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## Inspiring Naval Engineering

incorporating the International Ship Control Systems Symposium (iSCSS)

### Tuesday 2 – Thursday 4 October 2018

Technology & Innovation Centre, University of Strathclyde, Glasgow, UK

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**IMarEST LEARNED SOCIETY EVENTS**

#### INEC/iSCSS 2018 at a glance

- Over 300 expert participants
- Over 100 peer-reviewed technical papers
- The Sir Donald Gosling Award
- 15 plus focussed exhibition stands
- International attendance from over 18 countries
- Excellent networking opportunities and social programme
- The relaunch of the International Ship Control Systems Symposium (iSCSS) entitled *Revolutionary Technology Inspiring Ship Control*



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INEC/iSCSS 2018 is organised by FIGS Events Limited on behalf of IMarEST

## www.inec.org.uk



# CONFERENCE PROGRAMME (subject to amendment)

## Tuesday 2 October 2018

0800 – 0900 Registration and coffee

### OPENING PLENARY SESSION | Main Auditorium

0900 – 0915 Introduction | *Capt Matt Bolton RN, Chairman, INEC 2018*

0915 – 0930 Welcome Address  
*Professor Sir Jim McDonald, Principal and Vice Chancellor, University of Strathclyde, UK*

0930 – 1100 Keynote Addresses  
*Rangesh Kasturi, President, L3 MAPPs; Rear Admiral Paul Methven, Director Submarine Acquisition, Royal Navy; Commodore Peter Knipping MBE RNLN, Chief Naval Engineering Officer, Royal Netherlands Navy*

1100 – 1130 Coffee  
*Chair: Cdr Rinze Geertsma RNLN, Chairman, iSCSS 2018*

1130 – 1200 Combined seapower: A combat power perspective  
*G H Sturtevant, United States Department of Navy, USA; Dr I Whitelegg, Rolls-Royce, UK; J M Voth, A M Lowe, Herren Associates, Inc., USA*

1200 – 1230 Standing on the shoulders of giants: How the maritime industry can leverage developments in autonomy from other domains  
*Dr C L Benson, Delft University of Technology/United States Air Force Office of Scientific Research/Massachusetts Institute of Technology, The Netherlands/USA; P D Sumanth, Ir A P Colling, Delft University of Technology, The Netherlands (Sir Donald Gosling Award Candidates)*

1230 – 1300 Defence youth STEM outreach – inspiring the next generation  
*Capt M F Rose RN, Capt D Joyce RN, Ministry of Defence, UK*

1300 – 1315 Discussion

1315 – 1430 Lunch

### AFTERNOON PARALLEL SESSIONS

**INEC | Submarines**  
Main Auditorium A, Level 2  
*Chair: Tim Hardy, BMT*

**INEC | Systems engineering**  
Main Auditorium B, Level 3  
*Chair: Peter Deverill, Ministry of Defence, UK*

**INEC | Waste heat recovery**  
Main Auditorium C, Level 3  
*Chair: Phil Crago, Babcock International Group*

1430 – 1500 More than a mission – modelling the impact of a support solution on submarine availability, cost and safety  
*R J C MacMillan, S K Crawford, Babcock International Group, UK (Sir Donald Gosling Award Candidates)*

The physical integration of a significant marine engineering package into the T23 Frigate  
*D G Dobbins, Naval Design Partnering, UK (Sir Donald Gosling Award Candidate)*

Effect of Gas-To-Liquid (GTL) fuels on marine diesel engines compared to F-76  
*Lt R S Tol RNLN, Netherlands Defence Academy, The Netherlands; Lt Cdr Y Linden RNLN, Defence Materiel Organisation, The Netherlands (Sir Donald Gosling Award Candidates)*

1500 – 1530 SUPREME: Submarine space partitioning in Rhino by Quaestor3  
*Dr M van Hees, Maritime Research Institute Netherlands (MARIN), The Netherlands; W H van den Broek-de Bruijn, Defence Materiel Organisation, The Netherlands*

From automation to autonomy – designing a complete ship control system  
*C J Field, Rolls-Royce, UK (Sir Donald Gosling Award Candidate)*

Charge air configurations for propulsion diesel engines aboard fast naval combatants  
*J Q Rusman, Delft University of Technology, The Netherlands (Sir Donald Gosling Award Candidate)*

## Keynote speakers Full biographical details can be found at: [www.inec.org.uk](http://www.inec.org.uk)

### Prof Sir Jim McDonald FREng FRSE

*Principal & Vice Chancellor, University of Strathclyde*

Sir Jim McDonald joined the University of Strathclyde in 1984 following seven years in the electric utility industry and was appointed to the Rolls-Royce Chair in Electrical Power Systems in 1993. He became Principal and Vice Chancellor of the University of Strathclyde in March 2009.



### Rangesh Kasturi

*President, L3 MAPPS*

Rangesh Kasturi has accumulated almost 35 years of experience and leads a global business that provides pioneering solutions in naval control systems, high fidelity simulators for nuclear power plants as well as modelling and simulation for space applications.



### Rear Admiral Paul Methven

*Director Submarine Acquisition, Royal Navy*

Paul Methven took up his current appointment in January 2017. He joined the Royal Navy in 1988 and has held a number of positions on board submarines as well as heading projects within DE&S at the Ministry of Defence.



### Commodore Peter Knipping MBE RNLN

*Chief Naval Engineering Officer, Royal Netherlands Navy*

Peter Knipping began his military career in 1982 and is currently Director Materiel, a post he has held since May 2016 following a range of positions on board ships and as a staff officer in the Directorate of Materiel.



## Welcome from the INEC 2018 Chairman

### Dear Delegate

I am honoured to be chairing INEC once again; the Institute's flagship Learned Society event which provides such a unique opportunity for naval engineers across all sectors and domains to meet professionally and debate the latest thinking. It consistently produces far reaching and world leading technical papers that generate intense discussion and academic challenge.

The theme for INEC 2018 is *Inspiring Naval Engineering* and as INEC continues to evolve and reflect the international scale of naval programmes, I am delighted that this year's programme will encompass the International Ship Control Systems Symposium (iSCSS). The theme for iSCSS is *Revolutionary Technology Inspiring Ship Control* establishing this forum once again after an absence of nine years, not only for the naval engineering sector, but for the marine industry worldwide.

