



Dear Colleagues:

Under a joint Statement of Intent (SOI), the Agenzia Spaziale Italiana (ASI), the Canadian Space Agency (CSA), the Japan Aerospace Exploration Agency (JAXA), and the National Aeronautics and Space Administration (NASA), hereinafter “the Agencies,” have formed a Concept Team to assess the potential of an International Mars Ice Mapper (I-MIM) mission. As part of this collaboration, the Agencies invite scientists, engineers, and other qualified and interested individuals from institutions to apply for membership on the mission’s Reconnaissance/Science Measurement Definition Team (MDT).

The Agencies’ have mutually established a Reconnaissance Goal and related Reconnaissance Objectives that drive mission measurement requirements. Reconnaissance is “what we need to know before humans go,” as enabled by robotic spacecraft that address critical knowledge gaps related to the human exploration of Mars. Highest among the Agencies’ reconnaissance priorities is identifying the location and extent of water ice reserves for potential scientific discoveries worthy of sending humans (e.g., ice coring for astrobiology/climatology) and characterizing adequate, accessible water-ice resources to meet human needs on the Martian surface such as in-situ resource utilization (e.g., for ISRU).

The requirements-driving **Reconnaissance Mission Goal** to enable human exploration is: *to map and characterize accessible (within the uppermost 10m) subsurface water ice and its overburden in mid-to-low latitudes to support planning for the first potential human surface mission to Mars.* In response to this goal, the Agencies have identified an anchor payload: an L-band polarimetric Synthetic Aperture Radar (SAR)/SAR Sounder. The Agencies have also established a **Supplemental Value Goal** to maximize the mission’s return on investment: *As possible, provide high-value science opportunities and high-priority mission-support capabilities that serve reconnaissance, science, and engineering.*

The formal I-MIM MDT charter, including mission background and objectives, is posted at: https://go.nasa.gov/imim_mdt

The I-MIM MDT aims to commence its work in late September, 2021 and to complete the following tasks by late January, 2022:

- Task 1: Define measurements traceable to Reconnaissance Requirements (ice detection, overburden characterization, and candidate human landing site characterization) and ways to optimize the payload(s) for these purposes.
- Task 2: Provide findings on potential high-value, prioritized reconnaissance/science/engineering augmentations that are synergistic with the anchor payload and may enhance the mission’s return on investment within established mission boundary conditions
- Task 3: Prepare a model concept of operations based on findings for Tasks 1 and 2.

To complete these tasks, the MDT requires a multidisciplinary team of subject-matter experts who collectively have a comprehensive knowledge of synthetic aperture radar and radar sounding, geologic context for the subsurface sequestration of water ice (with associated climatology), astrobiology, glaciology/cryospheric science, remote sensing (including imaging related geologic landforms related to water-ice detection), in situ resource utilization (ISRU) engineering, aspects of entry descent, and landing (EDL) and ascent, and civil engineering (CE), among other specialties.

For reasons of cost, time, and safety, most of the MDT’s work will be carried out using email and tele/video conferences. By applying, applicants acknowledge they waive all claims associated with their MDT participation against any of the partner Agencies, entities, or persons.

The products developed by the MDT will be used by the Agencies in finalizing their joint concept study. Members will sign a statement confirming that they will not release any technical data or MDT information during proceedings and must receive approval for any additional presentation or research purposes. However, the partner Agencies will make the final report and any other output materials of the MDT publicly available. The MDT will be disbanded prior to any future Announcement of Opportunity (AO) for participation in I-MIM’s planned international, multidisciplinary Mission Reconnaissance/Science Team.

DETAILS OF THIS CALL FOR MDT PARTICIPATION

Applications are invited only from individuals. Group applications, collaborations, and teams will not be considered. The issuance of this call does not oblige/obligate the Agencies to accept any of the applications. Any costs incurred by an applicant in preparing a submission in response to this Call are the responsibility of the applicant.

Response to this Call for Membership shall be in the form of an application consisting of:

- 1. .pdf application form, downloadable at: https://go.nasa.gov/imim_mdt
- 2. resume/curriculum vitae (CV)

Both should be emailed to: gsfc-imim-mdt@mail.nasa.gov by August 23, 2021.

