REQUEST FOR INFORMATION (RFI)
International Study on Remote Pilotage

1 Background

The International Maritime Pilots' Association (IMPA), established in 1970, represents pilots' organisations in over 50 countries and a professional community of over 8,000 maritime pilots. The Association is a not-for-profit organisation which uses the resources of its membership to promote effective safety outcomes in maritime pilotage as an essential public service. It achieves this objective by bringing together pilots' associations worldwide to share knowledge, expertise and experience on matters affecting maritime pilotage.

The International Maritime Organization recognises the importance of employing qualified, licensed pilots on board ships in areas where such pilotage services would contribute to the safety of navigation more effectively than other possible measures, including ports and other areas where specialised knowledge is essential.

Given the role of maritime pilotage, IMPA considers it critically important that any concept that could impact mandatory pilotage practices and systems, including remote pilotage, be carefully examined and assessed.

IMPA has launched a project to study pilotage as a socio-technical system and the readiness, risks, impacts, benefits, opportunities, and prerequisites of remote pilotage (the Study). It will consider the findings of previous shore-based pilotage projects and seek to validate the insights delivered by the project with trials of technology and protocols on conventionally navigated ships, principally in Canada.

To deliver this Study, the IMPA is collaborating with the Canadian Coast Guard (CCG), which is Canada's provider of shore-based systems in support of safe and efficient navigation, and which operates a fleet of 130+ vessels, Canada's National Centre of Expertise on Maritime Pilotage (NCEMP), and Lloyd's Register acting as the project's technical adviser.

This RFI is an iteration of the initial non-prescriptive RFI issued in November 2024 which was designed to attract as many candidate remote pilotage solutions as possible. As a result of this initial RFI, two candidate remote pilotage solutions were subject to the Study's Technology Readiness Assessment methodology.

The outcome of this assessment was evidence of progress in the development of potentially viable remote pilotage solutions for specific applications, but no suitable candidate remote pilotage solutions were identified to enable the Study to achieve its objectives through safe and comprehensive trials phases.

This second RFI provides manufacturers and system integrators with a more detailed high-level specifications to better guide them to understand what a minimum viable remote pilotage solution should be capable of, particularly in terms of pilotage workflow tasks.

2 Study Objectives

The Study aims to provide pilots' organisations, competent authorities and industry unbiased, science-based and authoritative insights into the readiness, risks, impacts, benefits, opportunities and prerequisites of remote pilotage on commercial ships in mandatory pilotage waters now and in the future.

IMPA, therefore, intends to trial solutions advanced by manufacturers and system integrators who believe that their solutions could enable remote pilotage in mandatory pilotage waters and make observations on the readiness, risks, impacts, benefits, opportunities, and prerequisites of remote pilotage.

3 Requirements

To conduct those trials, IMPA solicits the interests of manufacturers and system integrators who believe their technology solution(s) meet the requirements, as outlined in the following High-Level Specifications for Technology Solutions section.

IMPA believes manufacturers and system integrators can significantly gain from participating in the study. Benefits include:

- Working closely with the most concerned end-users and shore-based service providers;
- Free, rigorous technical and operational assessments in various operational environments;
- Free and rigorous comparative assessment of technology solutions capabilities and performance relative to other technology solutions submitted in response to the RFI after phases 2 – 5 of the Study; and
- Being a member of the stakeholder advisory group for the project, offering exposure to regulators, pilotage authorities, pilots, shore-based service providers, and other stakeholders in mandatory pilotage.

To ensure full transparency, all technology solutions submitted in response to this RFI will be referenced publicly in reports published by IMPA.

In line with IMPA's policy on endorsement, no endorsement, approval, assurance, or certification will be issued by IMPA or any of the project partners. IMPA assures all prospective contributors a safe and unbiased assessment of the readiness of their proposed solution.

The IMPA final report will be widely distributed and is expected to inform future decision-making by pilots' organisations and competent authorities about the potential role of remote pilotage. The process and methodology used by IMPA will be disclosed in publicly available material for future re-use by pilots' organisations, competent authorities, industry and academia. This will provide a model methodology for similar evidence-based assessments to be conducted in the future.

