

Container Coning and Deconing Research Grant Call 2026

Singapore Maritime Institute
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Supporting Partners: PSA Corporation Ltd, National Robotics Programme (NRP),
Maritime & Port Authority of Singapore (MPA)

BACKGROUND

1. To meet Singapore's 2040s goal of 65 million twenty-foot equivalent units (TEUs), full-scale automation for port operations is imperative. While PSA has automated cranes and vehicles, container coning/deconing remains a manual, hazardous, and labour-intensive task. With an aging workforce and recruitment challenges, automating this process is essential for safety and long-term sustainability.
2. The automation of wharf-side coning and deconing is now viable due to a critical convergence: mature Embodied AI (EAI) for perception and dexterity, a full stack of robust hardware and connectivity, a strong economic driver from labour and safety costs, and proven tech from automated logistics. Hence, targeted research and development (R&D) is the essential next step to adapt and deploy a specialized robotic solution, transforming this long-standing bottleneck into a new standard of efficiency and safety for PSA.
3. This Grant Call targets R&D in enabling technologies—such as advanced materials, multimodal perception, and data-driven training—to bridge technical gaps in coning/deconing. Projects must align with industry needs to accelerate the deployment of robotic solutions within PSA and the broader sector.
4. Previous Singapore Maritime Institute (SMI)-funded research (refer **Annex A**) with PSA confirmed the feasibility of robotic coning/deconing while identifying the technical and operational gaps that still prevent scalable deployment.
5. Proposals should build on prior SMI work to improve system robustness and technology readiness. This continuity aims to fast-track PSA's adoption of these solutions, with the potential to scale across their global terminal network.
6. The Grant Call shall be open from **12 January to 10 April 26**.

PROBLEM STATEMENT

7. Wharf-side coning and deconing remain manual, labor-intensive bottlenecks that hinder port productivity and safety. While EAI offers a solution, current systems lack the reliability and scalability required for live operations. This grant call seeks R&D proposals focused on specific component breakthroughs—rather than full-system prototypes—to accelerate the deployment of robotic solutions for coning and deconing. Key technical targets include:

a. High-Speed Manipulation: Robotic systems capable of a coning/deconing cycle time of ≤ 30 seconds under wharf-side conditions; and

b. Precision Perception: Detection models capable of identifying 40+ fitting types with 95% accuracy, including the identification of defective or non-standard components.

PROJECT SCOPE AND DETAILS

8. This Grant Call focuses on wharf-side coning and deconing operations. Proposals shall be submitted under one of two distinct tracks: (A) **Hardware Development** or (B) **Software Development**.

Track A: Hardware Development

Focus: Enhancing the physical durability and dexterity of robotic components in harsh port environments.

- **R&D Scope:**
 - Research and test robotic embodiments (arms and end-effectors) for long-life, force-adaptive manipulation.
 - Address environmental hardening, wear engineering, and contact mechanics for corner casting constraints.
 - Evaluate and build upon PSA's curated robotic designs to bridge industry-readiness gaps.
 - Conduct material research on anti-slip surfaces for corroded/dirty fittings.

- **Integration & Support:**
 - Ensure compatibility with PSA's curated robotic designs which include co-developed with PSA industry partners (non-exhaustive list provided in **Annex B**), and support teleoperation for demonstrations.
 - Provide comprehensive training materials and knowledge transfer for end-users.

- **Key Deliverables:**
 - **Validation:** Lab-validated testing plans ready for transition to field trials.
 - **Performance Metrics:** Quantifiable improvements in mechanical durability, slip resistance, and manipulation stability. (e.g. more than 60% reduction in slip events per 1,000 operations and more than 30% increase in meantime between failure of 1000 hours, reduction in slip events and increase in meantime between failure \geq 1000 hours).

Track B: Software Development

Focus: Advancing AI models and synthetic data to improve recognition, decision-making, and manipulation.

- **R&D Scope:**
 - **Identification:** Multimodal AI (Vision-Tactile-Language-Action) to identify twist lock types and failure modes.
 - **Grasping:** Models to predict optimal grip force, torque sequences, and grasp positions.

- **Synthetic Data:** Generation of wharf-side video scenarios (varied lighting, crane angles, extreme corrosion) for AI training.
- **Task Planning:** Action-annotated videos for long-horizon planning and dexterous manipulation.
- **Integration & Translation:**
 - Ensure interoperability with open-source EAI models, simulation environments, and data pipelines.
 - Provide technology translation plans (e.g., PoC with PSA-curated partners)
- **Key Deliverables**
 - **Accuracy:** Lab-validated models showing significant improvements in action grounding and failure prediction.
 - **Efficiency:** Methodologies that meaningfully reduce the volume of real-world data collection required.

9. The following need **not** be considered for this Grant Call: i) Full system builds or end-to-end autonomous prototypes; ii) Hardware integration specifically for wharf trials; and iii) Start-ups focusing solely on the end-to-end workflow rather than component breakthroughs.

10. Research teams must collaborate closely with **PSA and its identified partners (Annex B)** to ensure R&D remains aligned with industry trends and facilitates seamless system integration. Teams are also encouraged to engage **additional relevant industry partners** to enhance the project's impact and collaborative depth.

11. The maximum project duration is **24 months**. The timeframe should be tailored to the project's scope (e.g., software-focused tracks may follow an accelerated schedule). Proposals must include a detailed timeline featuring progress reporting and key review milestones.

ELIGIBILITY CRITERIA

12. Principal Investigators (PIs) from Singapore-based Institutions of Higher Learning (IHLs)/Research Institutes (RIs) and affiliated research laboratories are eligible to apply.