Following the huge success of recent INECs, the conference and exhibition moves to the University of Strathclyde, and to the Technology & Innovation Centre which reflects the Technical Advisory Committee's aim to increase the academic influence of the technical programme. We are thrilled to be returning to the City of Glasgow with its global reputation as a centre for engineering excellence – a truly outstanding venue for our event.

On behalf of the Technical Advisory Committee and IMarEST, we look forward to seeing you at this week's conference.

**Capt Matt Bolton RN**  
BEng(Hons) MSc  
CEng FIMarEST  
FIMechE



### iSCSS | Power systems

Level 1 Auditorium, Level 1

*Chair: Jeffrey Cohen, US Navy Surface Warfare Center*

**The expanding role of Variable Frequency Drives in naval automation**

*W A Johnson, Rockwell Automation, USA*

**The role of future information in control system design for shipboard power systems**

*Dr D F Opila, Cdr J D Stevens USN, US Naval Academy, USA; Dr A M Cramer, University of Kentucky, USA*

### iSCSS | Exploitation of marine robotic systems

Conference rooms 6&7, Level 3

*Chair: Andrea Munafó, National Oceanography Centre*

**WAVE module for hybrid oceanographic autonomous underwater vehicle – prototype experimental validation and characterisation**

*Prof A Caiti, Dr R Costanzi, Dr D Fenucci, Università di Pisa/Interuniversity Center of Integrated Systems for the Marine Environment (ISME), Italy; V Manzari, Università di Pisa/Naval Experimentation and Support Centre of Italian Navy (CSSN), Italy; Dr A Caffaz, GraalTech s.r.l., Italy; M Stifani, Naval Experimentation and Support Centre of Italian Navy (CSSN), Italy*

**U-SWATH: An innovative USV design towards the extended ship**

*G Bruzzone, A Odetti, M Caccia, Dr M Bibuli, C Lugni, National Research Council INM, Italy; E F Campana, National Research Council DIITET, Italy*

# CONFERENCE PROGRAMME (subject to amendment)

## Tuesday 2 October 2018

AFTERNOON PARALLEL SESSIONS	<b>INEC   Submarines</b> Main Auditorium A, Level 2 <i>Chair: Tim Hardy, BMT</i>	<b>INEC   Systems engineering</b> Main Auditorium B, Level 3 <i>Chair: Peter Deverill, Ministry of Defence, UK</i>	<b>INEC   Waste heat recovery</b> Main Auditorium C, Level 3 <i>Chair: Phil Crago, Babcock International Group</i>	
	<b>1530 – 1600</b>	<b>The influence of the facility nuclear safety case on the design of naval refit support equipment</b> <i>H K Cole, Babcock International Group, UK</i> <i>(Sir Donald Gosling Award Candidate)</i>	<b>Systems engineering – the hard way</b> <i>A R Edmondson, BAE Systems Maritime - Submarines, UK;</i> <i>B Twomey, Rolls-Royce, UK</i>	<b>Evaluation of electric-turbo-charging applied to marine diesel-engines</b> <i>Prof R Bucknall, Dr S Suárez de la Fuente, University College London, UK; Dr S Szymko, W Bowers, Bowman Power Group Ltd, UK; A Sim, Rolls-Royce, UK</i>
	<b>1600 – 1615</b>	<b>Discussion</b>		
	<b>1615 – 1645</b>	<b>Tea</b>		
AFTERNOON PARALLEL SESSIONS	<b>INEC   Applied mechanics</b> Main Auditorium A, Level 2 <i>Chair: Prof Catriona Savage, University College London</i>	<b>INEC   Enhanced and autonomous navigation</b> Main Auditorium B, Level 3 <i>Chair: Bernard Twomey, Rolls-Royce</i>	<b>INEC   Electric weapon system integration</b> Main Auditorium C, Level 3 <i>Chair: Glen Sturtevant, US Department of Navy</i>	
	<b>1645 – 1715</b>	<b>A practical ultrasonic inspection method for detecting and characterising defects found within composite repairs</b> <i>J Downing, A Hook, Babcock International Group, UK</i>	<b>When will autonomous ships arrive? A technological forecasting perspective</b> <i>Dr C L Benson, Delft University of Technology/United States Air Force Office of Scientific Research/Massachusetts Institute of Technology, The Netherlands/USA; Ir C Kooij, Ir A P Colling, Delft University of Technology, The Netherlands</i> <i>(Sir Donald Gosling Award Candidates)</i>	<b>The Advanced Technology Corvette-Railgun (ATK-R) design study – future weapons and small ship power systems</b> <i>Dr R J Pawling, L Farrier, Prof R Bucknall, University College London, UK</i>
	<b>1715 – 1745</b>	<b>Remedial solutions to control excessive propeller induced hull vibrations on a landing craft</b> <i>Prof M Fan, Abu Dhabi Ship Building, UAE; Dr B Aktas, Dr W Shi, Dr N Sasaki, P Fitzsimmons, Dr M Atlar, University of Strathclyde, UK</i>	<b>Enhanced navigation at sea: An augmented reality-based tool for bridge operators</b> <i>Dr M Martelli, Prof M Figari, Polytechnic School of Genoa University, Italy; M di Summa, G P Viganò, M Sacco, Institute of Automation and Industrial Technologies, (CNR-ITIA), Italy; P Cassarà, A Gotta, National Research Council, Institute of Science and Information Technologies, (CNR-ISTI), Italy; L Sebastiani, Seastema s.p.a, Italy; P Guglia, G Delucchi, Fincantieri s.p.a, Italy</i>	<b>Informing the power system performance envelope for pulse load operation</b> <i>K Mills, Rolls-Royce Naval Electrical Automation and Control, UK; J Xiong, P Venkatesh, Rolls-Royce@NTU Corporate Lab, Singapore; Dr X Liu, Rolls-Royce Electrical, Singapore</i> <i>(Sir Donald Gosling Award Candidates)</i>
	<b>1745 – 1815</b>	<b>FAUSST – bridging the gap between steel and fibre reinforced materials</b> <i>Dr L Molter, Center of Maritime Technologies e.V., Germany</i>	<b>Is there a case for emulating a fish or other sea borne creatures for propulsion of underwater vehicles?</b> <i>Cdre (Dr) R K Rana, Independent Consultant, India; N Johnson, P Dongare, Prof S Barve, Savitribai Phule Pune University, India</i>	<b>Energy storage design considerations for an MVDC power system</b> <i>Dr L J Rashkin, Dr J C Neely, Dr D G Wilson, Dr S F Glover, Sandia National Laboratories, USA; Dr N Doerry, S Markle, NAVSEA, USA; Dr T J McCoy, McCoy Consulting, LLC, USA</i>
<b>1815 – 1830</b>	<b>Discussion</b>			
<b>1830 – 2000</b>	<b>Welcome Reception   INEC/iSCSS 2018 Exhibition area</b>			



