NATO OTAN
NURC
a NATO Research Centre
un Centre de Recherche de l'OTAN
NURC
PARTNERING FOR MARITIME INNOVATION

Memorandum Report **NURC-MR-2011-002**

Waterside Security 2010 (WSS2010) Conference: post conference report

Ronald Kessel and Manell Zakharia

February 2011

About NURC

Our vision

- To conduct maritime research and develop products in support of NATO's maritime operational and transformational requirements.
- To be the first port of call for NATO's maritime research needs through our own expertise, particularly in the undersea domain, and that of our many partners in research and technology.

One of three research and technology organisations in NATO, NURC conducts maritime research in support of NATO's operational and transformation requirements. Reporting to the Supreme Allied Commander, Transformation and under the guidance of the NATO Conference of National Armaments Directors and the NATO Military Committee, our focus is on the undersea domain and on solutions to maritime security problems.

The Scientific Committee of National Representatives, membership of which is open to all NATO nations, provides scientific guidance to NURC and the Supreme Allied Commander Transformation.

NURC is funded through NATO common funds and respond explicitly to NATO's common requirements. Our plans and operations are extensively and regularly reviewed by outside bodies including peer review of the science and technology, independent national expert oversight, review of proposed deliverables by military user authorities, and independent business process certification.

NURC-MR-2011-002

Waterside Security 2010 (WSS2010) Conference: Post Conference Report

Ronald Kessel and Manell Zakharia

This document, which describes work performed under Project NLRPP (Non-Lethal Response Technologies for Port Protection) of the NURC Scientific Programme of Work, has been approved by the Director.

Intentionally blank page

NURC-MR-2011-002

Waterside Security 2010 (WSS2010) Conference: Post Conference Report

Ronald Kessel and Manell Zakharia

Executive Summary: NURC conducts research on technologies for military force protection in ports and harbours (the MFPPH project), for maritime situation awareness (MSA project), and for civilian port and ship security (SECTRONIC project and Counter Piracy project). One common goal of these projects is to foster the community of maritime security experts, in order to capitalize on shared expertise and to develop collaborative relationships. This can be done in part by supporting and hosting relevant conferences and workshops.

Among the conferences was the 1st International Waterside Security Conference (WSS2008, August 2008, Technical University of Denmark, Copenhagen), in which NURC featured notably among the conference sponsors, participated significantly with contributed papers, and led several scenario-based workshops. NURC then offered to host the 2nd in the new conference series, called WSS2010. The objective was to bring together experts from a variety of disciplines and backgrounds who have a common interest in preventing terrorist attacks and criminal activity in ports, harbours, coastal waters, and inland waters. The conference was held 3-5 November 2010, in Marina di Carrara, Italy.

The local organizing committee for WSS2010 was made up of selected NURC staff members and contractors hired for support. The technical panel responsible for setting the conference programme and for soliciting and reviewing papers was an international panel made up of experts from NATO and non-NATO nations. WSS2010 was hosted by NURC without financial profit. It was an international conference, not a NATO event.

This report gives a summary of the WSS2010 conference to give an overview of its planning panels, demographics, topics, sponsors, workshops, and so forth, for information to it sponsors and for parties involved in future conferences, such as WSS2012 currently planned for Singapore, hosted by the Singapore Defence Research and Technology Office.

Intentionally blank page

Waterside Security 2010 (WSS2010) Conference: Post Conference Report

Ronald Kessel and Manell Zakharia

Abstract: The 2nd International Conference on Waterside Security was hosted by NURC, Carrara, Italy, 3-5 November 2010. This report provides summary statistics of the conference, a summary of the workshops, remarks form the WSS2010 Chairman (Ronald Kessel), and acknowledges key contributors.

Keywords: WSS2010, waterside security, port protection, counter piracy, maritime security

Table of Contents

Background

WSS2010 is the 2nd International Waterside Security Conference. The first was WSS2008 hosted by the Technical University of Denmark, Copenhagen, Aug 2008, chaired by Prof. Leif Bjørnø. NURC led the workshop sessions at WSS2008. It was announced at WSS2008 by D-NURC, Dr. Martin-Lauzer, that NURC would host the next conference in Italy, in 2010. WSS2010 was held 3-5 Nov 2010, in Carrara, Carrara Congressi, Italy.

