to learn to apply to further exploration?

2. The research return on the EVA was greater than the risk. Safety first.

3. Data collected on an EVA are categorized and analyzed before a follow up EVA is scheduled. While we understand that some projects require a lab more sophisticated than ours, all attempts should be made to learn something from the data collected on an EVA before you go out to continue that research. Crews on Mars are not going to send data back to Earth without first doing as much of the analysis of those data as can be done at the station.

Remember too that when scheduling an EVA, the goal is not to take as many people as want to go out, but only as many people are needed to complete the EVA's objective.

Another thing to remember is that science needs to be a stakeholder in the sim. Your science questions need to be considered in defining the scope of your simulation. For example, if you are doing any sort of human factors experiment that looks at crew interactions or the effects of isolation, your simulation must have rules that are adhered to throughout the mission. If you have research devoted to fieldwork, make sure your crew scientists get to the places they need to go to do that work. The values and goals you place on your science needs to be reflected in the values and goals of your simulation.

A rigorous simulation also means keeping a daily routine similar to that which we would have on Mars. This should be defined by the crew. Your crew should get together early on in planning your mission and discuss this. It is important that you discuss this prior to your mission, or you will spend many days trying to work it out once you arrive at MDRS and you will lose valuable time during your mission. You also need to discuss what parts of sim might be deal breakers for one or more members of your crew. If there is something that someone feels stronger should or should not be done in regards to sim, it should be respected and a compromise worked out. For example, if one person on the crew feels very strongly that their sim would be unacceptable if people didn't go to bed and get up on a schedule, that should be respected, and maybe you determine a wake-up time in the morning and a quiet time after a certain hour at night. Crewmembers need to be very open about things that are important to them, not only regarding their research goals, but also about personal feelings that they might have. If someone can't stand people brushing their teeth in the kitchen sink, they need to tell the team early, rather than blow up about it on day ten of their mission. In addition, if a crewmember has a personal goal, such as wanting to get a great photo of them doing research on EVA, then need to let people know, rather than get angry that no one takes their photo on EVA!

What is sim and what is not sim? I get asked this a lot. It really is as simple as "Think like a Martian, act like a Martian". Ask yourself "Could I do this on Mars?" If the answer is no, don't do it. There is one caveat to this rule. If what you want to do will be answered by a technology fix on Mars, you can do it and consider it being in sim. For example, we don't have a way to go to the bathroom in our spacesuits, but you will one Mars. So if you have to go to the bathroom on an EVA, do it. Take off the spacesuit, do the thing, and then put your suit back on and continue your EVA in sim. Don't give yourself a urinary tract infection because you don't want to break sim. Because it isn't breaking sim. On the other hand, if you need a handful of small rocks, don't dash out the rear airlock and grab a few from just beyond the tunnels. Wait until your next EVA and collect them at that time.

Expect to complete about half of what you expect to complete. Instead of panicking and trying to get it all done before your rotation ends, adjust your expectations prior to your arrival. Working as a team under simulation constraints takes much more time that you expect. Crews on Mars will set a LIVABLE pace for their research and you should, too.

There has been some confusion over what constitutes crew support when a crew is in sim versus when a crew is not in sim. This has led to frustration for some crews and sometimes leads to the us versus them paradigm that we like to avoid.

It is simplest to describe support prior to sim. Without considering COVID in a situation, most of the time the crew can rely on information from whoever is on site. Early on they will be introduced to systems, and then they will be trained in protocols. Information, particularly about COMMS, can also be obtained from Mission Support. This is an active training period so any and all information can be shared. Crews should make sure they have a full understanding of any systems and/or instruments they want to use during their mission before they go into sim.

When a crew goes into sim, this flow of information changes. Whoever is on site becomes the last point of information. This makes sense, because for the purpose of the sim, the crew is on Mars, and they are alone. I understand that it is easier to radio over to the onsite person and ask for answers, but if you follow the most basic tenant of the sim "Think like a Martian, act like a Martian", you would not be able to do so. It is true that in many cases it is the onsite person who will have the answer to your question, but you violate sim when you call them.

Ideally, unless you have an emergency, a crew should not have contact with onsite personnel at all while they are in sim unless it is via COMMS. Sometimes one of us will chime in on a radio conversation if you are about to do something that is not allowed, but otherwise we do not contact the crew. We understand that some crews are more comfortable with more support, and we will be happy to help on non-sim issues as much as you like in the first few days but crews should try to decrease the amount of support they seek from onsite personnel.

By far the thing that causes the most confusion and frustration with crews is when onsite personnel do not chime in on the radio when they are about to do something that causes their activity to fail, because they have missed something they should have known or done in the process. This is an operational analog. We are not going to help you solve a problem that you created. It's okay that you fail. You have to remember, this is a learning environment, whether you are a student or a professional, and things aren't always going to go smoothly.

