THE INTERNATIONAL MARS ICE MAPPER MISSION MEASUREMENT DEFINITION TEAM: OVERVIEW, COMPOSITION, TASKS, AND TIMELINE. T. Haltigin[1], M. Lavagna[2], J. Plaut[3], A. M. Bramson[4], R. Davis[5], R. Mugnuolo[6], T. Usui[7], E. Ammannito[6], D. M. H. Baker[8], R. Collom[5], M. Kelley[5], P. Plourde[1], L. Ratliff[5], and M. Viotti[3]. [1]Canadian Space Agency (timothy.haltigin@asc-csa.gc.ca), [2]Politecnico di Milano, [3]Jet Propulsion Laboratory, California Institute of Technology, [4]Purdue University, [5]NASA Headquarters, [6]Agenzia Spatiale Italiana, [7]Japan Aerospace Exploration Agency, [8]NASA/GSFC

Introduction: The International Mars Ice Mapper (I-MIM) Mission is a mission concept being developed by international partners Agenzia Spatiale Italiana (ASI), Canadian Space Agency (CSA), Japan Aerospace Exploration Agency (JAXA), and National Aeronautics and Space Administration (NASA).

The overarching goal of the mission is to map and characterize accessible (within the uppermost 10 m) subsurface water ice and its overburden in the Martian mid- to low-latitudes to support planning for the first potential human surface mission to Mars.

In addressing this goal, the mission concept is organized around three core Reconnaissance Objectives (RO): *RO-1* Location and Extent of Water Ice; *RO-2* Accessibility of Water Ice, and; *RO-3* Candidate Human Landing Site Assessment.

As potential complements to the Reconnaissance Objectives, the partners have established Supplemental Science Objectives (SSO) and Mission Support Objectives (MSO) to maximize potential returns on investment, including: *SSO-1* Augmented Water Ice Inventory; *SSO-2* Reconnaissance/Science Investigations of Opportunity; *MSO-1* Operational Technology Demonstration – High Altitude Communications Relay Obiter(s), and; *MSO-2* Complementary Payloads for Reconnaissance, Science, and Engineering.

Additional detail on the mission concept is provided by [1].

Measurement Definition Team (MDT) Approach: Formulation of the mission objectives and anchor payload – a polarimetric L-band (930 MHz) Synthetic Aperture Radar (SAR) that would operate in side-looking imaging and nadir sounding SAR modes – have been formulated through several years of concept development by the mission partners.

In preparation for a potential Mission Confirmation Review (MCR) and following the guiding principle of internationalizing the mission as much as possible, the partners acknowledged that it was crucial to engage the broader international scientific community and seek their input. As such, the partners sought to populate an internationally-competed Measurement Definition Team (MDT).

Most notably, while the core reconnaissance objectives have been set, there is still an opportunity for the MDT to formalize the definition of the anchor payload measurements needed to address the objectives and potentially suggest complementary payloads to augment the mission. Moreover, the MDT offers an opportunity to incorporate international science priorities in defining the highest priority science investigations that could be conducted by the mission.

Charter and Tasks: The MDT charter [3] outlines the effort's driving goals, centered around three tasks:

Task 1 - Core Reconnaissance Mission: The MDT shall define measurements for the anchor payload that are traceable to the Reconnaissance Objectives (ice detection, overburden characterization, and candidate human-landing-site characterization) and ways to optimize the payload(s) for these purposes.