NURC was lead sponsor for WSS2010. NURC struck the WSS2010 technical committee to assist with programme content, and a local organizing committee to manage conference logistics.

Objectives

The objective was to bring together experts from a variety of disciplines and backgrounds who have a common interest in preventing terrorist attacks and criminal activity in ports, harbours, coastal waters, and inland waters. Specifically, the conference goals were to:

1. To advance new maritime technologies in:
   - Port protection
   - Counter-piracy
   - Counter-terrorism
   - Protection of critical infrastructure
   - Protection of high-profile events
   - Small boat monitoring and stopping
   - Protection of ships and energy platforms
   - Prevention of underwater intruders
   - Maritime interdiction, maritime surveillance, and information sharing

2. Stimulate multi-disciplinary thinking on:
   - Quantitative threat analyses
   - Communication of risk
   - Cost-benefit analyses
   - Quality and effectiveness metrics
   - Best practices
   - Table-top exercises
   - Integrated systems and their evaluation
   - Policy
   - Recommended way ahead

WSS2010 Topics and Participation

SESSION	#
SURVEILLANCE SENSORS	16
INTEGRATED SYSTEM	15
NON LETHAL RESPONSE	8
CONCEPTS	7
SENSOR PROCESSING	7
THREATS AND RISKS	6
UNMANNED VEHICLES	6
FUSION	4
SPECIAL SESSION ENVIRONMENTAL	4
DISTRIBUTED SYSTEMS	3
GAMING AND PLANNING	3
NETWORKED SYSTEMS	3
INTERAGENCY COOPERATION	2
TOTAL	**84**

Table 1: WSS2010 presentations by topics. Most of the authors (72) have provided a full paper. All the papers were included in the Conference CD that was distributed to participants on arrival. They will also be available on IEEE Explore for reference.

COUNTRY	#	COUNTRY	#
AUSTRALIA	1	POLAND	1
BELGIUM	2	PORTUGAL	3
CANADA	8	SINGAPORE	8
DENMARK	2	SOUTH AFRICA	2
FRANCE	3	SPAIN	1
GERMANY	9	SWEDEN	5
INDIA	2	TURKEY	3
ITALY	40	UK	10
JAPAN	2	UKRAINE	1
NETHERLAND	5	USA	40
NORWAY	5	**TOTAL**	153

Table 2: WSS2010 participation by nation. A total number of 153 persons from 21 countries have participated to WSS2010 including 29 persons from the NURC.

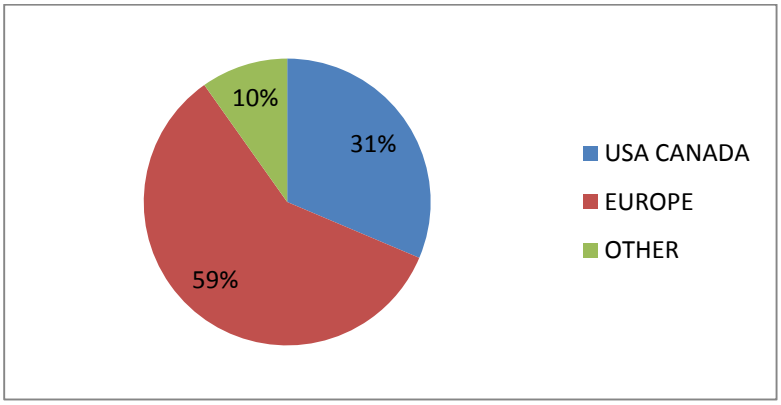

Figure 1: WSS2010 participation by Continent

Keynote addresses

Three keynote addresses were presented, one each day:

- *Reducing Vulnerability Through Multi-National Collaboration* by Commander SG Stein Olav Hagalid Royal Norwegian Navy, Director NATO Shipping centre
- *Singapore's Approach to S&T for Maritime Infrastructure Protection* by George Loh, Director, Defense Research and Technology Office, Singapore
- *Looking into the future of maritime security*, by Rear Admiral Chris Parry CBE

Sponsors

NURC was honoured to join with others sponsoring WSS2010.