## Welcome from the Principal Sponsor

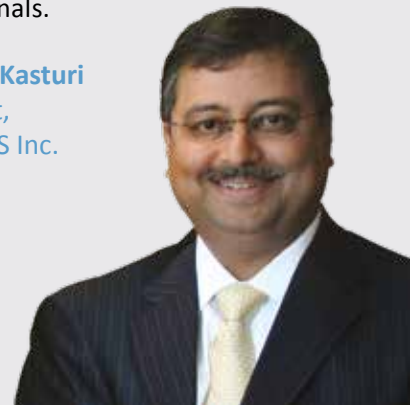
### Dear Delegate

Welcome to INEC and iSCSS from L3 MAPPS. We are delighted to be the Principal Sponsor for such an important event taking place at the University of Strathclyde in Glasgow. With over 18 countries represented and over 300 delegates expected, we are looking forward to learning about the best in naval engineering innovation, especially during 2018 – the Year of Engineering.

As a global leader in the development and evolution of modern warship Integrated Platform Management Systems, modeling and simulation, training simulators, turnkey training services, and In-Service Support, L3 MAPPS has over 35 years of experience in serving navies worldwide and is honoured to support and participate in INEC/iSCSS once again.

We are pleased that the International Ship Control Systems Symposium will be held alongside INEC, and I personally look forward to meeting you all including our many longstanding customers, partners and colleagues as well as the next generation of aspiring naval engineers and controls professionals.

**Rangesh Kasturi**  
President,  
L3 MAPPS Inc.



*“The sharing of technical expertise, research and development was really excellent”*

INEC 2016  
Delegate

### iSCSS | Power systems

Level 1 Auditorium, Level 1  
Chair: Jeffrey Cohen, US Navy Surface Warfare Center

**Deriving specifications for coupling through dual-wound generators**

*Dr L J Rashkin, Dr J C Neely, Dr D G Wilson, Dr S F Glover, Sandia National Laboratories, USA; Dr N Doerry, NAVSEA, USA; Dr T J McCoy, McCoy Consulting, LLC, USA*

### iSCSS | Exploitation of marine robotic systems

Conference rooms 6&7, Level 3  
Chair: Andrea Munafó, National Oceanography Centre

**OCEANIDS: Building next generation maritime autonomous systems**

*M Furlong, R Marlow, S McPhail, A Munafó, M Pebody, A Phillips, D Roper, G Salavasidis, National Oceanography Centre, UK*

### iSCSS | Engine control

Level 1 Auditorium, Level 1  
Chair: Rear Adml ME (ret) Klaas Visser, Delft University of Technology

**Robustness analysis of the next generation of EGR controllers in marine two-stroke diesel engines**

*X Llamas, Prof L Eriksson, Linköping University, Sweden*

**Micro-pilot-induced ignition diesel/natural gas engine control system development and engine performance/emission optimization**

*G Zhao, Harbin Engineering University, China  
(Sir Donald Gosling Award Candidate)*

**Ships diesel engine performance modelling with combined physical and machine learning approach**

*Dr A Coraddu, University of Strathclyde, UK; Ir M Kalikatzarakis, Ir G J Meijn, Damen Schelde Naval Shipbuilding, The Netherlands; Dr L Oneto, University of Genoa, Italy; Lt Cdr (E) Ir R D Geertsma RNLN, Dr M Godjevac, Delft University of Technology, The Netherlands*

### iSCSS | Exploitation of marine robotic systems

Conference rooms 6&7, Level 3  
Chair: Angelo Odetti, National Research Council INM

**An advanced guidance & control system for an unmanned vessel with azimuthal thrusters**

*Dr M Bibuli, Ga Bruzzone, Gi Bruzzone, M Caccia, G Camporeale, D Chiarella, R Ferretti, M Giacomelli, A Odetti, A Ranieri, E Spirandelli, E Zereik, National Research Council of Italy, Italy*

**An acoustic-based approach for real-time deep-water navigation of an AUV**

*A Tesei, M Micheli, A Vermeij, G Ferri, M Mazzi, G Grenon, L Morlando, NATO STO CMRE, Italy; R Costanzi, D Fenucci, A Caiti, Università di Pisa, Italy; A Munafó, National Oceanographic Centre, UK*