A crew should not be so eager to go into sim that they realize they are missing information about something once they are in sim, because it will be much harder to obtain the information you need once you are in sim. If a crew discovers they don't know how to operate a lab instrument and need more information, for example,

they need to contact Mission Support before they operate the instrument and inadvertently cause damage. They will then be instructed on how to operate it through email, which is far more difficult that having someone show them in person before their sim.

Of course, there are exceptions to this. For example, if the crew suspects a gas leak, they will be asked to check it with the gas meter. If no one in the crew has used one, they can contact onsite personnel to get instructions, and in cases when they are not comfortable using it or in a serious emergency, breaking sim and getting help is paramount. Radio for help, and we will come right over.

Crews at MDRS now have it much better than earlier crews who came to the station. We used to have to break sim all the time to manage the systems that now run automatically for crews. Take advantage of the improvements at the station and do the most rigorous sim you can do. Believe me, you will regret it later if you don't take the sim seriously.

We are often referred to by the media as pretend astronauts participating in a mock mission to Mars or a fake space mission. This is incorrect and I wish people would get it right. A simulation is a scientifically justified exercise meant to uncover problems and solutions of situations before or during the actual experience. Operational simulations have always been part of space exploration and they will probably continue to be for the near future. You are a participant in an activity that is time honored and respected in the space community. Do the best job you can.

Appendix A. Application materials

MDRS Crew Application for 2022-2023

PLEASE NOTE: In the past we have considered applications that did not follow the instructions completely. For this field season, no application will be accepted if instructions have not been followed. You are applying to participate in a professional program and following instructions is a required part of being an analog astronaut.

PART ONE OF THE APPLICATION:

Please answer the following questions on the first page of your application. Do not include the questions, only your answers. Applications with the questions included will not be considered.

1. Please write your name. Include the following: Surname/Family name, Given name Title (optional). What would you like to be called by your crewmates (if not your given name)?

2. Please write your postal address complete with postal code and country and denote whether the address is: Home, Work, School, or Other (please specify)

3. Do you have US citizenship, permanent resident status, a US visa that will remain enforce through June 2022, or will you acquire a tourist or other visa in order to visit?

4. Please list the email address you want to use for all correspondence from the Mars Society (one only).

5. Please give us your telephone number. Please include the country code if the number rings outside the US or Canada.

6. Please give us your date of birth as day month year, e.g. 16 July 1994

7. Are you applying as: an individual applicant or as part of a self-organized team? Please list the name of your self-organized team's name, if applicable.

8. Are you applying as a student or as a professional? If applying as a student, you will need to show proof of current registration prior to your arrival at MDRS. Please see other qualifications for students in instructions.

9. Please enter the dates of the rotations (listed below) that you are available to serve on a MDRS crew.

NOTE: You should have discussed this with the director of MDRS prior to being invited to apply. Note all possible dates that you discussed.

Please add any optional comments or explanations concerning your available dates.

NOTE: Crew rotation numbers and dates are tentative and will probably change depending on crew assignments.

10. Please list your ILR level of English language proficiency according to the self-assessment at http://www.govtilr.org:

Elementary 1 2 3 4 5 Native/Bilingual

11. Do you have any dietary restrictions or food allergies? If so, please describe. If not, please enter "none". Please be aware that it is your responsibility to address solutions to any food restrictions on your own. MDRS is not responsible for providing crewmembers with special food during their time at MDRS.

12. Do you have a driver's license valid in the US?

13. If you have served on a space analog crew or long-term expedition crew in the past, please list your experience. Specify the facility or location, the duration of your mission, the number of crewmembers serving with you, and your role in the mission.

14. For safety reasons, MDRS crew members must be physically fit enough to perform outdoor work in cold and/or hot conditions wearing heavy mock space suits. They should have sufficient fine motor skill for typical hand writing and typing tasks, and sufficient (corrected) visual and hearing acuity for independent (non-assisted) participation in all aspects of the crew's work and communications. Please choose one of the responses - if you choose the second, and are otherwise qualified to join a crew, just let us know what accommodations to your limitations are required. Please write the following statement that applies to you on your application:

- I attest that I am sufficiently able-bodied to do all of these things.

- I am unsure about my fitness level, sight or hearing, and would like to discuss my situation with one of the MDRS management team. (Also include what about your fitness level, sight or hearing that you may have and how you will manage it at MDRS.)

15. MDRS is located at least 45 minutes from the nearest emergency medical service and about 2.5 hours from the nearest full service hospital. If you have a major health condition that could impact your stay at MDRS (e.g. diabetes, asthma, high blood pressure, cancer, cardiovascular disease, blood clots, mental illness, autoimmune disease, major allergies or substance abuse issues), or have a history of any of these health conditions including heart attack or stroke, you should obtain clearance from your physician before participating at MDRS. Please write the following statement that applies to you on the application:

- I attest that I do not have, and have no history of, any of the above-mentioned health conditions.
- I would like to discuss my situation with one of the MDRS management team. (Also include your health condition and how you will manage it at MDRS.)