Organizing and lead sponsor
- NATO Undersea Research Centre (NURC)

Silver Sponsors:
- Norwegian Ministry of Defence
- (ONR Global) Office of Naval Research Global
- ECA Group

Sponsors:
- Atlas Electronik
- DTC Conferences
- Sonardyne
- SECTRONIC
- Kongsberg

Technical Co Sponsors:
- IEEE/OES, Ocean Engineering Society

Figure 2: Front (upper) and back (lower) of WSS2010 “postcard” distributed early to advertise the conference.

WSS2010 Local Organizing Committee

- Prof. Leif Bjørnø (DEN, Honorary Chair)
- Ronald Kessel (NURC, Chair)
- Stein Hole (NURC, Secretary)
- Tom Pastore (NURC)
- Manell Zakharia (NURC)
- Chris Strode (NURC)
- Lillian Gassie (NURC)
- Capt. Valter Maggiani (ITA Navy)
- Hazel Stavely (Almondhill Management)

WSS2010 Technical Committee

Prof. Leif Bjørnø	Technical University of Denmark	Denmark
Dr. Ronald Kessel	NURC	NATO
Fivos Andritsos	European Commission Joint Research Centre	Italy
Prof. Akira Asada	University of Tokyo	Japan
Prof. David Bradley	Applied Research Laborattory / Pennsylvania State University	USA
Sergio M. Carbone	University of Genova	Italy
Dr. D.Vance Crowe	Defence Research and Development Canada - Atlantic	Canada
Mr. Kirk Jenne	Defense Research and Engineering Laboratories Office	USA
Dr. Nick Langhorne	Office of Naval Research Global, London	UK
Ron Lennartson	Swedish Defence Research Agency, FOI	Sweden
Professor Qihu Li	Institute of Acoustics, Chinese Academy of Sciences	China
George Loh	Defence Research and Technology Office	Singapore
Thomas Meurling	RESON	Sweden
Dr. Tom Neighbors	SAIC	USA
Richard Olsen	Norwegian Defence Research Establishment (FFI)	Norway
Mr. Thomas Pastore	NURC	NATO
Eric Pouliquen	Allied Command Transformation	NATO
Dr. Julie Pullen	Stevens Institute of Technology	USA
Prof. Andrzej Rucinski	University of New Hampshire	USA
Prof. Andrzej Stepnowski	Gdansk University of Technology	Poland
Mr. Chris Strode	NURC	NATO
Dip.-Ing. Josef Traxl	Bundeswehr Technical Centre for Ships and Naval Weapons, Maritime Research and Technology – WTD 71	Germany
Dr. Giancarlo Vettori	NURC (Retired)	Italy
Brian Cranmar	Head of International Security Compliance Services Maritime & Underwater Security Consultants	Malta
Mark Hallett	Maritime Operations Div., DSTO	Australia

Table 3: WSS2010 Technical Committee.
Prof Leif Bjørnø was Honorary Chair. Ronald Kessel was Chair.

WSS2010 Workshops

Six workshops were held on the second and third days, on the following topics

- IEDs – Their Potential Threat to Waterside Security
- Risks, liabilities and benefits in waterside security – balancing ends ways and means
- Response measures for waterside security
- Data Fusion for Waterside Security
- AIS for waterside security
- Passive vs Active diver detection systems

WORKSHOP 1: IEDs – Their Potential Threat to Waterside Security

Moderator : Nick Langhorn

Rapporteur: Manell Zakharia

Description: In the current age of asymmetrical warfare and terrorist activities the use of IEDs poses a significant threat to waterside security. Potential threats include the deployment of IEDs in port approaches, at berthing facilities and attached to vessels' hulls. This workshop is designed to bring together delegates with expertise and wide ranging experience to discuss the different aspects of the potential threat. Free ranging debate will be encouraged in order to assess the risks, address capability shortfalls and develop international collaboration to seek solutions.