# CONFERENCE PROGRAMME (subject to amendment)

## Wednesday 3 October 2018

0800 – 0900 Registration and coffee

MORNING PARALLEL SESSIONS	<b>INEC   Standards</b> Main Auditorium A, Level 2 <i>Chair: Jens Ballé, thyssenkrupp Marine Systems GmbH</i>	<b>INEC   Damage control and survivability part 1</b> Main Auditorium B, Level 3 <i>Chair: Cdre Peter Knipping RNLN</i>	<b>INEC   Energy storage</b> Main Auditorium C, Level 3 <i>Chair: Benjamin Thorp, Rolls-Royce</i>
	<b>0900 – 0930</b> <b>International Naval Safety Association – the first 10 years</b> <i>N Overfield, Chair, INSA Steering Committee, UK; J McKay, INSA Secretariat, Lloyd's Register, UK</i>	<b>Machinery space fire fighting – modern alternatives</b> <i>T Goode, Babcock International Group, UK</i> <i>(Sir Donald Gosling Award Candidate)</i>	<b>Investigating the faulted performance of warship power systems with integrated energy storage</b> <i>L Farrier, University College London, UK</i> <i>(Sir Donald Gosling Award Candidate)</i>
<b>0930 – 1000</b> <b>Selection of standards in naval programmes: Harmonising classification rules with commercial and military standards</b> <i>G G Salas-Berrocal, C Marrugo-Puerta, COTECMAR, Colombia</i> <i>(Sir Donald Gosling Award Candidates)</i>	<b>Royal Canadian Navy – fighting the internal battle with a battle damage control system and embedded kill cards</b> <i>M Nottegar, T Gauthier, Naval Engineering Test Establishment, Canada; S Pakianathan, Department of National Defence, Canada; Y Lamontagne, L3 MAPPS, Canada</i>	<b>Active control of a hybrid energy storage module (HESM) driving transient loads</b> <i>I J Cohen, Dr D A Wetz, University of Texas at Arlington (UTA), USA; J M Heinzel, Naval Surface Warfare Center, USA</i>	
<b>1000 – 1030</b> <b>Efficient procurement of low vulnerability warships</b> <i>J S Schofield, D J Wright, Survivability Consulting Limited, UK</i>	<b>COSIMAR: Continuous Operational Signature Monitoring Awareness and Recommendation</b> <i>Dr J A A J Janssen, TNO, The Netherlands; H Hasenpflug, M Janssen, CSSM, Germany</i>	<b>Battery &amp; ultra-capacitor based energy storage vessel integration, capabilities, considerations and challenges</b> <i>M Southall, K Ganti, GE Power Conversion, UK</i>	
<b>1030 – 1045</b> <b>Discussion</b>			
<b>1045 – 1115</b> <b>Coffee</b>			
MORNING PARALLEL SESSIONS	<b>INEC   Aviation integration</b> Main Auditorium A, Level 2 <i>Chair: Simon Knight FEng, Babcock International Group</i>	<b>INEC   Damage control and survivability part 2</b> Main Auditorium B, Level 3 <i>Chair: Cdre Peter Knipping RNLN</i>	<b>INEC   Real time control of power systems</b> Main Auditorium C, Level 3 <i>Chair: Roger Tooke, Rolls-Royce</i>
	<b>1115 – 1145</b> <b>The role of modelling and simulation in the preparations for flight trials aboard the Queen Elizabeth Class Aircraft Carriers</b> <i>Dr M F Kelly, N A Watson, Dr M D White, Prof I Owen, University of Liverpool, UK; Dr S J Hodge, BAE Systems, UK</i>	<b>Towards a novel design perspective for system vulnerability using a Markov chain</b> <i>Ir A C Habben Jansen, Dr A A Kana, Delft University of Technology, The Netherlands; Dr Ir E A E Duchateau, Defence Materiel Organisation, The Netherlands</i> <i>(Sir Donald Gosling Award Candidates)</i>	<b>T26 PMS – real time control of power generation, propulsion &amp; auxiliaries</b> <i>W Miners, H Arikkat, L3 MAPPS UK, UK</i> <i>(Sir Donald Gosling Award Candidates)</i>
<b>1145 – 1215</b> <b>Superstructure aerodynamics of the Type 26 Global Combat Ship</b> <i>R Mateer, Dr S A Scott, Prof I Owen, Dr M D White, University of Liverpool, UK</i>	<b>Impact of finch technology on damage control and survivability</b> <i>D Berenbaum, Dr R Sahie-Pour, L3 MAPPS UK, UK</i>	<b>Optimal control and real-time simulation of hybrid marine power plants</b> <i>Dr T Q Dinh, T M N Bui, J Marco, Warwick Manufacturing Group (WMG), UK; Dr C Watts, Babcock International Group, UK</i>	

## Welcome from the iSCSS Chairman

### Dear Delegate

I am honoured to chair this Symposium with its distinguished history of technical symposia spanning over 50 years and last organised in 2009. Together with a sub-committee of international control experts, we aim to bridge the gap between the shipbuilding industry, academia and research institutes not only for the naval sector but for the maritime sector as a whole.

The Symposium's theme is, *Revolutionary Technology Inspiring Ship Control*, and our aim is to inspire researchers, engineers, seafarers and others involved in future ship control to present their papers on innovative and emerging technologies and to actively stimulate debate across the maritime industry. We are particularly interested in attracting the new generation of professionals who have 'grown up' with these technologies and I am delighted that the Sir Donald Gosling Award will be extended to include iSCSS in 2018.

This Symposium represents an opportunity to influence future control strategies – I encourage you to be part of this movement to change the industry.

**Cdr Rinze Geertsma RNLN**  
MSc CEng  
MIMarEST



*Probably the highest academic level marine engineering conference in the world*

INEC Delegate

### iSCSS | System identification and simulation

Level 1 Auditorium, Level 1

Chair: *Dr Michele Martelli, University of Genoa*

**Energy efficient propulsion system for dynamic positioning application: Design and assessment**

*Dr A Coraddu, K Chu, University of Strathclyde, UK; Dr S Donnarumma, Prof M Figari, University of Genoa, Italy*

**Fingerprinting the ship propulsion system: Low hanging fruit or mission impossible?**

*Dr A Vrijdag, Y Sang, Delft University of Technology, The Netherlands*

**Submarine autopilot performance optimization with system identification**

*Dr F Belanger, Dr X Cyril, L3 MAPPS, Canada; D Millan, National Research Council, Canada*

### iSCSS | Safety

Level 1 Auditorium, Level 1

Chair: *Suthakar Pakianathan, Department of National Defence, Canada*

**Lessons learnt from IEC61508 software assessments**

*R H Campbell, C Allsopp, R M Phillips, Frazer-Nash Consultancy, UK (Sir Donald Gosling Award Candidates)*

**Three laws good: Technology is a dangerous master**

*Dr M J Cook, T Simpson, E Garrett, M Thody, BAE Systems (Maritime), UK*

Interactive sessions | 0900 - 1415

### Power and propulsion

Foyer, Level 3

*Chairs: Oliver Simmonds, BMT / Prof Dr Ir R G van de Ketterij, Royal Netherlands Naval Academy*