16. Crews at MDRS live in close physical proximity to each other. If you carry a communicable disease which can be passed from person to person in a normal living environment (e.g. tuberculosis, Hepatitis C) we expect you to discuss your situation with your doctor and disclose it with us. If you select the second option, and are otherwise qualified to join a crew, we may contact you. Please write the following statement which applies to you on your application.

- I attest that I do not carry any communicable diseases.
- I would like to discuss my situation with MDRS management. (Also include your communicable disease and how you will manage it at MDRS.)

17. Have you or anyone in your household tested positive or been treated for COVID 19? This will not have any bearing on your application but we do need this information for the health and safety of other people.

18. Are you fully vaccinated for COVID 19? Proof will be required prior to your arrival at MDRS as long as it is recommended by the CDC.

PART TWO OF THE APPLICATION

Please address the following in a short summary paragraph:

Read over the skill sets for the crew positions in a typical MDRS crew in the instructions that accompany this application and decide which ones are best suited to your skills, experience and interests. Roles include Commander,

Executive Officer, Health and Safety Officer, Crew Engineer, GreenHab Officer, Crew Geologist, Crew Biologist, Crew Astronomer, Crew Scientist, and Crew Journalist/Artist/Communicator/Media Officer. If you are applying as a professional Artist-in-Residence, please indicate this. Professionals may indicate their preference for a crew role other than those listed above. However, it is the responsibility of the applicant to provide evidence that they are qualified for this role and also that a significant part of their work at MDRS will reflect this role. It is at the discretion of the Crew Selection Committee to grant titles other than those listed.

List the positions for which you are qualified to serve and rank them in order of preference. Please do not apply for a position for which you are not qualified. Fully justify, through your education and experience, why you are applying for the position. If you are applying as a team, please list **only** that role for which you have been assigned in that team, although you still must justify why you were selected for that role. If you are applying as both part of a team and as an individual, please indicate this in your answer to this question. Briefly describe your qualifications/training for each position and your interest in serving in each one. (250-500 words)

PART THREE OF THE APPLICATION

Please let us know about any of the following skills or experience you have that would make you a particularly valuable member of a MDRS crew. On your application, list only those things that you have notably more experience in than a normal MDRS crewmember. Give a short summary of your background and skills in all areas of expertise that you have listed.

Do not list any of these things on your application for which you have no special skills or experience.

Member of The Mars Society or affiliates (e.g. Mars Society Australia, etc.)

Prior MDRS or FMARS crewmember

Prior member of other analog facility expedition (e.g. HiSEAS, NEEMO, D-RATS, etc.)

Member of a team whose home institution/group has a multi-year history of successful participation at MDRS

Analog astronaut (simulation)

Mars Analog research (no simulation)

Medical Training (e.g. First aid, First responder, EMT, nurse, M.D.)

Greenhouse management

Field research (Geology/Geophysics, Biology, Meteorology, etc.)

Lab research (Chemistry, Biology, Physics, Horticulture, etc.)

Living off-grid

Living/working in wilderness/remote setting

Working in extreme environments

Leadership

Group participation showing a long term commitment, for example, clubs that you have participated as an active member over a period of time (does not have to be Mars/Space related)

Home repair and maintenance (e.g plumbing, carpentry, electrical, heating/cooling, propane and water pumps)

Mechanical skills (e.g engine repair and maintenance)

Electronic skills (e.g. soldering, measurement, testing, troubleshooting and repair)

IT skills (e.g.operation, configuration and connectivity of computers, Wi-fi, networked devices, basic network commands)

Communications (e.g. ham radio operator, repeater operations)

Aviation experience, including drones

Cooking

Travelling by ATV and/or 4WD

GPS and map reading

Expedition management

Social media

Multi-lingual

Communication and collaboration with diverse cultural groups not centrally located

Maintenance and cleaning of a research facility

Maintenance and cleaning of a communal living facility

Graduate education

Specialized training related to analog research

Relevant licenses/certificates held

Prior published research on Mars analog research

Any other skills you feel are relevant to being a crewmember at MDRS

PART FOUR OF THE APPLICATION:

To complete your application, please attach the following as the final page(s) of your application:

a) A simple resumé or curriculum vitae including the names and addresses of three references. Please submit as a word doc and do not include a photo. If you are a student or a crew of students, one of your references must be an academic mentor/advisor. If you are part of a team with an external director, he/she must be one of the references for each member of the team.

b) A formal one-page summary of all research (scientific and engineering), outreach, education and media activities you will be proposing for your stay at MDRS. Be sure to include names of collaborators and sponsors, as well as your institutional affiliation for this research. If the research involves human factors, please include your plans for IRB approval. If you will require special permission for land use, and/or special use of MDRS facilities, please include this is your research. You will be asked to update these documents within 30 days of your arrival at MDRS, but it is important that you give us as many details as you can for your applications.

c) Any additional paperwork required by your crew per application instructions.

