Research on Future Trimaran (US-JAPAN Co-operative Research)

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1. Background

Trimaran is one of the multi-hull vessels, which is now attracting attention from many navies. As shown in Fig.1, trimaran has one main hull on center and two small side hulls. Trimaran can achieve high speed because of the fine main hull. Additionally, it can obtain wider deck area than comparable monohull, hence trimaran embarks considerable number of Helicopter, UUVs and USVs to perform multiple operations.

Trimaran is relatively-new hullform, and its design scheme is not yet established. For design of future trimaran, fundamental researches are necessary to develop design procedure.

Naval Systems Research Center is now conducting co-operative research project on trimaran (High-Speed Multi-Hull Vessel Optimization; HSMVO) with Naval Surface Warfare Center Carderock Division, US Navy. In this project, the authors are conducting fundamental research and design on trimaran. In this presentation, the outline of the project and results on Japan side study are introduced.

2. Outline of the HSMVO

The objective of the HSMVO project is to assess the capability of trimaran as naval platform and obtain trimaran performance database to design variety of different trimaran for future operational requirements. Therefore, US and Japan have been jointly studying on various stage of design, performance evaluation and sharing the achievements. The outline of the project are described below.

Firstly, both countries jointly develop the CONOPS: concept of operations for trimaran on the HSMVO project. From this CONOPS, each country separately conducts concept design of trimaran which has different particulars.

Secondly, each country conducts performance evaluation by both experiment and numerical simulation, and improve hullform based on evaluation results to redesign the trimaran. To optimize the hullform, these process will be repeated several times and parametric concept design will be created. Fig.1 is one of the concept design of Japan side created in the optimization process.

Finally, the optimized hullform will be evaluated in detail. Additionally, the evaluated results will be utilized to consolidate parametric performance database. By comparing different trimaran between both counties, we can expect to create more diverse performance database and improve design and performance evaluation capability of both counties.

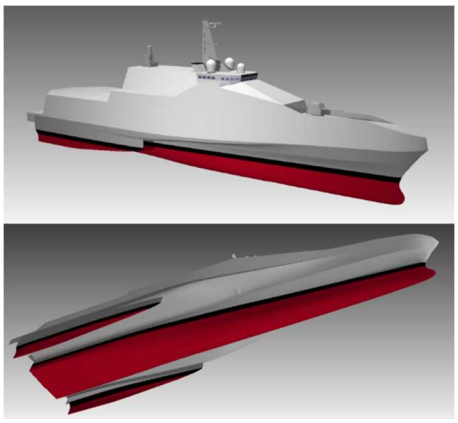

Figure 1: Japan side concept design of trimaran on the HSMVO project

3. Situation of Japan side study

Now Japan side has selected the final design and is preparing for detail evaluation. Current results of Japan side are as follows

Japan side assumes the CONOPS for trimaran as patrol and MCM, and conduct concept design for these primary missions. For the first step of optimization, resistance reduction is set as objective function and parametric evaluation was conducted by numerical method. Secondly, towing tank experiments were conducted to evaluate propulsion, seakeeping and maneuvering performance. Hullform was also optimized by experimental results. Structural strength study conducted simultaneously both on numerical and experimental. Now Japan side is manufacturing experimental models for detail analysis on final design.

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