Discussion Summary: IEDs in ports, berthing facilities, under piers, and attached to ship hulls can be a significant threat to waterside security. Delegates pointed out that vulnerability to underwater IEDs in shallow maritime environments is high and IEDs are relatively cheap, making waterside assets attractive to attackers. As with bomb-scares generally, moreover, even hoaxes about underwater IEDs could result in significant closures and therefore call for effective action. Preventative response consists of strictly enforced exclusion zones and close inspection of the underwater domain. This response must be scalable from small to large areas. Need was expressed for cross-disciplinary work in technologies and method for search, identification, and neutralization.

WORKSHOP 2: Risks, liabilities and benefits in waterside security - balancing ends, ways and means

Moderator: Rear Admiral Chris Parry

Rapporteur: Ronald Kessel

Description: making the case for new security technologies, metrics and measures of effectiveness, key elements of cost-benefit

Discussion Summary: The business case for new security technologies requires metrics and measures of effectiveness that could feature in cost-benefit studies beyond the usual risk analyses. Delegates noted the important role of deterrence and the difficulty of including it in a cost-benefit study. Beyond deterrence are the detection and defeat of a waterside attack, which may require extension of the maritime boarder outward in layered defence, for a comprehensive coastal approach extending to maritime border security more generally. Some warned of a lack of imagination in security planners (expect the unexpected), and called for more "red-team" gaming. The response to an attack as it unfolds must be rapid and rapidly adaptive to unexpected and unfamiliar modes of attack. Need was expressed for electronic hardening of communications and sensor networks, which are also vulnerable during an attack.

WORKSHOP 3: Response measures for waterside security

Moderator : Mark Hankey

Rapporteur: Chris Strode

Description: Discussions between response technology experts, and those familiar with the practicalities of employment in waterside scenarios, will seek to answer the following questions: What are the minimum requirements, in terms of range and effect, for a response against small surface contacts in ports and at sea? What are the relative advantages of less-lethal and lethal response mechanisms? What tactics could be employed within a layered and proportional response package?

Discussion Summary: The following questions were posed: What are the minimum requirements, in terms of range and effect, for a response against small surface contacts in ports and at sea? What are the relative advantages of less-lethal and lethal response mechanisms? What tactics could be employed within a layered and proportional response package? In discussions it came out that the high visibility of lethal response bodes well for deterrence. Constant high readiness is required in any case, lethal or non-lethal. Some warned against apparent apathy about response because it falls in some other group's or agency's mandate. One's capacity to respond is a significant determining factor in the design of a security system. Response measures furthermore need to be scalable in time, effort, and coverage. They must be lawful (proportionate) and responsible (keep human in the loop). Rapid and effective response also requires layering and good system integration.

WORKSHOP 4: Data Fusion for Waterside Security

Moderator : Tom Pastore

Rapporteur: Leif Bjørnø

Description: Sensor density and percentage overlap play important roles in defining the fusion system. This one-hour workshop aims to bring together expertise from among the participants at the WSS2010 conference to examine the issues, with particular attention to the full spectrum of realistic sensor density. In the approaches or outer harbour, overlapping coverage may occur in only a small fraction of the available area. In areas of dense traffic and many competing sensors, on the other hand, system designers may find themselves on the other end of the need-to-know / need-to-share spectrum.

Discussion Summary: Sensor density and coverage overlap play important roles in defining the fusion system. In the approaches or outer harbour, coverage overlap may occur in only a small fraction of the available area. In areas of dense traffic and many competing sensors, on the other hand, system designers may find themselves on the other end of the need-to-know / need-to-share spectrum. A comprehensive approach to fusion across air, surface, water column, and seabed was considered, with seamless application envisioned for, say, an object falling from the sky, spending time in each domain. Work on the semantics of fusion, sensor fusion, and information fusion was identified as a route

to situation understanding. The role of response actions in shaping constructive data fusion was noted, within the longstanding orient-observe-decide-act (OODA) loop and effects-based operations. Information quality assurance and resistance to spoofing were cited as requirements. The challenges of sharing information between agencies, owing to culture or legislative barriers, were also noted.