13. The PI shall be based in Singapore. While collaboration with foreign organizations and experts is permitted in the capacity of Co-PI or Collaborator, all research shall be conducted in Singapore. Any research activities to be performed overseas require express prior approval from the grantor.

14. Proposals already funded by other government agencies are ineligible for this grant call. Applicants must declare all existing funding sources and any concurrent applications during the submission process. Proposals with a similar scope that are currently under evaluation elsewhere will not be considered until a final decision has been reached by the other funding bodies.

FULL PROPOSAL SUBMISSION

15. Applicants must ensure that all submissions comply with the Grant's terms and conditions and the collaboration guidelines outlined in **Annex C**. Non-compliance may lead to the immediate rejection of the proposal without technical review, particularly for the following:

- a. Missing, incomplete or inaccurate information;
- b. Applications require formal endorsement from the host institution's Director of Research (or equivalent authority). Incomplete or late applications, as well as those lacking electronic endorsement from the host R&D organization, will not be considered. No revisions will be permitted once the application has been submitted;
- c. Applications that do not align with the study objectives outlined in Paras 8-11;
- d. Proposals that are duplicates of submissions currently under review by other public funding agencies for simultaneous funding; and
- e. Applications that do not meet the eligibility criteria outlined in Paras 12-14 above.

16. The proposal must be written in English and make sure that there is a comprehensive and concise case for support via the application document (**Annex D**).

17. Applicants must submit an accompanying presentation deck (**Annex E**) with the proposal and the proposed budget (**Annex F**). Additional reference slides can be included as annexes to the presentation, where necessary.

18. Relevant privileged or confidential information shall be disclosed in the application to help convey a better understanding of the proposal. Any such information should be clearly indicated in the application.

19. Selected applications shall be invited to present to the Project Evaluation Panel (PEP), comprising SMI, MPA, relevant technical and industry experts. The PEP shall rank applications based on the evaluation criteria in Table 1.

Table 1: Evaluation Criteria

Evaluation criteria		Weightage
A	Methodology <ul style="list-style-type: none"> - Is the proposed methodology robust, innovative and feasible/viable? - Are the characteristics and quality of data available appropriate for the project? - Is the scope comprehensive and international benchmarks relevant? - Are the recommendations proposed upgradable/future-proof/fit for industry partners' adoption? 	40%
B	Industry Partnership and Technical competency <ul style="list-style-type: none"> - Does the research performer/team possess the necessary capabilities to conduct the research successfully? - Does the PI have the track record to lead and conduct the research successfully? 	30%

	- Does the proposal contain an industry partnership plan and is the research team able to complement the industry technical competencies?	
C	Project management - Are there clear quantitative and qualitative milestone targets in the project plan with key deliverables? - Comprehensiveness of the project management plan, including risk analysis and mitigation plan - Does the project team have ready research resources to complete the study on time?	15%
D	Project budget - Reasonableness of project budget	15%

20. The PEP reviewers may seek additional information to elaborate or clarify areas in the application during the review process.

21. Applications shall be accepted from **11 January 26, 0900 hrs – 10 Apr 26, 2359 hrs** (SGT / GMT+8).

22. All applications submitted shall receive an email acknowledgement by SMI within 3 working days. All applicants shall be notified by no later than end of April 26 on the outcomes of their applications.

23. Projects shall commence within **1 month of award**.

KEY TIMELINES

24. Interested applicants are to refer to Table 2 for the key timelines:

Table 2: Key Timelines

S/N	Item	Date
1	Launch of grant call	11 January 2026
2	Grant Call briefing	23 January 2026
3	Submission Deadline	10 April 2026
4	Shortlisting of applications for evaluation	April 2026
5	Review of proposals (Project Evaluation Panel)	May 2026
6	Expected award of proposal	Q3 2026
7	Expected commencement of Project	Q4 2026

PROPOSAL BRIEFING AND AWARD PROCESS

25. A briefing session will be held on **23 January 26 at 1400 hrs.** While attendance is optional, all interested applicants are strongly encouraged to attend.

mTower, Level 20 Excellence Room
460 Alexandra Road, Singapore 119963

26. Applicants of this grant are encouraged to collaborate with other institutions and industry partners.

FUNDING SUPPORT

27. Indirect Research Cost (IRC) may be claimed up to 30% of the approved qualifying cost. The total funding support includes the IRC and approved qualifying direct costs of the R&D project.

28. This Call for Proposals offers funding support of up to **S\$2 million** per project inclusive of indirect costs.

29. This Call for Proposals offers funding support for a period **up to 24 months.**

30. All costs and expenses incurred by the applicant in preparing or submitting the application shall be borne entirely by the applicant.

CONTACT DETAILS

31. All applications shall **only be submitted** to the below email addresses with subject head "SMI Grant Call" followed by Track A/B, Host Institute and PI Name, (e.g. "SMI Grant Call_Track A_NTU_Prof Jane Tan).

Attn: Mr Chen Kanghao & Mr Song Hanyu
Singapore Maritime Institute
kanghao@maritimeinstitute.sg & hanyu@maritimeinstitute.sg

LIST OF ANNEXES

- Annex A – Past Project Lesson Learnt (Attached Separately)
- Annex B – List of PSA-identified EAI industry partners (Attached Separately)
- Annex C – Grant Terms and Conditions (Attached Separately)
- Annex D – R&D Application Form (Attached Separately)
- Annex E – Presentation Template (Attached Separately)
- Annex F – Budget Excel Form (Attached Separately)