4 High-Level Specifications for Technology Solutions

4.1 IMPA intends to trial those end-to-end commercial technology solutions ready for demonstration in an operational environment. Using the UK Science and Technology Facilities Council (Eligibility of Technology Readiness Levels (TRL) – UKRI) readiness levels, achievement of TRL Level 6 would be required, with a clear pathway to qualification (TRL 8) and deployment (TRL 9).

Any proposed solution should conform with the goal, functional requirements and expected performances described in appendix 1 of this RFI. Conformity should be

demonstrated using the goal/claim, evidence approach outlined in the Guidance to proponents on preparing for the technology readiness assessment.

4.2 In addition to being ready for demonstration in an operational environment (achieved TRL Level 6) and for which there is a clear pathway to qualification (TRL 8) and deployment (TRL 9), technology solutions must:

1. Meet minimum compatibility requirements for the trials to be possible, including any special requirements the CCG may require; and

2. Be scalable so that they can contribute to each trial phase and be used on multiple ships.

5 Trials Phases

During the Study, there will be three phases of trials:

5.1 **Simulated:** Conduct a technical performance evaluation using shore-based systems and emulation.

5.2 **Controlled:** Conduct trials on board a CCG ship (CCG ships are not subjected to mandatory pilotage requirements) operating mainly in mandatory pilotage waters.

5.3 **Near-real-life.** Conduct trials onboard a commercial vessel operated by a domestic crew, and onboard a commercial vessel operated by an international crew, both in mandatory pilotage waters. At all times, those trials would be done under the supervision of an onboard qualified, licensed pilot, to ensure all laws and regulations on maritime pilotage are met irrespective of the trials being conducted.

6 Study timelines

For manufacturers and system integrators that propose solutions for this Study must agree to provide their solutions for the duration of the project, including providing technical support when required. Trials are estimated to begin in late 2027/early 2028 and continue until 2029/30. These timelines may change at the discretion of IMPA based on the Study's needs.

7 Costs

IMPA expects manufacturers and system integrators to cover the cost of their technology solutions, their deployment, and any associated costs other than those directly resulting from any special requirements or modifications requested by IMPA or its partners in the Study.

IMPA will work to ensure any requirements imposed on manufacturers or system integrators for the purposes of conducting trials are kept to minimum to avoid unnecessary costs.

8 Proposals and Expressions of Interest

8.1 Manufacturers and system integrators who wish to have their technology solution(s) considered for inclusion in the trial phases of the project should submit a proposal in English detailing how their solution meets the requirements of sections 3 and 4 of this RFI. To assist with this process, a guidance documents relating to pilotage workflows is issued with this RFI and proponents are strongly encouraged to use this guidance as a basis for their proposal documentation. Supplementary documentation (such as user

guides, sales and marketing material, presentation material, pictures, video evidence, etc) are welcome.

8.2 Manufacturers and system integrators that have solutions in development which have not yet achieved TRL 6 but which *may* be able to meet the High-Level Specifications for Remote Technology Solutions are encouraged to present these proposals with an anticipated timeline for achieving TRL 6.

9 Next Steps

9.1 Interested manufacturers and system integrators are invited to submit their proposals to Captain Alain Arseneault (aarseneault@pilotage-expertise.ca) by 30 April 2026. The next steps, including the assessment phase, will be determined based on the proposals received.

9.2 Captain Arseneault should also be contacted with any questions about this RFI. We are committed to responding to questions in a timely manner.

9.3 Extensions to the deadline above will be considered on a case-by-case basis. Manufacturers and system integrators who believe they need more time to respond to the RFI are invited to contact Captain Arseneault as soon as possible.

APPENDIX 1: HIGH LEVEL SPECIFICATION FOR CANDIDATE REMOTE PILOTAGE SYSTEMS

1. **Goal:** To enable the direction of navigation in port approaches, ports, harbours, canals, rivers and lakes by qualified, licensed pilots from ashore which delivers an equivalent or superior level of safety of navigation.

2. **Functional requirements and expected performance:**

FR1 The ship shall have its navigation directed by a qualified, licensed pilot in all reasonably foreseeable normal and emergency situations.

EP1.1 At all times in port approaches, ports, harbours, canals, rivers and lakes where pilotage is mandatory, a qualified, licensed pilot or a pilotage exemption certificate (PEC) holder is directing the ship's navigation.

