

# EXTENDING TRANSIT WINDOWS AND VESSEL DRAFTS IN PORT BOTANY USING A NEXT GENERATION, PHYSICS-BASED OPERATIONAL SYSTEM

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## INTRODUCTION

The increasing number of very large container ships servicing major intercontinental shipping routes has resulted in growing pressures on Australian ports to enable safe passage of container vessels beyond 8500 TEU.

Servicing the largest population centre in Australia, Port Botany is vital to the economic wellbeing of Sydney and New South Wales. The channel entrance is often subject to energetic Pacific Ocean swell, moderate tides and occasionally severe winds. In August 2019, the Port Authority of NSW (PANSW) adopted the NCOS ONLINE system to provide enhanced decision support for under keel clearance management of deep drafted vessels in Port Botany.

The technical framework and real-life application of the physics-based operational system NCOS ONLINE is presented in this paper.

## A PHYSICS-BASED APPROACH

The NCOS ONLINE system belongs to a new generation of physics-based port traffic management systems that are capable of resolving the detailed response of each unique vessel entering a port with the same level of accuracy as a 3D full bridge simulator. NCOS is able to do this by utilising the same engine blocks as used in the full-bridge simulator SIMFLEX4 which includes a 2<sup>nd</sup> order 3D panel method for resolving wave response incorporating the effect of forward speed and varying water depth. Coupled with detailed 7-day forecasts of wind, waves and hydrodynamics covering the entire port domain, the system is able to provide safe transit windows for all classes of ships, with unprecedented accuracy.

## FULL-SCALE VALIDATION

Full-scale validation of under keel clearance was carried out using fully instrumented transits of the 280 m Container Vessel Cosco Hamburg and the 244 m Tanker Falcon Express.

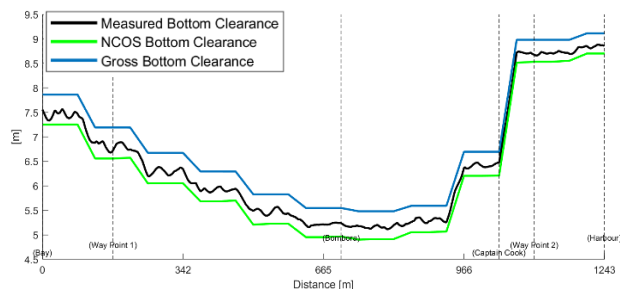


Figure 1 Comparison of measured and NCOS predicted bottom clearance for the Falcon Express

Instrumentation consisted of 3 RKT corrected DGPS

sensors providing accurate measurements of squat, roll, pitch and heave compared directly to NCOS predictions. Figure 1 presents the comparison between measured and predicted bottom clearance for the Falcon Express Tanker vessel.

## OPERATIONAL APPLICATION

On 22 August 2019 at 1400 hours, despite heavy seas exceeding 6 m offshore and gale-force winds, PANSW successfully brought the container vessel OOCL Texas through the Heads and into Port Botany using the newly installed NCOS ONLINE system. The transit was considered groundbreaking as it would not have been possible using previous port regulations. Since then NCOS ONLINE has deferred extensive transit delays during storm events and has overall increased safe transit windows by more than 130% over the last 12 months.



Figure 2 - OOCL TEXAS became the first vessel to use NCOS ONLINE on its transit into Port Botany

## CONCLUSION

The next-generation physics-based operational system, NCOS ONLINE, has been adopted at Port Botany as a tool for improving UKC decision support and increasing port capacity. By utilising a highly accurate method for predicting vessel response dynamically, more precise safety factors can be applied to UKC predictions. Under most weather conditions, this sophisticated framework results in extended transit windows for large, deep drafted vessels.

## REFERENCES

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