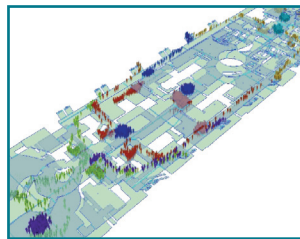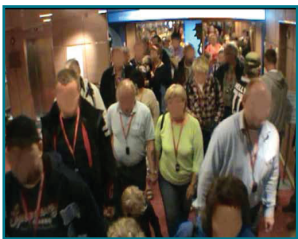# SAFEGUARD
Passenger Evacuation Seminar

One Day Seminar

30th November 2012, London, UK

- Do we really know that cruiseships and ferries can safely evacuate passengers in an emergency?
- How do "real" passengers actually react in an evacuation?
- Can we be certain the current passenger evacuation simulation software is realistic?

The EU-funded SAFEGUARD research project brings together nine international companies and research institutes based in the UK, France, Canada, Norway and Greece to perform a series of full-scale ship passenger evacuation trials to gather data for calibration and validation of ship based evacuation simulation models.

Programme

For further information visit:

www.rina.org.uk/Passenger-Evacuation-Seminar

Call Laura on +44 (0) 20 7201 2401
or email conference@rina.org.uk

Programme

0900-0930	*REGISTRATION*
0930-1000	WELCOME ADDRESS & INTRODUCTION TO THE SAFEGUARD PROJECT *Dr. Philipp Lohrmann, BMT*
1000-1015	COLORLINE: THE 'SUPERSPEED' IN SAFEGUARD - PROCEDURES, ROUTE AND EXPERIENCE *Mr. Jan Helge Pile, Color Line*
1015-1030	ROYAL CARIBBEAN: THE 'JEWEL OF THE SEAS' IN SAFEGUARD - PROCEDURES, ROUTE AND EXPERIENCE *Mr. Chris Van Raalten, Royal Caribbean International*
1030-1045	MINOAN LINES: THE 'OLYMPIC PALACE' IN SAFEGUARD - PROCEDURES, ROUTE AND EXPERIENCE *Mr. Christos Vazouras, Minoan Lines*
1045-1100	*COFFEE BREAK*
1100-1130	ENHANCED EVACUATION SCENARIOS - BACKGROUND, STRUCTURE AND RESULTS FROM SIMULATIONS *Mr. Antoine Breuillard, Bureau Veritas*
1130 - 1200	DATA COLLECTION METHODOLOGIES - VIDEO, IR AND QUESTIONNAIRES *Dr. Steven Deere, University Of Greenwich*
1200-1300	*LUNCH*
1300-1330	RESPONSE TIME DATA AND RECOMMENDATIONS TO IMO *Mr. Rob Brown, OSSC*
1330-1400	VALIDATION DATA SETS, MODEL PERFORMANCE AND RECOMMENDATIONS TO IMO *Professor Ed Galea, University Of Greenwich*
1400-1430	HEEL BENCHMARK, MODEL PERFORMANCE AND RECOMMENDATIONS TO IMO *Mr. Ian Nicholls, Safety at Sea*
1430-1500	FIRE BENCHMARK, MODEL PERFORMANCE AND RECOMMENDATIONS TO IMO *Professor Ed Galea, University Of Greenwich*
1500-1530	*COFFEE BREAK*
1530-1630	*DISCUSSION PANEL*
1630-1700	*CONCLUSIONS AND OUTLOOK*

Biographies

Dr Philipp Lohrmann holds a PhD in Mathematics from King's College London. Since joining BMT in 2010, he has been working on several FP7 projects concerning ship safety, including FLOODSTAND and FIREPROOF. He is acting as project manager of SAFEGUARD since 2011.

Jan Helge Pile is a Project Director with Color Line since February 2007. He is responsible for conversions, newbuildings, and environmental projects within Color Line.

Chris Van Raalten graduated from HTS Noorderhaaks (The Netherlands) in 1992 with a degree in Petroleum engineering. After some years as a professional yacht racer, he started working as a project manager for Detyens Shipyard (USA) in 1995. Chris joined Royal Caribbean International in 2006, and in 2011 he became Director of Maritime Safety and Compliance.

Christos Vazouras is an R & D project manager for Minoan Lines with more than 10 years experience in the maritime sector and specialisation in the introduction of new technologies for rescue operations, security and communications.

Antoine Breuillard has been working as a research engineer in Bureau Veritas Marine Research Department since 2006. He is acting as BV's leader for fire, explosion and evacuation modelling and is responsible for conducting the analysis for the SOLAS Fire Safety - Alternative Design and Evacuation requirements for ships.

Dr Steven Deere joined the Fire Safety Engineering Group in 2004 where he studied for a PhD in ship based evacuation analysis. Part of Dr Deere's PhD research contributed to the passenger ship response time analysis which was adopted as part of IMO MSC Circ 1238. He has worked on the SAFEGUARD project for the past three years where he has been involved in both the collection of evacuation data from sea trials and in evacuation simulation.

Robert Brown is a professional engineer with over 15 years experience in the planning, conduct and dissemination of applied research. Rob is currently completing a PhD from the University of Greenwich (UK) which has a focus on human behaviour during the mustering and evacuation process on large passenger ships.