EP1.2 Only a remote pilot assigned to a ship[1] can connect to and communicate with a ship for the purpose of directing navigation.

EP1.3 The Master can verify that a pilot directing the navigation of the ship is a pilot assigned to the ship.

FR2 The bridge team and pilot can make a full appraisal of the situation and navigate the ship safely under all operational conditions in port approaches, ports, harbours, canals, rivers and lakes where pilotage is mandatory.

EP2.1 The pilot can use physical aids to navigation and other visual cues and information to enable execution and monitoring of the navigation in accordance with the pilot's passage and (un)berthing plan.

EP2.2 The pilot can independently use radar for navigation to ensure the ship remains in safe water and to avoid allisions and groundings.

EP2.3 The pilot can independently comply with the COLREGs when vessels are in sight of one another, and when navigating in restricted visibility.

EP2.4 The pilot can perceive, comprehend and act on geospatial information required for navigation.

R2.4.1 The pilot can use resilient position, navigation and time (PNT)[2] from the ship to determine its absolute position and position relative to the pilot's passage and (un)berthing plan, aids to navigation and navigation hazards.

R2.4.1 Geospatial and related data is presented to the pilot conforms to the appropriate S-100 based product specification.[3]

[1] A pilot assigned to a ship includes a trainee pilot, relief pilot and/or second pilot, where necessary.

[2] Performance standards for multi-system shipborne radionavigation receivers (MSC.401(95), as amended)

[3] https://iho.int/en/s-100-based-product-specifications.

R2.4.2 Geospatial and route information exchanged between the ship and the pilot conforms with recognised international standards.[4]

EP2.5 The pilot can perceive, comprehend and act on all hydrometeorological and traffic information required for the execution and monitoring of navigation.

R2.5.1 Hydrometeorological data presented to the pilot conforms to the appropriate S-100 based product specification.[5]

R2.5.1 Automatic identification system (AIS) information is provided to the pilot from the ship or an alternative source providing an equivalent level of coverage and accuracy.[6]

EP2.6 When the hazards of navigation or the characteristics of the ships dictate, the pilot can perceive, comprehend and act on information provided by real-time kinematics (RTK).

R2.6.1 RTK sensors are independent of all other ship sensors.

R2.6.2 RTK information is provided to the pilot using an independent secure and resilient means of data exchange.

EP2.7 The pilot can coordinate tugs and mooring personnel in all reasonably foreseeable operational and emergency situations.

R2.7.1 The pilot can establish and maintain secure and resilient closed-loop communications with tug masters and mooring personnel.

R2.7.2 The pilot can perceive, comprehend and act on the position and movement of tugs.

EP2.8 The pilot can perceive, comprehend and act on:

.1 Interactions between the ship and other vessels in proximity.
.2 Shallow water and bank effects.
.3 The impact of wake on waterway infrastructure.

FR3 Provide the pilot with convenient and continuous access to essential information presented clearly and unambiguously.

EP3.1 The pilot is provided with a user interface that enables them to assimilate and use all information required for the execution and monitoring of navigation.

R3.1.2 The minimum acceptable latency for ultra-low latency information shall not exceed 200ms.[7]

[4] IEC 63173-2:2022 - Maritime navigation and radiocommunication equipment and systems - Data interfaces - Part 2: Secure communication between ship and shore (SECOM).

[5] https://iho.int/en/s-100-based-product-specifications.

[6] Performance standards for an universal shipborne AIS (MSC.74(69)), IEC 61993-2:2018 - Maritime navigation and radiocommunication equipment and systems - Automatic identification systems (AIS) - Part 2: Class A shipborne equipment of the automatic identification system (AIS) - Operational and performance requirements, methods of test and required test results.

[7] Refer to Guidance to proponents on preparing for the technology readiness assessment.

R3.1.3 The minimum acceptable latency for low latency information shall not exceed 5s.[8]

R3.1.4 Geospatial and radar information is displayed on an interface which complies with at least the relevant IMO performance standards.[9]

EP3.2 Connectivity for data exchange between the pilot and the ship is secure and resilient.[10]

R3.2.1 The data exchange architecture of the solution does not rely on proprietary protocols which limit the security, compatibility or scalability of the solution architecture.