WORKSHOP 5: AIS for Waterside Security

Moderator : Torkild Eriksen

Rapporteur: TBD

Desciption: This workshop will cover issues relating to the use of the AIS system within a waterside security context. Questions to address will include:

- The reliability and accuracy of AIS messages used for detection and tracking purposes - noting that errors may occur both accidentally and intentionally.
- Requirements for satellite based AIS data.
- The fusion of AIS data with additional sensor contacts for better identification of anomalous behaviour.

Discussion Summary: Issues relating to the use of the Automatic Identification System (AIS) for ships in waterside security were discussed. The issues cited were those generally encountered when using AIS for maritime security: 1.) information ought to be protected from unfair commercial exploitation 2.) over time AIS provides a valuable dataset of patterns of activity 3.) the AIS standard is entrenched and difficult to improve where security is concerned.

WORKSHOP 6: Passive vs Active diver detection systems

Moderator: M Zakharia

Rapporteur: Ronald Kessel

Description: A common approach for diver detection was inspired and adapted from mine counter-measurements or obstacle avoidance systems: multi-beam survey sonar + post-processing for tracking and reducing the false alarm rate. A major effort has been put on multiple divers' detection, tracking and / pursuit. More recent approaches have been developed that used either acoustic or magnetic passive sensing. The workshop will discuss the benefits and limitations of both techniques in terms of range, detection probability and false alarms, tracking and pursuit. The workshop will try to summarize the merit of both approaches and their complementarities.

Discussion Summary: Both passive and active sonars were discussed by presenters at WSS2010. The workshop explored the advantages and disadvantages of each in terms of overall coverage, system costs, false alarms, and ability to track. The need to respond against intruders places a premium on capability for intruder tracking, at which active sonar systems excel relative to passive, although promising experimental results were shown for passive. Passive systems seem to be less expensive, but have less coverage in noisy environments. A cost-benefit study still needs to be done, including through-life costs. Active sonar systems may face deployment restrictions in some ports. It was argued that both technologies, active and passive, are complementary in many ways and ought to be combined.

Special session: environmental impacts on sensor performance

Chaired by Julie Pullen, Stevens Institute (USA)

In addition to the workshops there was a special session assessing the environmental impacts on sensor performance. In the oceans and rivers, acoustic sensing of intruders can be degraded by temporal and spatial salinity and temperature variations, wave state, bathymetry, harbor geometry, pier structures, and background noise. Contributions to this session quantified environmental variability in harbors throughout the world. The effects of this variability on sensor performance can be predicted and even partially mitigated by technological innovations. One sonar developer (Sonardyne) explained how they address environmental complexity by giving security providers a range measurement or “performance indicator” projected from local conditions. The topic of environmental impact on sensor performance will remain an important one as suites of sensors and sensor networks expand to cover diverse landscapes and ocean regions and encounter unique and variable operating conditions. Sensors that anticipate ocean and atmosphere changes and cue each other to turn on or off would represent a valuable technological advance.

Remarks from the Chairman

Foremost among the drivers of security are of course the current and emerging threats. Much was said at WSS2010 about the threats and the waterside vulnerabilities to them. In the face of emerging threats, however, it is generally recognized that the technical security measures implemented at the point of impact of a threat—namely, the surveillance and response measures applied during the moments of attack or entry, which characterize much of waterside security—are at best only partial solutions.

As pointed out at WSS2010, for instance, the solution for piracy lies more in nation building in collapsed states than in capturing pirates in the act on the high seas; the solution to terrorism lies more in intelligence gathering than in the stopping force during the moments of attack; the solution to human trafficking lies more in alleviating countries from destitution and civil strife than from capturing boatloads of people along the coast. There are perhaps no threats whose technical countermeasures could not be replaced more satisfactorily by a sociopolitical solution by governments. The political will and consensus for these may be lacking, but they are nevertheless a turn in the road that one

might and avoid the burden of more technical countermeasures at the point of attack or entry. This has a “capping” effect for technological approaches.

