

# **Warship 2017: Naval Submarines and UUVs**

Bath, United Kingdom  
14-15 June 2017

ISBN: 978-1-5108-8302-4

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2017) by The Royal Institution of Naval Architects  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2019)

For permission requests, please contact The Royal Institution of Naval Architects  
at the address below.

The Royal Institution of Naval Architects  
8-9 Northumberland Street  
London, WC2N 5DA  
United Kingdom

Phone: 020 7235 4622  
Fax: 020 7259 5912

[publications@rina.org.uk](mailto:publications@rina.org.uk)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

## CONTENTS

### **Set-Based Requirements, Technology, and Design Development for SSNX''''3**

*M C Parker, Naval Sea Systems Command, USA*

*M D Garner, Naval Sea Systems Command, USA*

*J T Arcano, Naval Sea Systems Command, USA*

*N Doerry, Naval Sea Systems Command, USA*

### **Managing Early Stage Design Uncertainty and Establishing Policy for a Low Risk Design ''33**

*S Daley, R Dvorak, M Parker, NAVSEA, USA*

### **Submarine Design is Not Ship Design''43**

*D Andrews, University College London, London, UK*

### **Human Factors Issues for Unmanned Underwater Vehicles''59**

*C Soper QinetiQ, UK*

### **Development of an AUV Launch and Recovery System for the Portuguese Manned Submarines via Torpedo Tubes''65**

*H Vieira da Silva, Naval Academy, Department of Sciences and Technology, Portugal.*

*M Cavique, UNIDEMI\_CINAV & Naval Academy, Department of Sciences and Technology, Portugal.*

*J Borges de Sousa, University of Porto & LSTS, Electrical and Computer Engineering Department, Portugal*

### **Method for the Simulation of the Swim Out of a Weapon from a Launching Tube''73**

*F Pécot DCNS Research / Sirehna, France*

*T Taillefet, DCNS Ruelle, France*

### **The Operational Benefits of Covertly Refuelling a Conventional Submarine whilst at Sea''83**

*S Harrison, H Diab, K Slater, Defence Science and Technology Group, Australia*

*M Renilson, University of Tasmania, Australia*

### **I Didn't See that Coming: The Perils of Underwater Automation''8;**

*M Cook, M Thody and D Garrett, BAE SYSTEMS Maritime Submarines, UK*

### **Lloyd's Register Code for Unmanned Marine Systems''9;**

*M Palmer, Lloyds Register EMEA, Marine & Offshore, UK*

**Past, Present and Future in Submarine Manoeuvring Control"";**

*D Ritchie, A Cowley BAE Systems, UK and S Russell, MOD, UK*

**The Dynamic Stability of Submarines on the Surface"";**

*P Crossland, C K Pope, QinetiQ Ltd, UK*

*S Machin, Naval Authority Group, Submarine Delivery Agency, UK*

**Efficient Modelling of the Structural Response of Submarine Pressure Hulls to Underwater Explosions""333**

*D Graham, J Hobson, P Murphy, C Toole, S Cross and J Farnworth, QinetiQ Rosyth, UK*

**Alternatives to Domes as Pressure Hull End Closures""33;**

*K J Heaney, H J Hickson, P E Buckton, J M Underwood, BMT Defence Services, UK,*

*B Blum, P Gough, Ministry of Defence, UK*

**Performance Verification of the Air-Conditioning System in a Submarine""353**

*J D. Wilgenhof, MSc. , MecDes, The Netherlands*

*J Molina Toledo, MSc. , Navantia, Spain*

**Assessment of Flow Generated Noise on Naval Platforms""363**

*C Carter and G Hawkes, Frazer-Nash Consultancy Ltd, UK*

*C Smethurst, BAE Systems Maritime Ltd, UK*

**On the Added Resistance of Underwater Vehicles in Close Proximity to Regular Waves""373**

*S Daum and M Greve, thyssenkrupp Marine Systems, Kiel, Germany*

*R Skejic, SINTEF Ocean & NTNU, Faculty of Engineering, Trondheim, Norway*

**Probabilistic Submarine Flood Recovery Analysis""383**

*N R Horn, Royal Navy / UCL, UK*

**Tempis Fugit: But where does it go in time-limited safety-critical tasks""395**

*M Cook, BAE SYSTEMS Maritime Submarines, UK*

**Adapting Smart + Connected Solutions for Shipboard Use""3: 3**

*J Beel and K Jones, Cisco Systems, Inc., USA*

**The Effect of Speed and Geometry on the Characteristics of the Plume Generated by Submarine Masts""3: 7**

*A S T Conway, D Ranmuthugala, M R Renilson and J R Binns, Australian Maritime College, Australia*

**Cybersecurity Automation: Securely Delivering Smart Technologies and Operations'''3; 3**

*K Jones and J Beel, Cisco Systems, Inc., USA*

**Graphic Method for Improved Indonesian Navy Submarine Design Acquisition; The Investigation of Small (Midget) Naval Submarine Development'''3; 9**

*M H Mukti and R E Randall, Indonesia Endowment Fund for Education, Texas A&M University, USA*

**Parasite Drag on Substructures of Submerged Bodies'''42;**

*T Nietzsche, Schiffbau-Versuchsanstalt Potsdam (SVA), Germany*

**The Effect of Aft-Control-Surface Deflection at Angles of Incidence for the BB2 Generic Submarine'''435**

*D A Pook, RMIT University/Defence Science and Technology Group, Australia*

*G J Seil, Advanced VTOL Technologies/Defence Science and Technology Group, Australia*

*M R Renilson, Australian Maritime College, University of Tasmania, Australia*

*D Ranmuthugala, Australian Maritime College/Defence Science and Technology Group, Australia*

*M Nguyen, Advanced VTOL Technologies/Defence Science and Technology Group, Australia*

**On Mathematical Modelling of Main Ballast Tank System of a Sub-Surface Platform'''445**

*Z Riaz, M A Waqas, W Ahmed, H Khalid, A R Hashmi, Centres of Excellence in Science & Applied Technologies (CESAT), Pakistan*

*P G Wrobel, University College London, UK*

**Integrated Performance Modelling of Modern Conventional Submarines to Support Strategic Decision Making'''455**

*K Slater, H Diab and S Harrison, Defence Science and Technology Group (Department of Defence), Australia*

**Author's Contact Details'''465**