Please email your completed application as a SINGLE word document (no pdf's or other formatted documents will be accepted) to MDRSapplications@marssociety.org.

You may also attach a team proposal to your application, as long as we also receive a **separate** completed individual application for all applicants.

On to Mars!

Appendix B. Legal documents for crews

THE MARS SOCIETY: MDRS CREWMEMBER WAIVER, RELEASE AND INDEMNITY AGREEMENT

I, _____, the undersigned, being at least eighteen years of age, and in consideration of the right to participate as a crew member at the Mars Desert Research Station (MDRS) during the period_____, do hereby agree to the terms of this Waiver, Release and Indemnity Agreement.

I recognize that being a crew member at MDRS is a hazardous activity carrying significant risk of personal injury. I further recognize that there are natural and manmade obstacles; hazardous surfaces and environmental conditions, and other risks, which in combination with my actions can cause severe or fatal injury. I hereby freely agree to assume all risks which may be associated with or result from my participation as a crew member at the Mars Desert Research Station.

I also specifically hereby acknowledge and confirm my understanding that use of an EVA suit constricts and limits my ability to safely conduct activities that I may undertake while a crew member at MDRS, including but not limited to hiking, riding all-terrain (ATV) vehicles, climbing, sample taking, and other similar EVA activities. Such restricted abilities in the remote and hostile Utah desert environment may be dangerous and can lead to serious injury or death. I specifically agree to assume full responsibility for, and hereby acknowledge the risk of, any bodily injury, death, or property damage that may arise from riding any type of EVA vehicles anywhere while a crew member at MDRS.

I further agree to assume full responsibility for and to hold harmless and indemnify and hereby release The Mars Society, Inc., its agencies, departments, officers, directors, employees, agents, and volunteers, from any and all costs of litigation, liability, claims, demands, actions, and causes of actions whatsoever for any loss, claim, damage, injury, illness, or harm of any kind or nature arising out of or in connection with my participation as a crew member at MDRS.

I hereby acknowledge and grant The Mars Society, Inc., its officers, directors, members, servants, and agents, the right to photograph me and use my image and any other reproduction of my physical likeness (as the same may appear in any still camera photograph and motion picture) in, and in connection with, exhibition, theatrically, on television or otherwise, or any motion picture(s) in which the same may be used or incorporated, and also in the advertising,exploiting, and/or publicizing of any such motion picture(s), but not limited to television or theatrical motion picture(s). I hereby certify and represent that I consider any publication of my image by the Mars Society, Inc. to be valuable consideration for

said release, and hereby waive any and all rights to further compensation of any kind in connection with the utilization of my picture and any other reproduction of my physical likeness with reference to my participation as a crew member at MDRS.

This release shall be binding upon the spouse, heirs, legal representatives, next of kin, executors, and administrators of the undersigned crew member.

By entering into this Agreement, I am not relying on any oral or written representation or statements, other than what is set forth in this Agreement. I specifically waive any defense insofar as this Agreement is concerned that may arise as a result of any state or local law and/or regulation or policy that may impact its enforceability.

CONSENT

In the event of an injury, consent is hereby expressly given for emergency medical aid, anesthesia, and/or surgical procedures, if in the opinion of an attending physician, such treatment is necessary.

I HAVE CAREFULLY READ AND UNDERSTAND THE CONTENTS OF THIS WAIVER, RELEASE, AND INDEMNITY AGREEMENT, AND I SPECIFICALLY INTEND ITS TERMS TO COVER MY PARTICIPATION IN THE ACTIVITIES SPECIFIED ABOVE.

Date: _____

_____
Signature of Crew Member

_____
Print Name

Mars Desert Research Station
Code of Conduct

All people taking part in Mars Society expeditions (the 'Expeditioner' or 'Expeditioners') are required to accept that their participation is conditional on their continued compliance with this Code of Conduct ('The Code'). This Code is valid in all Mars Society undertakings, whether a stay at one of the Mars Analogue Research Stations or on a Mars Society related expedition elsewhere. The Code is also considered to rule conduct at any Mars Society meeting, conference, or sponsored event.

PURPOSE AND POLICY
The Code establishes standards of personal behavior for those taking part in Mars Society Inc. expeditions, which contribute to morale, teamwork, participation, and, ultimately, a successful expedition.

The main focus of life at the Mars Desert Research Station is the collection of scientific data. This will take priority over all other aspects of the expedition and will determine the daily and weekly schedule. Expedition life is challenging, but by following this Code of Conduct and with the right attitude and work ethic, it may be one of the most rewarding experiences of your life.

STANDARDS AND OBLIGATIONS
Each Expeditioner must comply with the general standard of behavior recognized as reasonable by the wider community. The Expeditioner is also required to meet the additional and specific standards of behavior outlined in the Code. The Code is not intended to be exhaustive on matters of personal behavior. The Code outlines broad standards that serve as a guide to acceptable and unacceptable behavior.

