International Study on Remote Pilotage (R-Pilot)

The Authoritative Study on Remote Pilotage: An Update

Mariners' Workshop, 2026

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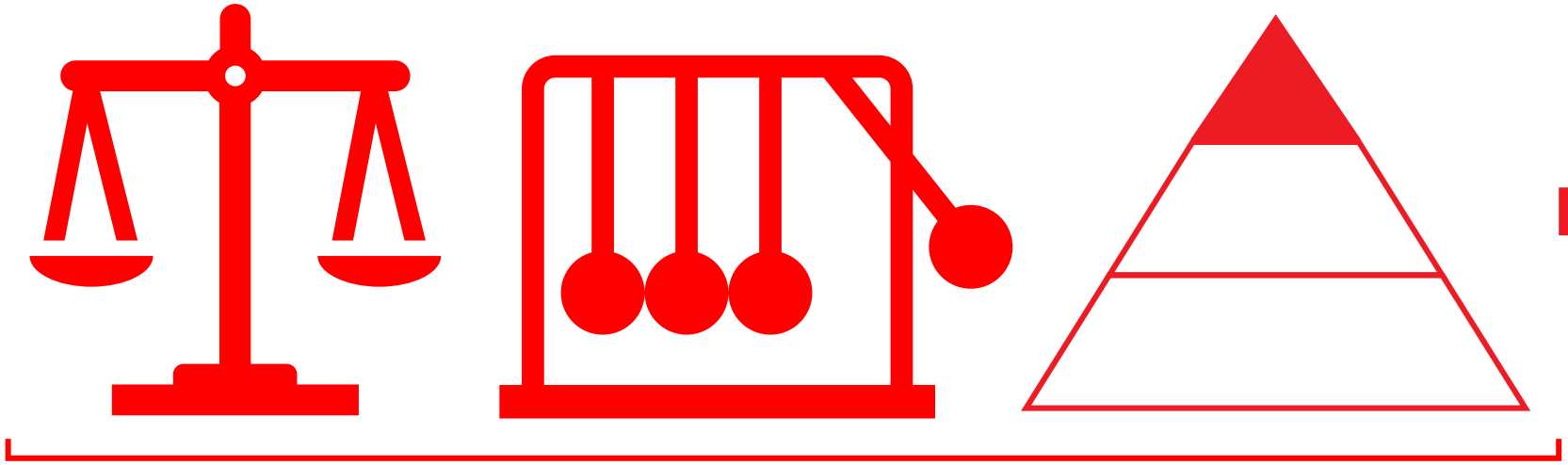
Why ?

Unbiased

Science-based

Authoritative



Evidence

Pilotage as a public service

Informed decisions

Who?

Project sponsor

Supporting partners

NATIONAL CENTRE OF EXPERTISE ON MARITIME PILOTAGE

Canadian Coast Guard | Garde côtière canadienne

Local Stakeholders Advisory Group (LSAG)

Shipping Federation of Canada

FEDNAV

CSL

PORT MONTRÉAL

CANADIAN MARINE PILOTS' ASSOCIATION

Key Assumptions

Planning Assumptions

- Qualified, licensed pilots
- Mandatory pilotage waters
- Established performance benchmarks
- Trials within current legal framework

