Medical Xpress

New study finds the opening of doors on passenger ships increases the risk of COVID-19 transmission

June 8 2022

A passenger ship operated by PT Pelayaran Nasional Ekalya Purnamasari (PNEP). Credit: Sciencedirect.com

The spread of COVID-19 in passenger ships is exacerbated when a cabin door is left open to let in fresh air, according to new research led by Cranfield University.

High performance simulations were developed to show how infected particles from a person's mouth were distributed onboard small passenger ships. The key finding was that keeping the cabin door shut led to a shorter area spread of particles.

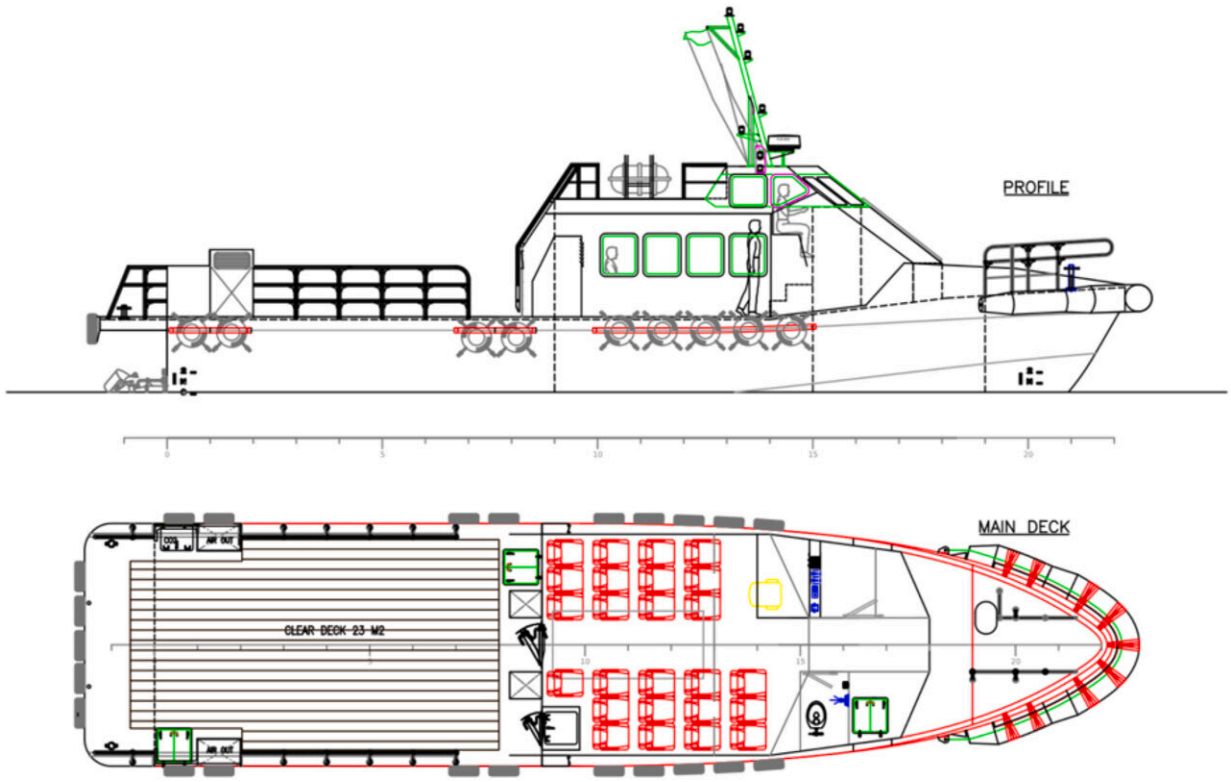
The research aims to aid the post-pandemic recovery of the maritime industry—which saw a reduction of 43% in passenger vessel operations due to COVID-19. The results will advance on-board protection measures against future viruses, reducing the economic and social impact of pandemics on seafarers, passengers and the shipping industry.

Maritime industry hit hard by pandemic

Passenger transportation across the world has been significantly affected by the COVID-19 pandemic, with the time passengers spend confined together creating a risk to health and spreading the virus.

Although research of how the virus spreads in hospitals and other settings such as cars is extensive, equivalent studies into COVID-19 on ships have been limited.

The key findings—published in the *Ocean Engineering* journal—show that the airflow environment on ships is unique because of their forward motion, and that the location of a front-facing door can cause significant wind flow to distribute infected particles more widely.



Profile and plan views of the ship's external and internal design. Credit: sciencedirect.com

Researchers, led by Cranfield University's Dr. Luofeng Huang, Lecturer in Mechanical Engineering, carried out research using a series of computational models to look at the airborne transmission of COVID-19 inside a ship. They examined what happened when an infected person coughed or was speaking when the door was open, and how the spread of this virus changed when the door was closed.

Closed doors and air conditioning units

Results from the research modeling showed that the movement of virus particles was limited to a radius of half a meter, less than a seat's width,

when doors were closed. The passenger seats could then be adjusted accordingly to take this spread radius into account.

The researchers also looked at the influence of air conditioning units and found that adjusting the direction of air flow downwards acted as a measure to limit virus spread.

Cranfield University's Dr. Luofeng Huang, the paper's lead author, said, "We initially started the research with a focus on Indonesia, a nation which relies heavily on sea transportation. But when the pandemic hit, there were ships around the world which were unable to leave port, or had to operate at reduced capacity. Our research demonstrated a safe way forward for ships, and will assist as the maritime industry recovers from the effects of the pandemic.

"We were very surprised by the results of the research as it differs to mainstream guidance on COVID and fresh air. In the case of ships, it is evident that keeping the front door of a vessel shut will mitigate the spread of an infection.

"Our next step is to continue the research to develop guidelines for fishing vessels, on which the catching process usually requires more than 10 crew working side-by-side, and the physical demands make it impractical to wear masks. With this concern, hundreds of thousands of fishing vessels are still suspended which increases the economic toll in the region."

More information: Luofeng Huang et al, COVID-19 transmission inside a small passenger vessel: Risks and mitigation, *Ocean Engineering* (2022). DOI: 10.1016/j.oceaneng.2022.111486