Take counter piracy operations for instance. In 2008 the overall effectiveness and cost of policing the International Recognized Transit Corridor (IRTC) happened to fall within the scope of what navies were willing to undertake. In the long term, however, if the costs of policing are high and the effectiveness at stopping piracy is debatable, then the option of entering and stabilizing Somalia or of somehow wiping out the coastal bases where pirates operate (as some have suggested) begin to look more attractive. I believe that we are, rightly, still far from tipping the scales in that direction, but the fact that admittedly speculative alternatives to at-sea policing exist means that the level of effort that one is willing to expend for policing actions is capped. In the discussion about technological measures for countering piracy, and aiming as programme managers must aim, for the consensus that a large capital investments require, it is usual for someone around the table to impatiently conclude that all this business about new technologies could be avoided once and for all by simply doing X, Y, and Z on the shores of Somalia, as if the outcome of a high-level cost-benefit analysis was finally settled. Much the same “capping” effect occurs, but to a lesser extent, with other maritime issues like irregular immigration, port security, and counter terrorism—*lesser* in these cases because their non-technical solutions appear more complicated and less obvious than piracy.

The point to be made is not that the sociopolitical options ought to be avoided in the technological forum, but rather the opposite. Whenever it comes to the transition of new technology into security operations, the force sociopolitical options and the context they provide *cannot* be avoided. It is absolutely necessary to take them into account, expertly and without over simplification, when charting a course toward real-world technological measures for threat reduction.

At the waterside, the security provider’s mandate, as defined in regulations and legislation, constitutes bounds of technological possibility no less than the laws of physics or economics do. Technology can influence that solution space, much as the development of AIS transponders for vessel collision avoidance influenced the IMO SOLAS convention to institute AIS carriage requirements for large vessels, but it never succeeds independently in it. The success of AIS functionality, for instance, meant nothing for improved safety and security until nations and the IMO mandated its use, apparently in record time owing to intense pressure from some governments. Still greater security might result with the extension of AIS carriage requirements to include smaller ships. The technology and regulations are in any case advancing hand in hand toward what most would consider a largely technological solution. To view it entirely as such is badly mistaken.

In ports, on the other hand, the solution space is shaped by the ISPS requirements for security on the waterside, which many believe still lack clear definition. I believe this lack of clarity on the waterside is why, as we saw at WSS2010, private industry and individuals are leading governments in the acquisition of technologies for detecting and countering underwater intruders. The risks levels from underwater intrusion are arguably comparable for all, but government agencies face inertia that industry and private individuals do not, which is not entirely bureaucratic. It occurs in part because, as

mentioned, governments must weigh political options applied farther from home, closer to the source of the threat, while industries and private individuals have only the predominantly technological option applied at home, at the point of attack or entry.

Another illustration includes the legal aspects of operating unmanned or autonomous systems for the constant high readiness and rapid reaction technologies, also featured in WSS2010; the legal aspects possibly imposing requirements for small, low-power, low-liability systems, for instance. Or there may be legal requirements elsewhere in response measures, for unambiguous warning, proof of hostile intent, and the use of proportional force, to protect innocent persons from harm and security providers from post-event litigation, and which therefore argue for non-lethal capabilities, some of which also featured in WSS2010.

Thus the technical and non-technical dimensions always go hand in hand; the one domain always shaping the prospects for the other. It is the productive exchange between experts in technology—developers, system analysts, earth scientists on the one hand—and the experts in context—policy, regulation, human factors and operations on the other—that the WSS conference undertakes to foster, looking ultimately toward technical solutions for security problems as they play themselves out in the real world. It is for this reason that I am especially looking forward to WSS2012 in Singapore.

Ronald Kessel,
Maritime Security,
NATO Undersea Research Centre
Nov 2010

Acknowledgements

Special thanks go to Cmdr. Stein Hole (NOR) for leading the local organizing committee, and for Ms. Hazel Staveley of Almondhill Management (GBR) for managing logistics so well. Tom Pastore, Chris Strode, Lillian Gassie and her public relations team, and Capt. Valter Maggiani provided excellent assistance on many different fronts throughout. Julie Pullen assisted in this report by contributing the section on her special session and co-authoring a companion summary letter to appear elsewhere in a scientific journal. Ultimately the keynote speakers, conference participants and scientific committee members make a conference what it can be. Special thanks go to all of them.