In the application form, applicants will provide evidence of their expertise in any of the topics and techniques listed in the chart below, as relevant. Applicants are not expected to have an expertise in all categories, but rather demonstrated competence in areas where they can most meaningfully contribute. The .pdf application form will also collect a statement confirming the applicant’s time availability to participate during the MDT timeframe and the extent to which any known schedule constraints would restrict full engagement in the significant amount of work that will be required in a reasonably short time frame.

1. TOPIC-SPECIFIC EXPERTISE	
1.1	<p>Expertise in detecting and mapping water ice (Reconnaissance Objective 1), especially as related to mapping near-surface water ice and its overburden for future human mission planning:</p> <ul style="list-style-type: none"> ○ accessing ice for human-led, robot-assisted investigations (e.g., ice-coring for astrobiology/climatology) ○ accessing ice for surface operations (e. g. ISRU for propellant, backup life support, mining and manufacturing, and (eventually) agriculture for food security etc.
1.2	<p>Expertise in characterizing surface/near-surface geotechnical properties (roughness, compactness) to provide a fundamental understanding of the accessibility of water-ice resources (Reconnaissance Objective 2)</p>
1.3	<p>Expertise in landing site characterization (Reconnaissance Objective 2)</p> <ul style="list-style-type: none"> A. General Expertise in landing site characterization (robotic/human Mars missions and/or lunar/Earth analogue sites). B. Specific Expertise in Human-led Surface Science (including ice coring for astrobiology/climatology) C. Specific Expertise in ISRU/Drilling to inform measurement requirements D. Specific Expertise in robotic and human-class EDL/ascent, especially as related to ice/overburden ("solid ground" + other engineering, terrain-related criteria/constraints) to inform measurement requirements E. Specific Expertise in Civil engineering as related to ice/overburden (e.g., drilling/processing water ice for in situ additive manufacturing; terrain characteristics and regolith resources for roads, structures, radiation shielding etc.) to inform measurement requirements

1.4	Scientific or technical expertise in: A. Mars cryosphere (ice/polar processes, glaciology, subsurface/permafrost etc.) B. Mars geology (especially as relevant to ice-indicating terrain, geotechnical properties etc.) C. Mars climate D. Astrobiology
2. TECHNIQUE-SPECIFIC EXPERTISE	
2.1	Science/engineering expertise related to the mission's primary anchor instrument: A. Polarimetric SAR capabilities and techniques B. Radar sounding C. Use of other Mars remote-sensing data to complement/enhance interpretations of the radar data for Mars ice detection/overburden characterization/human landing site assessment D. Data Science/GIS/Data Archiving
2.2	Additional expertise in reconnaissance/science and instruments for: A. Remote sensing (including orbital imaging) B. Mars atmosphere/weather/dust C. Space weather/radiation environment D. Radio science E. Navigation/EDL/Telecommunications F. Other, as relevant.
3. PUBLICATIONS	
A brief list (top 1-10) relevant scientific or technical peer-reviewed publications that establish the applicant's position of scientific leadership in the community and relevance to the above topic- and technique-specific expertise.	

The Agencies will determine membership in the MDT after formal review of the applications, selecting approximately 25-30 MDT members. The mission's multi-Agency Concept Team will appoint co-chairs with documented expertise in a) microwave remote sensing retrievals associated with detecting and characterizing water ice and b) human-mission-related surface operations related to accessing water ice. The MDT will also have an Executive Committee composed of Agency representatives who will serve as *ex officio* members of the MDT and provide technical experts to support the MDT as needed. Given realistic constraints on the size of the MDT, the Agencies may invite some applicants with a specialized scientific or technical expertise and not selected for the MDT (e.g., given their limited availability due to prior commitments) to present information that would significantly impact the success of the MDT in its deliberations, overall mission planning and outcomes, and reconnaissance/science/engineering community interests.

The point of contact for this task is:

Richard M. Davis
 Assistant Director for Science and Exploration
 NASA Program Executive, International Mars Ice Mapper Mission (I-MIM)

Address: NASA Headquarters
 Mail Suite 3E49
 300 E Street SW
 Washington, DC 20546-0001

Phone: 202.358.1530
 Fax: 202.358.3097
 E-mail: gsfc-imim-mdt@mail.nasa.gov