

# R-Pilot

Guidance to proponents on  
preparing for the technology  
readiness assessment

November 2025

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**PART 1: TRAINING AND FAMILIARISATION**

|   | 1                                                                                                                                                              | 2                                                                                                       |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|   | Prerequisites for system users                                                                                                                                 | How the pre-requisites would be achieved from the perspective of the manufacturer or system integrators |
| 1 | What training and familiarisation with the system would be required for maritime pilots to achieve error-free operation, and how is this delivered?            |                                                                                                         |
| 2 | What training and familiarisation with the system would be required for the Master and bridge team to achieve error-free operation, and how is this delivered? |                                                                                                         |

**PART 2: PILOT ASSIGNMENT AND RECORD KEEPING**

|   | 1                                                                                                                                                 | 2                                                                                                           | 3                                                                                                                                                                                                      | 4                                                                                                                                                   |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Claim<br>(Pilotage workflow task)                                                                                                                 | Argument<br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | Evidence<br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | Dependencies and Assumptions<br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 3 | The solution provides a secure means of assigning a remote pilot to a ship.                                                                       |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 4 | The solution is scalable, allowing multiple ships to comply with mandatory pilotage requirements simultaneously.                                  |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 5 | The solution has a means of recording and retaining complete records of all communications between a remote pilot and the master and bridge team. |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |

**PART 3: EXECUTION OF PILOTAGE**

|    | 1                                                                                                                                                                                                   | 2                                                                                                           | 3                                                                                                                                                                                                      | 4                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Claim<br>(Pilotage workflow task)                                                                                                                                                                   | Argument<br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | Evidence<br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | Dependencies and Assumptions<br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 6  | The solution enables a continuous Master-Pilot information exchange (MPX) under all operational conditions, including during emergencies.                                                           |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 7  | The pilot can direct the safe navigation of the ship under all operational conditions, including during emergencies.                                                                                |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 8  | The pilot can give helm, engine and thruster orders and verify they are executed correctly by the bridge team.                                                                                      |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 9  | The pilot can perceive, comprehend and act on the position of the ship relative to the planned track, aids to navigation and proximate navigation hazards.                                          |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 10 | The pilot can perceive, comprehend, and act on safe speed in prevailing circumstances and conditions, and in accordance with local regulations.                                                     |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 11 | The pilot can perceive and comprehend developing traffic situations, including arrangements for meeting and overtaking in narrow channels, and act in accordance with COLREGs or local regulations. |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |
| 12 | The pilot can perceive, comprehend and act on the weather at or in the vicinity of the ship.                                                                                                        |                                                                                                             |                                                                                                                                                                                                        |                                                                                                                                                     |

|    | 1                                                                                                                                                                                  | 2                                                                                                                  | 3                                                                                                                                                                                                             | 4                                                                                                                                                          |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Claim</b><br>(Pilotage workflow task)                                                                                                                                           | <b>Argument</b><br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | <b>Evidence</b><br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | <b>Dependencies and Assumptions</b><br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 13 | The pilot can perceive, comprehend and act on predicted and actual under-keel clearance, including at the berth, and in compliance with local regulations.                         |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 14 | The pilot can perceive, comprehend and act on the interaction between ships passing at close quarters and maintain safe distances from other ships and infrastructure.             |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 15 | The pilot can perceive, comprehend and act on shallow water and bank effects in narrow channels, rivers, canals and locks.                                                         |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 16 | The pilot can perceive, comprehend and act on the effects of wind and/or tide on the set and drift of the ship.                                                                    |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 17 | The pilot can perceive, comprehend and act on any increase in draft due to heeling in a turn.                                                                                      |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 18 | The pilot can perceive, comprehend and act on the progress of a turn and heading leaving a turn.                                                                                   |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 19 | The pilot can coordinate escort tugs, if required.                                                                                                                                 |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 20 | The pilot can perceive, comprehend and act on the wake being generated by the ship and its impact on other ships and the environment, including compliance with local regulations. |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |

#### PART 4: EXECUTION OF DOCKING AND UNDOCKING (AT BERTH OR IN LOCKS)<sup>1</sup> AND ANCHORING

|    | 1                                                                                                                                      | 2                                                                                                                  | 3                                                                                                                                                                                                             | 4                                                                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Claim</b><br>(Pilotage workflow task)                                                                                               | <b>Argument</b><br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | <b>Evidence</b><br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | <b>Dependencies and Assumptions</b><br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 21 | The pilot can direct the casting off sequence of lines to shipboard personnel and mooring personnel ashore.                            |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 22 | The pilot can perceive, comprehend and act on the position of mooring boats.                                                           |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 23 | The pilot can direct (un)docking and anchoring manoeuvres by providing helm, engine and thruster orders to the Master and bridge team. |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 24 | The pilot can coordinate tugs during (un)docking manoeuvres.                                                                           |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 25 | The pilot can verify that the helm, engine and thruster orders are executed correctly.                                                 |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 26 | The pilot can perceive, comprehend and act on the position of the ship relative to the berth and the final position of the bridge.     |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 27 | The pilot can perceive, comprehend, and act on the presence of obstructions, including overhangs and dock cranes.                      |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 28 | The pilot can receive information on propeller and thruster clearance.                                                                 |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 29 | The pilot can perceive, comprehend and act on the lead of the anchor chain.                                                            |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |

<sup>1</sup> Tasks are in chronological order for undocking and may be in a different order for docking.

|    | 1                                                                           | 2                                                                                                                  | 3                                                                                                                                                                                                             | 4                                                                                                                                                          |
|----|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Claim</b><br>(Pilotage workflow task)                                    | <b>Argument</b><br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | <b>Evidence</b><br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | <b>Dependencies and Assumptions</b><br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 30 | The pilot can determine and verify the length of the anchor chain paid out. |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |

**PART 5: DATA FOR NAVIGATION**

|    | 1                                                                                                                                                                                                          | 2                                                                                                                  | 3                                                                                                                                                                                                             | 4                                                                                                                                                          |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Claim</b><br>(Pilotage workflow task)                                                                                                                                                                   | <b>Argument</b><br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | <b>Evidence</b><br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | <b>Dependencies and Assumptions</b><br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 31 | The pilot can independently make use of visual Aids to Navigation to determine the ship's position.                                                                                                        |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 32 | The pilot can independently use X-band and/or S-band radar to determine the ship's position and the position of other objects.                                                                             |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 33 | The pilot can know X- and S-band radar settings and errors.                                                                                                                                                |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 34 | The pilot can independently use shipboard electronic position fixing systems (EPFS) or an alternative source to plot the position and movement of a ship on ECDIS.                                         |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 35 | The pilot can use real-time kinematics (RTK), which is independent of the shipboard sensors required by SOLAS Chapter V, when necessary, given the characteristics of the ship and the situation dictates. |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 36 | The pilot can know ship's true heading and determine or verify gyro error.                                                                                                                                 |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 37 | The pilot can know ship's course over ground.                                                                                                                                                              |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 38 | The pilot can know ship's speed through water, speed over ground.                                                                                                                                          |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 39 | The pilot can know depth beneath the keel at the ship's position.                                                                                                                                          |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 40 | The pilot can know the ship's rudder, or equivalent steering arrangement position.                                                                                                                         |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 41 | The pilot can know ship's telegraph, or equivalent engine control settings.                                                                                                                                |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 42 | The pilot can independently interrogate the ship's Automatic Identification System (AIS) or obtain AIS data from an alternative source.                                                                    |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 43 | The pilot can know the AIS antenna offset, if applicable.                                                                                                                                                  |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |

**PART 6: CONNECTIVITY AND COMMUNICATIONS (INCLUDING (UN)DOCKING AT BERTH OR IN LOCKS)**

|    | 1                                                                                                                                       | 2                                                                                                                  | 3                                                                                                                                                                                                             | 4                                                                                                                                                          |
|----|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Claim</b><br>(Pilotage workflow task)                                                                                                | <b>Argument</b><br>(How does the solution enable the workflow task? What information from Appendix 1 is provided?) | <b>Evidence</b><br>(What evidence is presented to justify the argument that the solution can deliver the workflow task? What assumptions are made? How is the relevant information from Appendix 1 provided?) | <b>Dependencies and Assumptions</b><br>(What information, data or services are required? What assumptions are made about the sources of this information?) |
| 44 | The pilot can establish and maintain secure connectivity with the ship, or an alternative source, to receive the data in Parts 4 and 5. |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |

|    | 1                                                                                                                                                                                                                    | 2                                                                                                                  | 3                                                                                                                                                                                                             | 4                                                                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| 45 | Hardware required to be installed onboard conforms to applicable IMO, ISO/IEC and IACS standards for electromagnetic compatibility                                                                                   |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 46 | Hardware required to be installed onboard and integrate with the equipment required by SOLAS chapter V conforms with the applicable ISO/IEC standard for data exchange                                               |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 47 | The pilot can establish and maintain connectivity with the ship, or an alternative source, to receive the data in Parts 4 and 5 using reversionary means.                                                            |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 48 | The pilot can establish and maintain secure two-way communications with the master and bridge team.                                                                                                                  |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 49 | The pilot can establish and maintain secure two-way communications with the master and bridge team using reversionary means.                                                                                         |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 50 | The pilot and the master and bridge team can conduct closed-loop communications throughout the act of pilotage.                                                                                                      |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 51 | The pilot can independently establish two-way communications with Vessel Traffic Services.                                                                                                                           |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 52 | The pilot can comply with ship reporting scheme obligations throughout the act of pilotage.                                                                                                                          |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 53 | The pilot can independently establish two-way communications with tugs required for escorting or manoeuvring the ship throughout the act of pilotage.                                                                |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 54 | The pilot can conduct closed-loop communications with the Masters of escort or harbour tugs throughout the act of pilotage.                                                                                          |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 55 | The pilot can independently establish two-way communications with other ships (including to coordinate collision avoidance and ships meeting) and other waterway users, as required, throughout the act of pilotage. |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 56 | The pilot can independently establish two-way communications with mooring personnel during docking and undocking.                                                                                                    |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |
| 57 | The pilot can conduct closed-loop communications with mooring personnel during (un)docking operations.                                                                                                               |                                                                                                                    |                                                                                                                                                                                                               |                                                                                                                                                            |

## APPENDIX 1: LATENCY

This appendix provides information on the recommended maximum latency of information exchange between the data source and the pilot.

|    | Information                                                                                         | Latency Identifier* |
|----|-----------------------------------------------------------------------------------------------------|---------------------|
| 1  | Two-way communications between the pilot and the master, and bridge team                            | U                   |
| 2  | Day/night optics at least equivalent to the bridge visibility requirements of SOLAS regulation V/22 | U                   |
| 3  | Day/night optics with zoom                                                                          | U                   |
| 4  | Processed radar data                                                                                | U                   |
| 5  | Raw radar data                                                                                      | U                   |
| 6  | Radar control (gain, clutter, rain, pulse length) and tools (EBL, VRM, PI)                          | U                   |
| 7  | True heading from a gyro compass or transmitting heading device (THD)                               | U                   |
| 8  | Rate of turn indicator (ROTI)                                                                       | U                   |
| 9  | Rudder angle indicator (RAI)                                                                        | U                   |
| 10 | Thruster(s) settings                                                                                | U                   |
| 11 | Ship position by Global Navigation Satellite Service (GNSS)                                         | U                   |
| 12 | Course Over Ground                                                                                  | U                   |
| 13 | Speed Over Ground                                                                                   | U                   |
| 14 | Position of the ship relative to the planned track and navigational hazards                         | U                   |
| 15 | Real Time Kinematics                                                                                | U                   |
| 16 | Sound signals (COLREGs)                                                                             | U                   |
| 17 | Sound signals from other ship and aids to navigation                                                | U                   |
| 18 | Bridge communications and exchanges between the master and bridge team                              | U                   |
| 19 | Ship-to-ship, Ship-to-shore and shore-to-ship communications (VHF)                                  | U                   |
| 20 | Night/day ship-to-ship signals                                                                      | U                   |
| 21 | Depth beneath the keel                                                                              | L                   |
| 22 | Magnetic compass                                                                                    | L                   |
| 23 | Wind speed & direction                                                                              | L                   |
| 24 | Automatic Identification System (AIS)                                                               | L                   |
| 25 | Inclinometer                                                                                        | L                   |
| 26 | Telegraph Settings, Engine RPM or Propeller Pitch                                                   | L                   |
| 27 | External data (e.g. weather sensors, live tidal data)                                               | L                   |

\*Expected latency levels:

| Description        | Maximum Latency  | Identifier |
|--------------------|------------------|------------|
| Ultra Low Latency  | 200 milliseconds | U          |
| Low Latency        | 5 seconds        | L          |
| Acceptable Latency | 30 seconds       | A          |