SOME PHOTOGRAPHS

Opening ceremony keynote address: Reducing vulnerability through multi-national collaboration, by Commander SG Stein Olav, Royal Norwegian Navy

Keynote address: Singapore's Approach to S&T for maritime infra protection
By George Loh, Defense Research and Technology Office, Singapore

Keynote address: Looking gin the future of marine security
Rear Admiral Chris Parry, CBE

Dr. Ron Kessel (Chair WSS2010) and RAdm Parry

Fivos Andritsos (GRC; left) from the European Commission Joint Research Centre (ITA) answering questions about the European approach to port security with session chair Nick Langhorne (GBR; right) presiding at WSS2010.

Mark Hallett (AUS) from DSTO at WSS2010 explaining a system for countering underwater intruders for protection in ports.

Document Data Sheet

Security Classification		Project No.
PUBLIC RELEASE		
Document Serial No.	**Date of Issue**	**Total Pages**
NURC-MR-2011-002	February 2011	20 pp.

Author(s)

Kessel, R., Zakharia, M.

Title

Waterside Security 2010 (WSS 2010) Conference: post conference report

Abstract

The 2nd International Conference on Waterside Security was hosted by NURC, Carrara, Italy, 3-5 November 2010. This report provides summary statistics of the conference, a summary of the workshops, remarks form the WSS2010 Chairman (Ronald Kessel), and acknowledges key contributors.

Keywords

WSS2010 - waterside security - port protection - counter piracy - maritime security

Issuing Organization

NURC
Viale San Bartolomeo 400, 19126 La Spezia, Italy

[From N. America:
NURC
(New York) APO AE 09613-5000]

Tel: +39 0187 527 361
Fax:+39 0187 527 700

E-mail: library@nurc.nato.int

DISTRIBUTION LIST

NURC's Scientific Committee of National Representatives (SCNR) & National Liaison Officers

BELGIUM
DGMR SYS-N/M, Brussels
EGUERMIN, Oostende

CANADA
MOD CANADA
DRDKIM-2, Ottawa

DENMARK
MOD DENMARK
DANISH ACQUISITION AND LOGISTICS ORGANIZATION (DALO), Ballerup

ESTONIA
MOD ESTONIA

FRANCE
MOD FRANCE
O.N.E.R.A. (ISP), Chatillon

GERMANY
FIZBW - Bonn
FWG - BIBLIOTHEK, Kiel

GREECE
MOD GREECE
DEFENCE INDUSTRY & RESEARCH GENERAL DIRECTORATE, Holargos

ITALY
MOD ITALY
SEGREDIFESA - V° REPARTO, Roma

LATVIA
MOD LATVIA

NETHERLANDS
MOD NETHERLANDS
DEFENCE ACADEMY, Den Helder
ROYAL NETHERLANDS NAVY COMMAND, Den Helder

NORWAY
MOD NORWAY
NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT - BIBLIOTEKET, Kjeller

POLAND
MOD POLAND
RESEARCH & DEVELOPMENT DEPARTMENT, Warsaw

PORTUGAL
MOD PORTUGAL
ESTADO MAIOR DA FORÇA AÉREA, Amadora

ROMANIA
MOD ROMANIA
ROMANIAN NATIONAL DISTRIBUTION CENTRE, Bucharest

SLOVENIA
MOD SLOVENIA

SPAIN
MOD SPAIN
SDG TECEN/DGAM, Madrid
INSTITUTO HIDROGRAFICO DE LA MARINA, Cadiz

TURKEY
MOD TURKEY
MILLI SAVUNMA BAKANLIĞI (MSB), Ankara
TURKISH NAVY RESEARCH CENTRE COMMAND, Istanbul

UNITED KINGDOM
DSTL KNOWLEDGE SERVICES, Salisbury

UNITED STATES
MOD USA
DEFENSE TECHNICAL INFORMATION CENTER (DTIC), Fort Belvoir, VA.