COVERAGE AND ESSENTIAL INFORMATION
The Expeditioner has been provided with a copy of the Code and should understand that their participation in Mars Society Inc. expeditions and events is conditional on their continued compliance with its provisions. It is the responsibility of the Expeditioner to familiarize themselves with the contents of the Code.

THE CODE
1. WORK
1.1 Expeditioners have been selected largely because of their skills, experience, knowledge, and personal qualities. The Expeditioner is expected to be efficient, effective, diligent, responsive, productive, and timely in meeting their

individual responsibilities. The performance of the Expeditioner should clearly show that they meet these expectations with minimal supervision. It is also expected that each Expeditioner will work with Mission Support and the MDRS management team to comply with all procedures, protocols, and practices established both at MDRS and operationally.

1.2 It is expected that the Expeditioner shall:

- work with others in the most effective manner to meet the objectives of the expedition;
- assist with routine base camp chores to be completed each day;
- assist with various infrastructural development and/or maintenance projects at the Hab as may become necessary during the expedition;
- show leadership, consult, coordinate, delegate, negotiate, and counsel as appropriate with other individuals, especially those under their control; and
- comply with and ensure that their team understands and complies with occupational health and safety principles and practices.

1.3 In order to distribute the daily workload fairly, the expedition team will share on a rotational basis the following tasks:

- assist in the preparation of food and ensuring the kitchen and eating area are cleaned after meals;
- ensure that the Hab and other buildings at MDRS are kept clean and that maintenance tasks are completed daily;
- prepare science, survey, and safety equipment for use during the day's fieldwork, and ensure that all equipment is cleaned and stowed for the next day's use as appropriate;
- assist in the loading and unloading of expedition equipment.

These tasks are essential to the safe operation of the expedition and the Hab. All Expeditioners are asked to complete the tasks to the best of their ability.

2. INDIVIDUAL CONTRIBUTION TO EXPEDITION AND TEAM

2.1 The Expeditioner should manage interpersonal relationships in such a way as to promote and maintain group harmony and well-being.

2.2 Expeditioners are expected to treat others with consideration, courtesy, respect, fairness, and tolerance. The general standard expected is one where conduct would not cause dissension or discord amongst Expeditioners or disrupt programs or other responsibilities. The Expeditioner is expected to respect others' rights, opinions, duties, aspirations, and privacy.

2.3 Difficulties may occur between an Expeditioner and other Expeditioners or members of other communities with which the Expedition interacts. It is the responsibility of all to ensure that such difficulties are resolved with courtesy and as quickly and effectively as possible, given the circumstances.

2.4 Smoking is prohibited in all vehicles, accommodation, dining places, and shared places during the Expedition. In all other circumstances, smokers should consider the rights and comforts of nonsmoking companions. In common with all activities involving the use of fire, smokers should take all due care with respect to the fire hazard that smoking creates.

2.5 Use of alcohol and prescription drugs should not compromise broader responsibilities. Drug and alcohol use, including prescription drugs, have clear implications for occupational health and safety and the maintenance of harmonious relations. Therefore the Expeditioner shall refrain from alcohol consumption, realizing that they are expected to be capable of performing their duties and other responsibilities at all times in a safe and effective manner. Expeditioners are reminded of their legal obligations and responsibilities related to the possession and use of prohibited or restricted drugs and the use of alcohol. The use of alcohol during an expedition shall be restricted to moments of 'special celebrations,' and those are expected to occur rarely.

2.6 The Expeditioner shall not behave in a manner that may be classified as 'extreme' nor encourage others to behave in such a manner. Examples of extreme behavior include, but are not limited to:

- threats to personal safety or property;
- disorderly behavior, including being violent, threatening, insulting, or abusive;
- indecent exposure and other gross, obscene, or offensive acts;
- willfully or negligently causing loss or damage to property;
- causing annoyance through the use of offensive language, excessive noise, or in ways that a reasonable person would find offensive;
- recklessly driving ATVs or cars or driving at a too high a speed to be safely followed by all expedition members.

3. RESPONSE TO AUTHORITY AND COMPLIANCE WITH THE LAW, LEGISLATIVE REQUIREMENTS, AND EXPEDITION POLICY AND PROCEDURES

3.1 The Expeditioner shall comply with lawful directions and reasonable instructions. Lawful directions, instructions, and standards of performance are normally issued or determined by the various leaders or persons in charge of any vehicle, field party, or work group. Such instructions and standards shall, at all times, comply with the requirements of the Mars Society's Code of Conduct.

3.2 The Expeditioner shall comply with relevant codes of occupational health and safety and ensure that their actions do not threaten their safety, health, and welfare or that of others.