**Torsional Vibration Analysis by bondgraph modelling – a practical approach**

*Ing T Heeringa, Heeringa Engineering, The Netherlands*

**Optimising technique in matching combined diesel engine or gas turbine (CODOG) propulsion system to hull and propeller of a frigate**

*Prof K D H Bob-Manuel, B O Okim, Rivers State University, Nigeria*

**Study on intelligent speed control algorithm for diesel engine**

*Dr E Song, C Ma, G Zhao, Dr C Yao, Harbin Engineering University, China*

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## Wednesday 3 October 2018

MORNING PARALLEL SESSIONS	INEC   Aviation integration Main Auditorium A, Level 2 <i>Chair: Simon Knight FEng, Babcock International Group</i>	INEC   Damage control and survivability part 2 Main Auditorium B, Level 3 <i>Chair: Cdre Peter Knipping RNLN</i>	INEC   Real time control of power systems Main Auditorium C, Level 3 <i>Chair: Roger Tooke, Rolls-Royce</i>
1215 – 1245	<b>De-risking flight trials using airwake simulations</b> <i>Dr C M Ward, Frazer-Nash Consultancy, UK</i> <i>(Sir Donald Gosling Award Candidate)</i>	<b>Network-based metrics for assessment of naval distributed system architectures</b> <i>G Papatistodimou, A Duffy, P Knight, I Whitfield, University of Strathclyde, UK; M Robb, C Voong, BAE Systems Maritime - Naval Ships, UK</i>	<b>Application of machine learning and mathematical programming in the optimization of the energy management system for hybrid-electric vessels having cyclic operations</b> <i>N Mohammadzadeh, Politecnico di Milano, Italy; Dr F Baldi, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland; E J Boonen, DAMEN Shipyard, The Netherlands</i> <b>Presented by Dr A Coraddu, University of Strathclyde, UK</b>
1245 – 1300	Discussion		
1300 – 1415	Lunch		
AFTERNOON PARALLEL SESSIONS	INEC   Support part 1 Main Auditorium A, Level 2 <i>Chair: John Forbes, BAE Systems Maritime – Naval Ships</i>	INEC   Ship design: Safety and environmental Main Auditorium B, Level 3 <i>Chair: Rob Skarda, Steller Systems</i>	INEC   Energy management Main Auditorium C, Level 3 <i>Chair: Prof Campbell Booth, University of Strathclyde</i>
1415 – 1445	<b>Low-pressure cold metal spray coatings for repair and protection of marine components</b> <i>M Pal, BAE Systems Maritime Services, UK</i>	<b>Environmental modelling and simulation for naval ships</b> <i>Y Abbas, Babcock International Group, UK</i>	<b>Extended heterogeneous controller hardware-in-the-loop testbed for evaluating distributed controls</b> <i>Dr K Schoder, Dr M Stanovich, Dr T Vu, Prof C S Edrington, Dr M Steurer, Florida State University, USA</i>
1445 – 1515	<b>Condition based data trending to optimise maintenance on Sandown class propulsion system</b> <i>P Richardson, Babcock International Group, UK</i>	<b>The high capacity expanding lifeboat HiCEL – meeting the modern SAR challenge</b> <i>J R E Wright, Ministry of Defence, UK; G E Payne, Steller Systems Ltd, UK</i> <i>(Sir Donald Gosling Award Candidates)</i>	<b>New developments in energy management – battery lifetime incorporation and power consumption forecasting</b> <i>D Mitropoulou, RH Marine Netherlands BV, The Netherlands; L Elling, Netherlands Defence Academy/University of Bath, The Netherlands/UK</i> <i>(Sir Donald Gosling Award Candidates)</i>
1515 – 1545	<b>Automatic 3D design tool for fitted spools in shipbuilding industry</b> <i>F Uzcategui, UMI UDC-Navantia, Spain; J Vilar, A Brage, Dr H Moro, Navantia, Spain; Dr A Paz-Lopez, Mytech IA, Spain; A Mallo, Dr F Bellas, University of Coruña, Spain</i>	<b>Effective safety management – the tale of the engineer, safety manager and accountant</b> <i>Dr A Franks, P J James, Lloyd's Register EMEA, UK</i>	<b>Effects of varying ramp rate and amount of ES</b> <i>D Gonsoulin, G Ozkhan, B Papari, Prof C S Edrington, Florida State University, USA</i>
1545 – 1600	Discussion		
1600 – 1630	Tea		



## iSCSS | Safety

Level 1 Auditorium, Level 1

Chair: *Suthakar Pakianathan, Department of National Defence, Canada*

### Shipping safety into the naval industry

*A Labonté Jones, N Lerigo-Smith, L3 MAPPS UK, UK*

## iSCSS | Navigation

Level 1 Auditorium, Level 1

Chair: *Prof Carlos Guedes Soares, CENTEC, Portugal*

### A random sampling based algorithm for ship path planning with obstacles

*Dr R Zaccone, Dr M Martelli, Polytechnic School of Genoa University, Italy*

*(Sir Donald Gosling Award Candidates)*

### Assessment of wind heeling lever determined through CFD against the current naval stability standards

*J N Alderton, QinetiQ, UK*

*(Sir Donald Gosling Award Candidate)*

### Manoeuvring automation towards autonomous shipping

*Dr Ing A U Schubert, Dr Ing M Gluch, Prof Dr Ing O Simanski, University of Applied Sciences Wismar, Germany; Dipl Ing M Kurowski, Prof Dr Ing T Jeinsch, University of Rostock, Germany*

## INEC/iSCSS 2018 is supported by

### Supporting Organisations



### Media Partner



### Supporting



## Conference networking events

### Welcome Reception | Tuesday 2 October 2018

At the end of day one all participants are cordially invited to a Welcome Reception to be held in the exhibition area hosted by The City of Glasgow with special thanks to The Lord Provost and Glasgow City Council. This will give everyone an opportunity to visit the exhibition stands as well as enjoying drinks and canapés with colleagues, friends and new acquaintances.



