# Safety Improvement of High-Speed planing Craft: Development of a Conceptual Framework

## Summary

*From one side, one of the main priorities for the maritime activities in the Baltic Sea Region is related to safety. From the other side, there are too many high-speed planing hulls, which are used in this area for various purposes including rescue and military missions, leisure activities, fishing, servicing etc. The crews onboard of a high-speed planning craft experience severe motions and accelerations that lead to serious physical injuries and death. The EU Physical Agents Directive limiting exposure to Whole Body Vibration (WBV) have had an increasing impact on high speed planing craft design and operations. It has been shown that high-speed planning craft can exceed the EU WBV daily exposure limit in a number of minutes in poor sea conditions. Therefore, this legislation has driven the requirement for a greater emphasis on high-speed planing craft motion during the design process. There are several solutions for motion reduction and improving the safety of planing hulls operations including shock mitigation seats, trim tab, interceptor and other devices. In this research, the main aim is to develop a conceptual framework in which several devices including trim tab and shock mitigation seat are merged as a unit solution for reducing the motions experienced by crews especially vertical acceleration. Both mathematical and numerical models will be developed to simulate the coupled simultaneous effects of active control trim tab and shock mitigation seat on motions reduction. Based on the developed models, a conceptual framework for simultaneous implementation of shock mitigation seats and active control trim tab will be developed that suggest the motions reduction and safety improvement of high-speed planing craft.*

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| Research field: | Mechanical engineering |
| Supervisor: | Abbas Dashtimanesh |
| Availability: | This position is available. |
| Offered by: | Estonian Maritime Academy |
| Application deadline: | Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich) |

## Description

From one side, one of the main priorities for the maritime activities in the Baltic Sea Region is related to safety. From the other side, there are too many high-speed planing hulls, which are used in this area for various purposes including rescue and military missions, leisure activities, fishing, servicing etc. The crews onboard of a high-speed planing craft experience severe motions and accelerations that lead to serious physical injuries and death. The EU Physical Agents Directive limiting exposure to Whole Body Vibration (WBV) have had an increasing impact on high speed planing craft design and operations. It has been shown that high-speed planing craft can exceed the EU WBV daily exposure limit in a number of minutes in poor sea conditions. Therefore, this legislation has driven the requirement for a greater emphasis on high-speed planing craft motion during the design process. There are several solutions for motion reduction and improving the safety of planing hulls operations including shock mitigation seats, trim tab, interceptor and other devices.

**Responsibilities and tasks**

In this research, the main aim is to develop a conceptual framework in which several devices including trim tab and shock mitigation seat are merged as a unit solution for reducing the motions experienced by crews especially vertical acceleration. Both mathematical and numerical models will be developed to simulate the coupled simultaneous effects of active control trim tab and shock mitigation seat on motions reduction. Based on the developed models, a conceptual framework for simultaneous implementation of shock mitigation seats and active control trim tab will be developed that suggest the motions reduction and safety improvement of high-speed planning craft.

**Qualifications**

The call is open for candidates with a wide range of backgrounds inside and outside of Estonia. Most importantly, high level of interest and motivation towards, and deep understanding on, marine hydrodynamics including seakeeping, mathematical modelling, active control systems and computational fluid dynamics are required.

The applicants should fulfill the following requirements:

- A suitable background may come from naval architecture, mechanical engineering or related disciplines
- Prior experience on working with StarCCM+ is a significant advantage and skills with programming tools Matlab and Python is necessary
- The candidate should prove his/her capabilities in writing the technical report and scientific papers in high quality journals
- Priority will be given to those who got the first-class honors for his/her bachelor degree and master by coursework course with research components and/or publications
- Experience in collaborative research/publication with the existing TalTech staff is also a plus
- The applicant for the position must have a Master's degree and must fulfill the requirements for doctoral students at the Tallinn University of Technology

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