3.3 The Expeditioner shall be sensitive to harassment issues and will not engage in any harassing behavior. Harassment can take many forms and may consist of offensive, abusive, belittling, or threatening behavior directed at another individual or group. It is often based on some real or perceived attributes or differences. Sexual harassment is any unwanted, unsolicited, and unreciprocated behavior of a sexual nature that is objectionable to another individual. Any behavior or series of behaviors, despite the intention of the individual performing the behaviors, will be considered sexually harassing if they are experienced in that way by the recipient and/or other Expeditioners.

The guidelines against harassment apply both to interactions with other Expeditioners and to interactions with members of communities and organizations that the Expedition encounters.

3.4 The Expeditioner shall comply with the requirements of all federal, state, and local laws, and respect and comply with the requirements of other relevant landholders and operators in the area with whom they may interact.

4. BREACHES OF THE CODE

4.1 Breaches of the Code may result in the Expeditioner being required to leave the Expedition. Transport may be provided to the nearest location with bus service (currently Green River, UT), and the former Expeditioner will then be responsible for all further costs and arrangements of accommodations and transportation.

The Mars Society may refer to appropriate legal authorities any criminal conduct and/or acts of theft, conversion, destruction, or damage to any property that it believes should be handled under relevant federal, state, or local law.

By signing below, I hereby acknowledge that I have read and retained a copy of the MDRS Code of Conduct, and that I fully understand its terms and agree to follow it at all times.

Date: _____

Crew # _____

Signed:

_____

(Sign full legal name)

Name:

_____

(Print full legal name)

TMS:10/12/2020

Appendix C. Food Inventory

BASICS:

Baking Powder
Baking mix
Baking Soda
Corn Meal
Flour, All Purpose
Flour, whole wheat
Milk, almond
Milk, coconut
Milk, powdered
Oil, Olive
Oil, Vegetable
Sugar, brown
Sugar, white
Yeast

FOOD ITEMS:

Almonds
Biscuit mix, Cheddar Bay
Brownie mix
Cheese, dry Parmesan
Chocolate bars
Chocolate chips
Couscous, varied
Crackers, Graham
Crackers, Saltine
Frosted Flakes
Granola
Honey
Jam
Jambalaya Mix
Kidney beans
Lentils
Nutella
Oatmeal
Pancake Mix
Pasta, various
Peanut butter
Peanuts, dry roasted
Pinto beans
Potatoes, instant mashed
Raisins
Raisin Bran
Rice, brown
Rice, white
Rice Krispies
Salsa
Soup mix, various
Spam, canned
Trail mix
Quinoa

BEVERAGES:

Coffee
Hot Cocoa
Nesquik Chocolate mix
Orange Delite
Tea, black
Tea, green

NON-FOOD ITEMS:

Baby wipes
Bleach
Digester for toilet
Dishsoap
Garbage bags
Hand sanitizer
Liquid Cleaner
Lysol disinfectant spray
Paper towels
SOS pad
Sponge
Toilet cleaner
Toilet paper
Towels, kitchen
Water filter, Brita

FREEZE DRIED FOODS:

Meat:

Beef Crumbles
Chicken
Sausage Crumbles

Fruits:
Apples, cinnamon
Bananas
Blueberries
Mango
Strawberries

Vegetables:
Broccoli
Carrots
Cauliflower
Celery
Corn
Mushrooms
Onions
Peas
Peppers, red and green
Potato slices
Spinach
Sweet Potatoes
Tomato powder

Other:
Eggs

Butter powder

SEASONINGS:
Hot sauce
Bouillon, beef
Bouillon, chicken
Bouillon, vegetable
Cayenne pepper
Celery Salt
cinnamon
Curry powder
Garlic Powder
Italian Seasoning
Lemon pepper
Lemon powder
Onion powder
Pepper
Saffron rice seasoning
Salt
Soy sauce low sodium
Vanilla

Please note that due to the worldwide shipping problems and shortages happening, not all food items may be available during your rotation and frozen foods may be provided instead of freeze-dried.

Appendix D. Pack list

MDRS 2022-2023 Field Season

Personal Equipment List

Please read this carefully and make sure you have what you need before you arrive at MDRS.

These lists are suggested equipment for each MDRS crewmember. They do not cover all details of what you should consider bringing for your rotation. Pay particular attention to the time of year of your mission and plan accordingly.

Environment

The MDRS is located in the high desert plateau country near Hanksville, Utah. Weather can range from pleasant to very hot or cold, depending on the season. In winter and early spring, temperatures may drop well below freezing (20°F or approx. -5°C, especially early in the morning) and rise to very pleasant levels (60°F/15°C on some afternoons). The air is usually very dry, but it may snow, sleet or rain. Winds can peak to 50 kts and wind chill is an important factor to consider. The area can be muddy during the rainy season (October through March). Late spring and summer are usually quite hot and dry (100°F/ 37°C daily highs), and afternoon thunderstorms are common in the highlands. Flash floods are a potential hazard. If you plan to do field work, familiarize yourself with basic desert safety.