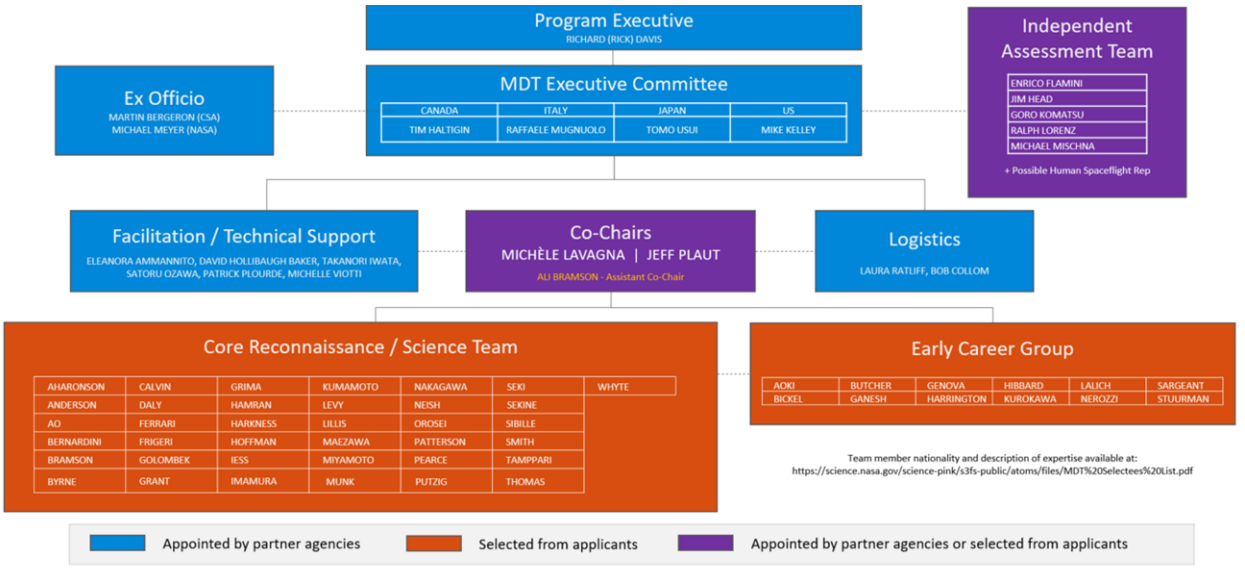
Task 2 - Potential Augmentation Options to Maximize Return on Investment: The MDT shall provide findings on potential high-value, prioritized reconnaissance / science / engineering augmentations that are synergistic with the anchor payload and might maximize the mission's return on investment within established mission boundary conditions.

Task 3 – Concept of Operations: The MDT shall prepare a model concept of operations based on findings for Tasks 1 and 2.

Selection Process: An international call for applicants to the MDT was released in August 2021 [2]. A total of 147 highly qualified respondents submitted applications, all of whom were considered for selection. A committee representing each of the mission partners reviewed and discussed at length each application. The primary criterion in forming the team was to ensure that sufficient expertise would provide coverage for each of the three Reconnaissance Objectives. Diversity considerations were applied to the extent possible given the applicant pool, ensuring broad representation of nationalities, gender, and career stage.

Regarding the latter, the partners acknowledged that the MDT was an exceptional opportunity to help train the next generation of research community leaders. As a result, a dedicated Early Career Group (< 10 years from highest academic degree) of 12 members was selected to complement the core team of 37 members. In total, the MDT comprises representation from 10 countries.

Figure 1: Organizational structure for the I-MIM MDT.



Organization: The MDT organizational structure (Figure 1) outlines roles & responsibilities at multiple levels. At the management level, the Program Executive is responsible for the overall coordination of the effort and delivery of final MDT products to agency stakeholders. The MDT Executive Committee provides the strategic management function, setting overall timelines and objectives, and interfacing between the core team and all MDT groups. Ex officio members represent the mission partners and ensure that the MDT work is aligned with agency priorities. An Independent Assessment Team comprised of multidisciplinary experts will provide critical reviews of the MDT work prior to mid-term and final deliveries.

At the tactical level, the Co-Chairs lead the team's day-to-day operations, and are responsible for final synthesis of the MDT products. The Co-Chairs are supported by a Facilitation/Technical Support Group that provides multidisciplinary expertise and a Logistics team to help organize and execute MDT operations. Finally, the Core Reconnaissance/Science Team and Early Career Group were selected (as outlined in the previous section) to provide the necessary expertise and inputs for the MDT deliverables.

Schedule: The MDT held its Kickoff Meeting (KOM) in November 2021. Follow-up full team meetings were held in early December to provide a review on relevant context information (e.g., current state of subsurface water ice mapping capabilities and geotechnical characterization, engineering long-poles for human exploration) and an overview of the envisaged mission architecture (technical design of the spacecraft and primary payload, anticipated operational modes and data products, ground rules and assumptions).

In January 2022, the team commenced its technical deliberations, addressing Task 1 by breaking into subgroups addressing each of the Research Objectives. Subsequently, new subgroups were formed to address Task 2 based on scientific investigation themes. Following that, a concept of operations will be developed (Task 3), with a final report delivery anticipated by mid-2022.

Upon completion of the work, the MDT will be disbanded. Future competitive opportunities are anticipated for the science community to join the mission's multidisciplinary reconnaissance/science team and to propose investigations. Membership on the MDT does not guarantee selection through such opportunities.

References: [1] Baker, D.M.H. et al. (2022), *LPS LIII (this meeting).* [2] https://science.nasa.gov/researchers/ice-mapper-measurement-definition-team. [3] https://science.nasa.gov/science-pink/s3fs-public/atoms/files/Final_I-MIM_MDT_Charter3.pdf