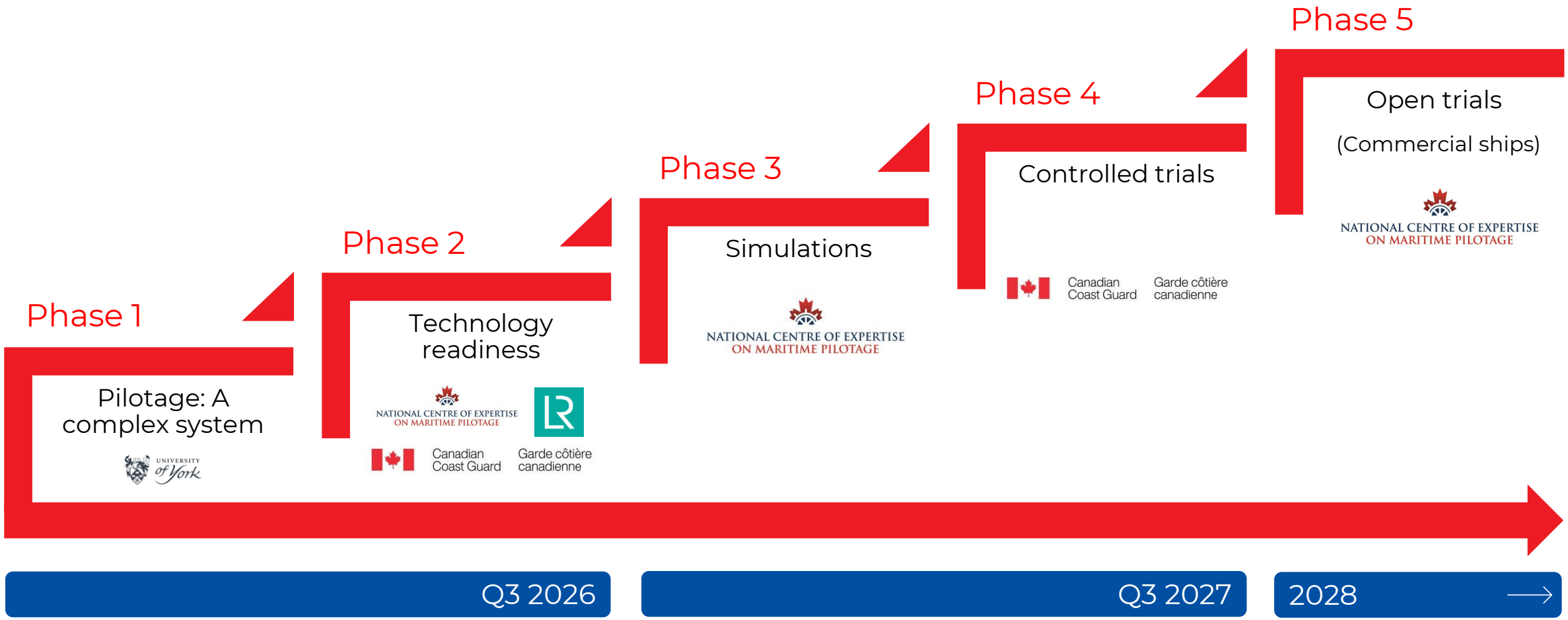
Outputs

- Quantitative and qualitative observations
- Public reports
- Reusable methodology

Out of Scope

- Remote navigation
- Shore-based pilotage
- Navigation assistance provided by VTS
- Transit, deep-sea and recommendatory pilotage
- Technology qualification and certification

Methodology and Timeline



Phase 1: Pilotage: a complex system

- **Document maritime pilotage as a complex system**
  - Primary and secondary legislation, and regulation
  - Management, tasks and technical characteristics of the system
  - Controls required to manage the consequences of complexity

- **Four major activities in the context of remote pilotage**
  - A model of pilotage “as is”
  - Hazard and risk assessment of transition from “as is” to “remote pilotage”
  - Identification of controls required to manage complexity arising from the introduction of remote pilotage

- **Reusable methodology beyond remote pilotage**

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Phase 2: Technology Readiness Assessment

- **Identification of candidate remote pilotage solutions**
  - First Request for Information (RFI) – November 2024
  - Three formal proposals (AD Navigation, Dryad Global and DanPilot/Danelec)

- **Assessment of candidate remote pilotage solutions**
  - Extensive desk-top assessment with proponents in April and May 2025
  - Evaluation of proposals based on pilotage workflows, compatibility, scalability and security
  - AD Navigation solution based on their current offering for SPM and FPSO mooring
  - DanPilot/Danelec solution was the system being trialled for parts of the transit pilotage routes in the entrance to the Baltic
  - Neither solution sufficiently capable to provide confidence that the Study will be able to achieve its objectives