### Conference Reception | Wednesday 3 October 2018

The Conference Reception will take place at The Riverside Museum on the evening of Wednesday 3 October 2018 and offers a special opportunity for all participants to visit this award-winning transport museum. With more than 3,000 objects on display, from skateboards to locomotives, paintings to prams, velocipedes to voitquettes, this new museum records Glasgow's important maritime history. This much-acclaimed development, designed by architect, Zaha Hadid has a riverside location where the River Clyde meets Glasgow's other main river, the Kelvin, and moored outside is the 19th-century sailing ship, Glasgow's Tall Ship, the Glenlee. Transportation to and from the Riverside Museum will be provided.

# CONFERENCE PROGRAMME (subject to amendment)

## Wednesday 3 October 2018

AFTERNOON PARALLEL SESSIONS	INEC   Support part 2 Main Auditorium A, Level 2 <i>Chair: John Forbes, BAE Systems Maritime – Naval Ships</i>	INEC   Safety Main Auditorium B, Level 3 <i>Chair: Keith Howard, Babcock International Group</i>
1630 – 1700	<b>An introduction to the Babcock designed super-dock blocks</b> <i>G Kerr, N Georgantzi, Babcock International Group, UK</i>	<b>“Having a blast” – assessment of compartment overpressure following an arc fault</b> <i>A Lane, BAE Systems Maritime Services, UK; P Worthington, Dr I Thompson, W Galloway, G Stark, BAE Systems Naval Ships, UK</i>
1700 – 1730	<b>Waterfront partnership – integration and cooperation in submarine repair</b> <i>Cdr A Bagga RCN, FMF Cape Breton, Canada; T J Dupuis, Seaspan Victoria Shipyards Ltd, Canada</i>	<b>Play it again Sam: Recurrent themes in interface development in safety critical systems for underwater platforms</b> <i>Dr M J Cook, Dr S Bury, T Simpson, M Thody, D Garrett, BAE Systems Submarines, UK</i>
1730 – 1800	<b>Discussion</b>	
1830	<b>Transportation to The Riverside Museum</b>	
1900 – 2100	<b>Conference Reception, The Riverside Museum</b>	

## Principal Sponsor profile

### L3 MAPPS | Principal Sponsor

Is a leading global supplier of integrated ship machinery monitoring and control systems, IPMS, and simulation & training solutions for warships and submarines. Training solutions include land-based and on-board simulators as well as turnkey long term training services. The business has been a pioneer in the integration of naval shipboard control systems and navigation products with an installed base of 229 ships for 22 navies around the world. L3 MAPPS also provides reactor control systems, safety shutdown systems and high fidelity training simulators for nuclear power plants; and real-time simulators for robotic systems and satellites to support simulation-based design and operations/maintenance training for the space industry. L3 Technologies offers a wider range of naval products and services including turnkey single source vendor platform systems, hybrid electric drive solutions, electrical distribution equipment, shipboard communication systems, and more.

Visit: [www.mapps.l3t.com](http://www.mapps.l3t.com)



**MAPPS**

## STEM Day

### Wednesday 3 October 2018

INEC/iSCSS 2018 will host up to 40 school students aged 10-18 years old from four local schools on Wednesday 3 October when a STEM Day is staged as the event's contribution to the UK's Year of Engineering 2018. As Captain Matt Bolton explains "STEM is what drives the Royal Navy – whether it is the mathematics used to design our ships and submarines, the engineering expertise to keep them running and at sea, the science that underpins the awesome range of capabilities, or the advanced technology which

## iSCSS | Human factors

Level 1 Auditorium, Level 1

Chair: Lt Cdr Frans Geertsma RNLN, Defence Materiel Organisation

### Enabling lean manning through automation

J Chilcott, N Kennedy, L3 MAPPS UK, UK

### Lighting future naval ships – mission optimized and human centric

Dr G G Langer, thyssenkrupp Marine Systems GmbH, Germany; N T Launert, LINKSrechts GmbH, Germany

makes the Royal Navy one of the foremost navies in the world – all of it relies on a detailed knowledge of STEM subjects. During the Year of Engineering, Royal Navy STEM teams have engaged with thousands of students and teachers, highlighting the importance of engineering in our world today and we're certainly looking forward to meeting all the school students." The students will visit the exhibition during sessions throughout the day and will be hosted by the Royal Navy.

## Further information

### INEC 2018 Technical Advisory Committee

Chairman: Capt Matt Bolton RN, Ministry of Defence, UK | Dr Sal Ahmed, US Office of Naval Research Global, UK | Jens Ballé, thyssenkrupp Marine Systems GmbH, Germany | Lt Amy Bolland RN, Ministry of Defence, UK | Prof Campbell Booth, University of Strathclyde, UK | Lt Cdr Alex Davies RN, Ministry of Defence, UK | Peter Deverill, Ministry of Defence, UK | John Forbes, BAE Systems Maritime - Naval Ships, UK | Cdr Rinze Geertsma RNLN, Defence Materiel Organisation, The Netherlands | Ian Grant, QinetiQ, UK | Prof Alistair Greig, University College London, UK | Cdr Ian Hassall RN, Ministry of Defence, UK | Keith Howard, Babcock International Group, UK | Paul Karas, UK | Paul Maillardet, UK | Dr Phil Rottier, The MathWorks, UK | Oliver Simmonds, BMT Defence & Security (UK) Ltd, UK | Rob Skarda, Steller Systems, UK | Glen Sturtevant, United States Department of Navy, USA | Benjamin Thorp, Rolls-Royce, UK

### iSCSS 2018 Technical Advisory sub-Committee

Chairman: Cdr Rinze Geertsma RNLN, Defence Materiel Organisation, The Netherlands | Jeffrey Cohen, US Navy Surface Warfare Center, USA | Toby Drywood, BMT Defence & Security (UK) Ltd, UK | Prof Carlos Guedes Soares, Centre for Marine Technology and Ocean Engineering (CENTEC), Portugal | Dr Michele Martelli, University of Genoa, Italy | Suthakar Pakianathan, Department of National Defence, Canada | Rear Admiral ME (ret) Klaas Visser, Delft University of Technology | Dr David Alan Wetz Jr., University of Texas, USA | Dr Mehdi Zadeh, NTNU Marine Technology, Norway

### INEC/iSCSS 2018 Patrons

The Patrons are eminent figures within the defence industry who promote the values of INEC and iSCSS and give support and counsel to the Technical Advisory Committees.

