

An Underwater Explosion-Induced Ship Whipping Analysis Method for use in Early-Stage Ship Design

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Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Ocean Engineering

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Description of item under review for fair use: Figure 12. Source: Hicks, A.N., "Explosion Induced Hull Whipping," Advances in Marine Structures, Admiralty Research Establishment, Dunfermline, Scotland, UK, 1986.

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Description of item under review for fair use: Figures 16, 17, 35, and 37. Source: Hicks, A.N., "The Theory of Explosion-Induced Ship Whipping Motions," Naval Construction Research Establishment, NCRE Report R579, 1972.

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Name: Benjamin Brainard

Description of item under review for fair use: Figure 13. Keil, A.H., The Response of Ships to Underwater Explosions. The Society of Naval Architects and Marine Engineers, 1961.

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Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

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Description of item under review for fair use: Figures 3 and 4. Source: Klenow, B., "Assessment of LS-DYNA and Underwater Shock Analysis (USA) Tools for Modeling Far-Field Underwater Explosion Effects on Ships," Master's Thesis, Virginia Tech, Blacksburg, VA, 2006.

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Description of item under review for fair use: Figure 47. Source: MAESTRO Structural Design Software Help Manual, DRS Advanced Marine Technology Center, 2015.

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Description of item under review for fair use: Figure 46 Source: Paik, J.K. et al, "Benchmark Study on the use of ALPS/ULSAP Method to Determine Plate and Stiffened Panel Ultimate Strength," MARSTRUCT 2011 Conference, Hamburg, Germany, 2011.

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Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

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Description of item under review for fair use: Figure 5. Source: Park, J., "A Coupled Runge Kutta Discontinuous Galerkin-Direct Ghost Fluid (RKDG-DGF) Method to Near-field Early-time Underwater Explosion (UNDEX) Simulations," Ph.D. Dissertation, Virginia Tech, Blacksburg, VA, 2008.

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Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

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Name: Benjamin Brainard

Description of item under review for fair use: Figures 2 and 10 Source: Reid, W.D., The Response of Surface Ships to Underwater Explosions. Department of Defense, 1994.

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Description of item under review for fair use: Figure 15. Source: Stettler, J.W., "Damping Mechanisms and Their Effects on the Whipping Response of a Submerged Submarine Subjected to an Underwater Explosion," Master's Thesis, Massachusetts Institute of Technology, Cambridge, MA, 1995.

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Description of item under review for fair use: Figures 19, 24, 26, 28, and 30. Source: Vernon, T.A., "Whipping Response of Ship Hulls from Underwater Explosion Bubble Loading," Technical Memorandum 86/225, Defence Research Establishment Atlantic, 1986.

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Description of item under review for fair use: Figure 14. Source: 11. Webster, K.G., "Investigation of Close Proximity Underwater Explosion Effects on a Ship-Like Structure Using the Multi-Material Arbitrary Lagrangian Eulerian Finite Element Method," Master's Thesis, Virginia Tech, Blacksburg, VA, 2007.

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Description of item under review for fair use: Figure 7. Source: Wood, S.L., Cavitation Effects on a Ship-Like Box Structure Subjected to an Underwater Explosion, in Mechanical Engineering. 1998, Naval Postgraduate School: Monterey, CA.

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