IMPORTANT NOTE: NOTHING you bring can remain at the HAB when you leave!! Unless with very explicit permission of the Director!
NO EXCEPTIONS! This includes supplies you bring for your research.

Batteries

All crewmembers should bring the batteries (rechargeable or not) they will need. **NOTE: please remove dead or near-dead batteries from the MDRS after use.** Be sure to dispose of the batteries in an environmentally sound way and in accordance with applicable laws.

Additional Note: We may charge for disposal of any batteries left at MDRS. It will vary with the size of the battery and the amount will be taken out of your crew's deposit.

Toiletries/Personal Care Products

Crews are allowed to use their own toothpaste and biodegradable shampoo, conditioner and body soaps (liquid soaps recommended, keeping in mind that we have a septic system and are not on a sewer line). Each crewmember will have a small cubby in the shower room for storage of toiletries.

What to Pack

In the list of items below:
"Required" designates equipment/gear that each field team member MUST bring along. In some cases, a spare is required. You should definitely have ALL of this equipment in order to be properly prepared for your rotation at the MDRS.
"Recommended" designates equipment/gear that each field team member is strongly advised to bring along. These are items that are not required but are likely to make your life A LOT more pleasant.
"Optional" designates additional suggested equipment/gear. This is equipment that you should bring along if you think you will enjoy having it.

Personal Clothing and Gear

What to Bring	How Much	Need	Notes
Clothing	For 15 days with re-wearing	Required	Bring at least one change of warm clothing (heavy sweater, fleece, long pants, long/thermal underwear) as the Utah high desert can be cool at night. The station has colder and warmer sections; for maximum comfort, dress in layers.
Underclothes	8-15	Optional	There are no laundry facilities at MDRS but space is also limited so consider wearing undergarments for more than 1 day. You can handwash in a bucket as well.
Socks	8-15 pairs	Required	Bring 15 if you want to wear a clean pair of socks daily. It gets dirty out here quickly.
Bath towel, Hand towel, Washcloth	2+	Required	You'll get a short Navy shower every 3-4 days. Practice at home especially for hair washing. A washcloth is helpful for low-water-use bathing. Consider a shower cap if your hair is long. The hand towel will be used for drying your hands as you wash them throughout the day.
Baseball cap or brimmed hat	1	Optional	Great for keeping your head out of the sun when outside and not "in sim". Not for wearing on EVA.
EVA Gear	see right	Required	Hiking boots – (Black or brown only) sturdy and already broken in. You must wear your personal boots on EVA. Be aware that they will get extremely muddy and/or dusty. Please note that these need to be BOOTs, not shoes. You will not be allowed on EVA if you do not have proper boots. Black gloves (No other color) – 2+ pairs. Inexpensive work gloves are good for cool to warm weather. Use heavy winter gloves in wintertime. Expect gloves to get very dusty and muddy. Long underwear – or long sleeve t-shirt or turtleneck, plus full-length leggings or yoga pants. Worn inside EVA suit to keep the suit clean and to protect you from chafing by the rough suit fabric. Flight Suit- Your crew needs to supply the flight suits you will use while on EVA. Coordinate with your crew to purchase these in the same color for your mission. You are encouraged to personalize your flight suits with mission patches and nametags.
EVA Gear	See right	Recom-	Stocking Cap –or "do-rag" or bandana in black or dark blue,

		mended	essential to control your hair and secure sunglasses & radio mic on EVAs
Windbreaker or winter jacket	1	Required	Bring a light jacket for night-time activity in the high desert in the warm season. If your mission occurs during the cold season, a winter jacket is essential.
Slippers or indoor sandals	1 pair	Required	To reduce dust, outdoor footwear is not worn in the living space (upper floor of Hab), but going barefoot is not recommended. Also, the stairs are very hard on bare/stocking feet.
Bathrobe and/or Pajamas	1 +	Recom-mended	It's a long way to the bathroom: through a cold, dark lower deck at night, and through a throng of fellow crewmembers in the morning.