Rear Admiral Nigel Guild CB FREng | Vice Admiral Sir Robert Hill KBE FREng HonFIMarEST | Sarah Kenny, Chief Executive, BMT | Commodore John Newell MBE RN (Rtd) | Professor Catriona Savage, University College London | Rear Admiral (ret) Ruurd Lutje Schipholt KNL OON HonFIMarEST | Professor ir Douwe Stapersma, Delft University of Technology | Vice-Admiral Dr ir Arie Jan de Waard, Director, Defence Materiel Organisation, The Netherlands

### Sir Donald Gosling Award

The IMarEST is delighted that Sir Donald Gosling has, once again, given his patronage of the Sir Donald Gosling Award to be presented at INEC/iSCSS 2018. Sir Donald has long been a strong supporter of the Royal Navy and his award, for authors aged 35 or under, aims to encourage involvement and attendance from younger participants from the military, industry and academia, allowing them to demonstrate a fresh and imaginative approach together with ingenuity, in delivering a practical proposal which contributes to improved future naval operations and support. The award ceremony will take place on the final day; there will be three prizes, a first prize of £5,000; a second prize of £2,500, and a third prize of £1,500.

# CONFERENCE PROGRAMME (subject to amendment)

## Thursday 4 October 2018

0800 – 0900 Registration and coffee

MORNING PARALLEL SESSIONS	INEC   Digital transformation part 1 Main Auditorium A, Level 2 <i>Chair: Ian Grant, QinetiQ</i>	INEC   Electric and hybrid Main Auditorium B, Level 3 <i>Chair: Oliver Simmonds, BMT</i>	INEC   Environmental compliance Main Auditorium C, Level 3 <i>Chair: Lt Amy Bolland RN, Ministry of Defence, UK</i>
0900 – 0930	<b>Enabling, equipping and empowering the support enterprise through digital transformation</b> <i>S N Waterworth, Lt Cdr R J McClurg RN, Capt M T W Bolton RN, Ministry of Defence, UK</i>	<b>General purpose frigate low-speed electric drive – when does it make sense?</b> <i>S M Newman, O J Simmonds, BMT Defence &amp; Security Ltd, UK</i>	<b>Instead of simply asking "what?", naval engineers need to ask "why?": Environmental compliance challenges and relevance in warship design</b> <i>J F Polglaze, PGM Environment, Australia</i>
0930 – 1000	<b>Turning data into reality</b> <i>S Leinster-Evans, BAE Systems, UK; S Luck, BMT, UK; J Newell MBE, Juno Fleet Services Ltd, UK</i>	<b>Towards the holy grail? A novel power dense, low noise permanent magnet motor</b> <i>B Salter, C Lewis, GE Power Conversion, UK</i>	<b>Marine dual fuel engine control system modelling and safety implications analysis</b> <i>Dr G Theotokatos, S Stoumpos, V Bolbot, E Boulougouris, Prof D Vassalos, University of Strathclyde, UK</i>
1000 – 1030		<b>Naval hybrid power take-off and power take-in – lessons learnt and future advances</b> <i>Dr M Benatmane, B Salter, GE Power Conversion, UK</i>	<b>Emissions reduction at The Netherlands Ministry of Defence: Potential, possibilities and impact</b> <i>Prof Dr Ir R G van de Ketterij, Netherlands Defence Academy, The Netherlands</i>
1030 – 1045	Discussion		
1045 – 1115	Coffee		
MORNING PARALLEL SESSIONS	INEC   Digital transformation part 2 Main Auditorium A, Level 2 <i>Chair: Ian Grant, QinetiQ</i>	INEC   UXV Main Auditorium B, Level 3 <i>Chair: Frank Mungo, Egeria Consulting Ltd</i>	INEC   QEC Class Main Auditorium C, Level 3 <i>Chair: Lt Cdr Alex Davies RN, Ministry of Defence, UK</i>
1115 – 1145	<b>An investigation into contracted loaded tip propellers using Computational Fluid Dynamics (CFD)</b> <i>N R J Williams, Southampton University, UK (Sir Donald Gosling Award Candidate)</i>	<b>Securing interoperable and integrated command and control of unmanned systems – building on the successes of Unmanned Warrior</b> <i>Dr P Smith, Dstl, UK; W Biggs, QinetiQ, UK</i>	<b>Capable, adaptable, flexible: The design of a cost-effective naval platform with focus on the increasing use of off-board assets</b> <i>R Irvine, Babcock International Group, UK</i>
1145 – 1215	<b>Digitally empowering naval fleet support</b> <i>C Rowley, Dr G Ford, Babcock International Group, UK</i>	<b>JIP LAURA, ensuring future flexible off board capability in todays and tomorrows surface combatants</b> <i>Dr M Robb, D Lewis, A Burgess, BAE Systems Maritime - Naval Ships, UK; D Smith, Naval Design Partnering Team, UK; Ir E H Takken, Defence Materiel Organisation, The Netherlands; Dr Ing F G J Kremer, Maritime Research Institute Netherlands (MARIN), The Netherlands</i>	<b>HMS Queen Elizabeth Aircraft Carrier: The challenges and successes of commissioning, trialling and delivering an integrated full electric power and propulsion system</b> <i>P A Eaton, GE Power Conversion, UK; D Webster, Thales, UK</i>



## iSCSS | Power conversion

Level 1 Auditorium, Level 1

Chair: *Dr David Wetz Jr, University of Texas*

### Sequence based control for electro-thermal management of next generation integrated power systems

*Dr T V Vu, Clarkson University, USA; Dr F Diaz, Corhuila University Corporation of Huila, USA; Prof C S Edrington, Florida State University, USA*

### Fast coordination of power electronic converters for energy routing in shipboard power systems

*Dr H L Ginn III, J D Bakos, A Benigni, University of South Carolina, USA*

### Exergy analysis of ship power systems

*Prof G G Parker, E H Trinklein, R D Robinett III, Michigan Technological University, USA; Dr T J McCoy, McCoy Consulting LLC, USA*

## iSCSS | Human factors

Level 1 Auditorium, Level 1

Chair: *Toby Drywood, BMT*

### QEC IPMS the technical challenge

*J K McKelvie, P Lakey, L3 MAPPS UK, UK*

### No process for initiative

*CPO G J Parkes, 1710 Naval Air Squadron, Royal Navy, UK*

## Further information continued

### Venue

INEC/iSCSS 2018 will be held at the Technology & Innovation Centre (TIC), University of Strathclyde, 99 George Street, Glasgow G1 1RD, UK.