TRA Snapshot – AD Navigation

Strengths
- Simplicity of the system and utilisation of proven PPU sensors, providing RTK
- Demonstrably effective in single SPM and FPSO applications
- Resilience to jamming and spoofing provided by the XR2 PPU
- UHF, WLAN and 4G/5G support for data exchange
- Not reliant on shore-based infrastructure

Weaknesses
- Supports voice-only communications for the continuous MPX
- Pilot has no access to radar for relative navigation and collision avoidance
- Reliant on AIS for collision avoidance
- Reliant on predicted rather than actual depth beneath the keel
- Pilot unable to immediately verify the execution of helm and telegraph orders
- Capabilities are limited to those tasks where the pilot requires PPU decision support only

Opportunities
- Line-of-sight applications for maritime pilots leading ships from another vessel in mandatory pilotage areas in accordance with national legislation

Threats
- Not designed to support over-the-horizon applications where the PPU is more than a decision support tool
- Pilot is compromised in their ability to demonstrate compliance with COLREGs (lookout by radar, reliance on AIS)
- Does not support shared situational awareness between the Master and bridge team (using shipboard sensors and ECDIS), and the pilot (using PPU sensors and software)
- The pilot's instructions are not recorded by the ship's VDR

TRA Snapshot – DanPilot/Danelec

Strengths
- NCC Communicator as a means of conducting a continuous MPX
- Under trial as an over-the-horizon remote pilotage solution in recommended pilotage areas in the entrance to the Baltic
- The pilot is provided with a wide range of data and information necessary for pilotage, and there are opportunities for maritime pilots and Masters and bridge teams to develop and maintain situation awareness

Weaknesses
- No day/night optical component
- Encourages significant reliance on GNSS
- Pilot is reliant solely on a VDR and the data it collects from shipboard sensors
- Pilot is reliant on radar images captured by the VDR with no ability to use it independently for navigation or collision avoidance
- No RTK data for manoeuvring large vessels and to provide an independent PNT source
- Requires Masters and bridge teams to be vetted to be able to use the system, where vetting is a standard below a PEC
- Only communications made during the chat are recorded by NCC Communicator
- Use of VHF as a redundancy measure for communications requires a coastal radio licence

Opportunities
- Utilisation of existing onboard data collection infrastructure
- Enables remote pilotage use cases in mandatory pilotage waters where a pilot or PEC holder in on board the ship

Threats
- Not designed to support port pilotage with gaps in the ability to conduct closed-loop communications with tugs and mooring personnel
- Single points of failure in communications and data exchange (VDR, VRS), presenting a risk of ships navigating in mandatory pilotage areas without a pilot or PEC holder directing the navigation
- Pilot is compromised in their ability to demonstrate compliance with the COLREGs (lookout by sight and radar)
- Potential bridge manning implications in mandatory pilotage waters where there is a high volume of communications between the pilot and the bridge team

Next steps

- **Phase 1: Pilotage as a complex system**
  - Complexity science and human factors expertise tested in medical, aviation and automotive domains
  - Developing the initial “as is” model for pilotage
  - Workshop with worldwide maritime pilotage experience to validate conclusions (TTBC)
  - First report expected in 2026

- **Phase 2: Technology Readiness Assessment**
  - Second RFI with more detailed goal-based high-level specifications launched
  - Flexibility provided to enable partnerships, if warranted
  - Genuine interests from major players
  - Deadline for responses is 30 April 2026

- **Phases 3 to 5: Trials Phases**
  - Trial phases originally planned to begin late 2025/2026 will likely begin in late 2026/2027, subject to the outcome of Phase 2
  - Simulations will be conducted in the right laboratory environment to validate Phase 2 conclusions

Thank you

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