R3.2.2 The data exchange architecture does not have single points of failure.

R3.2.3 Services used for data exchange provide coverage in the mandatory pilotage area and support uninterrupted data exchange.

EP3.3 Connectivity for communications between the pilot and the ship is secure and resilient.

R3.3.1 The communications architecture does not have single points of failure.

R3.3.2 Communications services provide coverage in the mandatory pilotage area and support uninterrupted communications.

FR4 Enable expeditious, continuous and effective information processing and decision-making by the bridge team and the pilot.

EP4.1 The communications arrangements and user interfaces enable the master, bridge team and pilot to rapidly establish and maintain trust through effective verbal and non-verbal communication.

EP4.2 The pilot and bridge team can establish and maintain closed-loop communications for a continuous master-pilot information exchange.

R4.2.1 Communications interfaces onboard and ashore support visual, text, free drawing and voice-based communications.

R4.2.2 Directions, advice, queries and warnings are highlighted and intuitively distinguished from other information until the bridge team or pilot actions them.

R4.2.3 Intuitive symbology and phraseology shall be used for visual and text communications.

[8] Refer to Guidance to proponents on preparing for the technology readiness assessment.

[9] Performance standards for ECDIS (MSC.530(106)), Revised performance standards for radar equipment (MSC.192(79)), Revised performance standards for INS (MSC.252(83)).

[10] IEC 63173-2:2022 - Maritime navigation and radiocommunication equipment and systems - Data interfaces - Part 2: Secure communication between ship and shore (SECOM).

R4.2.4 Communications between the pilot and the bridge team cannot be terminated without intentional action by the ship or the pilot's positive agreement.

EP4.3 Pilot to be able to perceive, comprehend and act on information about the accuracy and reliability of sensors.

R4.3.1 Information about the integrity of onboard sensors shall be provided to the pilot.

R4.3.2 Unambiguous visual indicators describing degraded sensor performance are provided to the pilot and bridge team.

FR 5 Minimise the risk of human error and detect such errors, if they occur, in time for the bridge team and the pilot to take appropriate action.

EP5.1 The pilot receives unambiguous information that the bridge team has executed directions relating to manoeuvring the ship.

R5.1.1 Ship’s heading, speed (SOG and STW), rudder angle, rate of turn, telegraph, propeller pitch, and azimuth information shall be provided to the pilot.

R5.1.2 Communications interfaces provide a visual indication that a direction has been received and that the direction has been executed.

EP5.2 Communications interfaces enable effective communication regardless of the native language(s) of the pilot and bridge team or their proficiency in maritime English.

EP5.3 Pilot workstation design and communications interfaces onboard the ship enable the pilot and bridge team to maintain their respective individual and common levels of situational awareness and rapidly resolve differences of perception about developing situations.

EP5.4 All information exchanged between the pilot and bridge team shall be recorded for continuous improvement, training and accident investigation.

R5.4.1 All communications, directions, information and data are recorded in a tamper-proof medium for retention at least 30 days.[11]

FR 6 Prevent excessive or unnecessary work and any conditions or distractions which may cause fatigue or interfere with the vigilance of the bridge team and the pilot.

EP6.1 The pilot can independently control and interrogate shipboard sensors for the purposes of directing the ship's navigation.

EP6.2 The pilot can make all reports to shore-based services and authorities required by national and local regulations.

[11] Equivalent to the requirements for voyage data recorder (VDR) long-term recording medium retention time in the Revised performance standards for shipborne VDR (MSC.333(90)).

EP6.3 User interfaces do not increase the pilot or bridge team's workload and enable enhanced pilot and bridge team performance.

R6.3.1 Sensor integrity monitoring is automated.

R6.3.2 Workstations and human-machine interfaces are designed and implemented in conformity with recognised international standards.[12]

R6.3.3 Alarms and alerts management are designed and implemented in conformity with recognised international standards.[13]

R6.3.4 User interfaces are intuitive and do not require type-specific training.

EP6.4 User interfaces ashore and onboard the ship are exclusively designed and used for the purpose of remote pilotage.

[12] ISO 9241 series – Ergonomics of human system interaction, ISO 11064 series – Ergonomic design of control centres.

[13] IEC 62682:2022 - Management of alarm systems for the process industries.