### Dress code

Navy personnel are encouraged to wear uniform particularly on day one and day three of the conference; for the networking programme and at all other times lounge/business suit is acceptable. The Royal Navy dress code is: No 1 uniform, negative medals.

### Continuing Professional Development (CPD)

All delegates will be sent a CPD certificate after the event.

### Complimentary IMarEST Membership

All non-member participants will be made IMarEST Affiliate Members for one calendar year, giving instant access to Institute services; full details can be found at [www.imarest.org](http://www.imarest.org).

### Network with us and join the INEC/iSCSS debate



Follow INEC/iSCSS 2018 on Twitter @Naval\_IMarEST



Join the debate on the IMarEST LinkedIn group

## IMarEST Journal Workshops



Taylor & Francis, the Institute's publisher of its journals will be presenting two workshops during INEC/iSCSS 2018. If you are interested in becoming a reviewer or understanding more about how to get published, join one of the workshops taking place in the exhibition area on Level 2, or call by for an informal discussion with IMarEST. Workshops will last approximately 30 minutes and will be repeated during the following times subject to demand.

**Presenter:** Shelley Allen, Taylor & Francis

**Location:** Level 2 Foyer

### How to get published: Understanding research and publishing

Wednesday 3 October: 1445 - 1630 hours

Thursday 4 October: 0800 - 1115 hours

### How to become an effective reviewer

Wednesday 3 October: 1630 – 1830 hours

Thursday 4 October: 1115 – 1415 hours

Taylor & Francis publish IMarEST's Journal of Marine Engineering and Technology (JMET) and the Journal of Operational Oceanography (JOO).

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1215 – 1245	<b>Digital – benefits for naval platforms</b> <i>D R Chaderton, GE Power Conversion, UK</i>	<b>Generational shift: How technology is shaping a step change in the future of mine counter-measures</b> <i>J C Rigby, J Johnson, BMT, UK; J McWilliams, QinetiQ, UK</i>	<b>Learning lessons to de-risk future complex projects: Design and integration of the world's largest ship platform management system Queen Elizabeth Class Aircraft Carriers</b> <i>M Williams, Thales, UK</i>
1245 – 1300	<b>Discussion</b>		
1300 – 1415	<b>Lunch</b>		
<b>CLOSING PLENARY SESSION   SHIP DESIGN FUTURE CONCEPTS   Main Auditorium</b>			
<i>Chair: Cdr Rinze Geertsma RNLN, Chairman, iSCSS 2018</i>			
1415 – 1445	<b>Nonlinear power flow control design methodology for navy electric ship microgrid energy storage requirements</b> <i>Dr D G Wilson, Dr S F Glover, M A Cook, Sandia National Laboratories, USA; Dr W W Weaver, Dr R D Robinett III, Michigan Technological University, USA; J Young, OptimoJoe, LLC, USA; S Markle, NAVSEA, USA; Dr T J McCoy, McCoy Consulting, LLC, USA</i>		
1445 – 1515	<b>Integration of battle damage repair management in an Integrated Mission Management System</b> <i>Lt Cdr F D Geertsma RNLN, Defence Materiel Organisation, The Netherlands</i>		
1515 – 1545	<b>Combat safety and survivability – Combining survivability and safety techniques to address crew safety in combat</b> <i>D Manley, Ministry of Defence, UK</i>		
1545 – 1600	<b>Discussion</b>		
1600 – 1615	<b>Closing Summary   Rear Admiral Nigel Guild CB FREng</b>		
1615 – 1625	<b>Presentation of the Sir Donald Gosling Award</b>		
1625 – 1630	<b>Closing Remarks   Capt Matt Bolton RN, Chairman, INEC 2018</b>		
1630	<b>Close of Conference</b>		

## Closing Summary

### Rear Admiral Nigel Guild CB FREng

Nigel Guild is a Past President of IMarEST and has been a Patron of INEC since 2016. He stood down as Chairman of the Board of Trustees of the Engineering Council in 2017 after 6 successful years. He is also a Fellow of the Royal Academy of Engineering. Following a career in the Royal Navy spanning more than 40 years, Rear Admiral Guild retired in 2009. His naval career began in 1966 and he read engineering at Trinity College, Cambridge. A Weapon Engineer Officer, he served at sea in HM Ships HERMES, EURYALUS and HMS BEAVER and on the staff of Flag Officer Sea Training. His shore appointments were mainly in the Procurement Executive, culminating in service on the Admiralty Board as Controller of the Navy. Rear Admiral Guild's final appointment was as Senior Responsible Owner for Carrier Strike, in the Ministry of Defence. At the same time, he also held the post of Chief Naval Engineer Officer. Nigel is also a huge supporter of the Institute's Learned Society events as well as INEC, he is closely involved in the EAAW Symposia series.



iSCSS | Human factors  
Level 1 Auditorium, Level 1  
Chair: Toby Drywood, BMT

Button it: Managing human factors requirement more effectively in expressed designs  
Dr M J Cook, T Simpson, BAE Systems Submarines, UK

## Photography

The highlights of INEC/ iSCSS 2018 will be captured in a highlights video and photographs; these will be displayed on the INEC website following the conference.

## Contact details

+ 44 (0)7766 462947  
+ 44 (0)7766 462765

@ inec@figsevents.co.uk

www.inec.org.uk

## Major Sponsors' profiles

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- Or simply interested in all things marine and maritime...

