Study of Dynamic Characteristics of High speed Catamaran Hull Form at sea waves

Mehdi Rowshan [1], Mohammad Javad Ketabdari [2], Mehdi Behzad [3]

Shiraz Air Naval Research Center. PO: 71949-15685
(me_rowshan@yahoo.com)

Abstract
In the new millennium, significant changes can be seen in the form of novel hull forms suitable for high-speed operation. Several authors have made significant contributions over the last few years tothe evaluation and analysis of dynamic performance of high-speed multihull forms. In this paper, an attempt has been made to present the dynamic characteristics of a high-speed catamaran hull form. The two-dimensional strip theory method (using Lewis-form sections) has been used to predict the heave and pitch motions in frequency domain. Finally the response amplitude operators (RAO) at different directions (wave entrance ahead and laterally) are obtained.

Keywords
Catamaran;dynamic characteristics; frequency domain

Introduction
Min et al (1993) [1] carried out a dynamic study on the development of a mid-size high-speed catamaran ferry based on the theoretical methods of strip theory and a three-dimensional source distribution; although the study concluded that strip theory is inaccurate in the high-speed region, no noticeable differences have been observed in both methods. The authors emphasize that the strip-theory method could be utilized as a practical tool to estimate dynamic Performance of catamarans. A further paper by Fang et al (1997) [2] introduced an extension of the linear frequency domain theory to a quasi-non-linear time-domain technique to compute the large-amplitude motions in regular waves. The authors have solved the coupled heave and pitch equations in time domain by the Runge-Kutta method and have experimented with a catamaran in head seas to compare the linear and nonlinear methods. Varyani et al (2000) [3] have presented the behavior of a catamaran hull form with and without forward speed. Like the previous authors, two different methods have been used, namely, strip theory and the three-dimensional pulsating-source method. Minor differences have been noted at zero forward speed in both methods. Monohull and catamaran hull configurations showed similar responses at higher speeds and higher frequencies. This was attributed to decrease interferences between the demihulls at high speeds for certain values of the hull spacing and the wave frequency. In this paper, we present results for heave and pitch motions in two main directions of wave entrances (heading and laterally) for typical catamaran hull form generally used in the high-speed ferry industry. The hydrodynamic coefficients in equations of motion are estimated by conformal mapping using Lewis-form sections and numerical method used to predict the heave