Personal Items

What to Bring	How Much	Need	Notes
Duffel Bag (preferred) or big suitcase (NOT recommended)	1	Required	There is limited storage space in the Hab for personal gear. All of your personal belongings must be stored in your stateroom, except your toiletries (in washroom cubby) and hiking boots (in EVA room) Staterooms average 4' wide x 11' long.
Laundry bag	1	Optional	There are no laundry facilities.
Ziploc bags and facial tissue	1-2 boxes each	Recom-mended	Great for collecting and protecting samples as well as protecting personal gear (i.e. cameras) from dust in the field. Consider slide lock zipper bags as gloves impair manual dexterity on EVA.
Sleeping bag or blankets	1	Required	A winter bag is not recommended as the upper deck must stay warm even during the night to prevent water lines from freezing. Stateroom bunks contain NO bedding.
Sheet	1	Required	Mattresses are provided in all staterooms. You are required to cover the mattress with a sheet before placing your sleeping bag on top. **No exceptions to this.** If you sleep warm, you may want to consider two sheets and a blanket for sleeping, instead of a sleeping bag
Pillowcase/pillow	1	Required/ Optional	Pillows are provided; bring a pillowcase if you want to use one of ours or bring your own if you need a special one for a good night's sleep.
Flashlight or head-lamp	1	Required	Useful at night, for repairing stuff, on EVAs as an emergency tool… Bring spare batteries too.
Personal water bottle	1	Required	Helps you remember to stay hydrated in the dry desert climate
Hand or body lotion, lip care (e.g. chapstick, blistex)		Recom-mended	The high desert is an extremely dry environment. You will be more comfortable and thus more productive if your face and hands are protected by a lotion, and your lips by a lip balm.
Hydrating eye/nose drops	1	Recom-mended	The high desert is both dry and dusty. Required if you are prone to nosebleeds or eye irritation, or if you wear contact lenses
Sunscreen	1	Required	Desert sun can be intense; the high altitude further increases its intensity. EVA suit helmets provide only partial protection.
Sunglasses	1 or 2	Recom-mended	**For UV protection. You cannot wear them on EVA without a doctor's note.**
COVID-19 travel kit	1	Required	Ziplock bag with cloth and/or disposable masks, gloves, disinfectant travel wipes, hand sanitizer

Personal Field Gear

What to Bring	How Much	Need	Notes
Utility knife (like a Swiss Army knife or Leatherman combo tool)	1	Strongly recom-mended	Very handy for repairs and field work. Note the airline restrictions on these items – bring yours in checked baggage.
Rock Hammer	1	Optional	Recommended for geologists. Rocks in the area are mostly "soft" so a standard sedimentary pick/hammer ("mason's tool") should suffice; the Hab has one sledge hammer. Ship in checked baggage. NOTE: THERE ARE NO ROCK HAMMERS AT THE HAB.
Personal (handheld) GPS & charger or batteries	1	Recom-mended	If you have one, bring it; if not, use the ones at MDRS. At MDRS, GPS data are recorded in UTM NAD 27 Zone 12 North Northings/Eastings. Know how to use the GPS and to set it to the correct measurement system. Bring spare batteries.
Field Book, Pens, office supplies	1	Recom-mended	Waterproof field book recommended. Please also bring any paper, pens and office supplies you commonly use, as we no longer stock them.
Field bag	As needed	Recom-mended	To hold supplies on EVA
Camera/digital camera with charger and/or extra batteries	1	Recom-mended	If you have it, bring it.
"Canned Air"		Optional	Useful for cleaning cameras and other personal equipment in the field and in the Hab
Tripod, remote shutter switch	1	Optional	Extremely useful for field photos – the desert is windy and spacesuit gloves are awkward.
Personal laptop/ iPad/phone	1	Recom-mended	**Disable all updates before arrival at MDRS, to conserve bandwidth.**

Other Personal Gear

What to Bring	How Much	Need	Notes
Reading materials	As needed	Optional	Downloaded books, magazines, textbooks related to your field of work. Internet bandwidth is small so you can't download anything once you are at MDRS.
Movies	as needed	Optional	Note: MDRS doesn't have a DVD player – DVDs are usually watched from a crewmember's laptop.
Other fun stuff	As needed	Optional	Crew members should consider bringing something they might like to do – cards, board games, a toy, a small musical instrument, an art or craft project. However, there is no guarantee of spare time.
Food & candy	As desired	Permitted	You may bring whatever personal food you want.
Personal medications	As needed	As needed	Medications stored in the Hab refrigerator/freezers must be labeled with your name and crew number. Place them in a small locked box if privacy is important to you. Consider coordinating with your crewmates to make sure you have all

			the over the counter medications you may need during your stay. We do not provide a store of these medicines.

Things not permitted at MDRS

Perfume or Cologne	None	Not permitted	Some individuals are sensitive to fragrance products. Be kind and don't use them at MDRS.
Alcoholic beverages	None	Not permitted	Not permitted at NASA stations and analogs and not permitted at MDRS.
Cigarettes, cigars, bongs, e-Cigarettes	None	Not permitted	Smoking and vaping are not permitted at MDRS.
Candles	None	Not permitted	Candles are allowed as part of your religious ceremonies ONLY. Please inform the Director of your use prior to your rotation.
Firearms	None	Not permitted	MDRS is a firearm free campus.
Plastic hooks or anything that you use to stick things to the wall, including tape of all kinds	None	Not permitted	Crewmembers are no longer allowed to stick hooks, nametags, crew decals or anything at all on the walls at MDRS.

One final note: In the past, in keeping with the idea that everything in a Hab would be valuable and used on Mars, we kept a varied supply of things you would commonly use at a research station. This has changed. Because we support so many crews each season, and in an effort to reduce the accumulation of supplies that don't get used, many of the small things you relied on being at the station may no longer be there. Please check with us before assuming what you need is available, and please plan accordingly and bring what you think you may need.