Ian Nicholls graduated in 2008 with an MEng in Naval Architecture from the University of Strathclyde. After some time spent working at sea he now works for Safety at Sea based in Glasgow. His work has a particular focus on Evacuation and risk assessment and he works with the advanced evacuation tool Evi.

Prof. Edwin Richard Galea is the founding director of the Fire Safety Engineering Group (FSEG) of the University of Greenwich in London where he has worked in the area of Computational Fire Engineering (CFE) research since 1986. Prof Galea's personal research interests include human behaviour in emergency evacuation situations, pedestrian dynamics, evacuation and pedestrian dynamics simulation, fire dynamics and CFD fire simulation

WELCOME ADDRESS & INTRODUCTION TO THE SAFEGUARD PROJECT
Dr. Philipp Lohrmann, BMT

Understanding how people behave in emergency situations within maritime settings is vital if we are to design and develop evacuation efficient vessels and evacuation procedures, train crew in the management of evacuation situations, develop reliable ship evacuation models and regulate the design and operation of vessels. An essential component of this understanding is the collection and characterisation of human performance data. Unfortunately, little data relating to passenger response time or full-scale validation data in maritime environments exists. The EU FP7 project SAFEGUARD addresses this requirement by providing both passenger response time data and full-scale validation data derived from five full-scale semi-unannounced assembly trials conducted at sea.

This talk will provide an overview of the SAFEGUARD project. We will briefly review the current regulations concerning evacuation analysis and explain the importance of collecting real-life data. We will summarise the aims, methods and key results of the project. The partners and their roles in SAFEGUARD will be introduced.

COLORLINE: THE 'SUPERSPEED' IN SAFEGUARD - PROCEDURES, ROUTE AND EXPERIENCE
Mr. Jan Helge Pile, Color Line

After the Safeguard project started in April 2009 it became clear that it would be advantageous to start the first trials already within the first 6 months of the 3 year programme. Season/weather considerations made it necessary to do this already in September 2009. This set us on a fast track in order to plan and carry through the trial within the given framework and tasks set out in the project. This was a challenge to both the SAFEGUARD organisation, Color Line, and the ship in question as well. The trial eventually had to be shifted to an identical sistership on short notice due to too low booking numbers for the targeted voyages on the weekend of September 4th-5th 2009 for the original ship intended for the trials ("SuperSpeed 2"), adding additional drama to the experiment. This is the story about how more than 2500 persons eventually helped get the first result for the SAFEGUARD project.

ROYAL CARIBBEAN: THE 'JEWEL OF THE SEAS' IN SAFEGUARD - PROCEDURES, ROUTE AND EXPERIENCE
Mr. Chris van Raalten, Royal Caribbean International

In July 2010, the SAFEGUARD evacuation trial was performed on Royal Caribbean's large cruise ship "Jewel of the Seas". The trial provided our shipboard officers and crew with a unique opportunity to more deeply evaluate how our passengers might respond in a true emergency. This valuable experience coupled with the detailed information and analysis will help us to find ways to improve our response procedures. For RCL, continuous learning and research are the corner stone in safety management. We believe that the outcomes of the SAFEGUARD project will benefit the entire industry, vessel operators, shipyards and legislators alike.

MINOAN LINES: THE 'OLYMPIC PALACE' IN SAFEGUARD - PROCEDURES, ROUTE AND EXPERIENCE
Mr. Christos Vazouras, Minoan Lines

The third and final SAFEGUARD trial was carried out on board of the Minoan Lines ferry "Olympia Palace" in March 2011. The trial was performed on the Patras - Venezia – Patras route, first shortly after departure from Patras and was repeated on the return trip after departure from Venice with the active participation of the crew. The trial tested the specific SAFEGUARD case of a ferry with passenger in cabins and public areas. Results were analysed and were found to validate the basic assumptions of the project and to be consistent with the rest of the trials.

ENHANCED EVACUATION SCENARIOS - BACKGROUND, STRUCTURE AND RESULTS FROM SIMULATIONS
Mr. Antoine Breuillard, Bureau Veritas

Within the last years at IMO/FP, the agenda item for enhancing the scenarios of advanced evacuation analysis has been put forward together with the inclusion of the obligation for cruise ships to pass such an analysis. Recent events also highlighted the importance to check the orderly evacuation capability of all passenger ships. Well before that, SAFEGUARD had adopted a proactive approach based on safety assessment looking back into the past events, quantitatively using databases and statistics, and qualitatively using accident reports and expertise. Within this approach we stressed important parameters that were not taken into account in the current IMO/ MSC Circ.1238 and that will improve safety if included in a new guideline. A set of possible improvements in the current scenarios have been investigated and implemented in software. Effects on the results have been assessed on a 3000 passenger cruise ship. Final recommendations to IMO are being submitted by the SAFEGUARD consortium to the next IMO/FP session.

DATA COLLECTION METHODOLOGIES - VIDEO, IR AND QUESTIONNAIRES
Dr. Steven Deere, University of Greenwich

In each SAFEGUARD trial, three types of data-sets were collected. The first consisted of response time data collected using video cameras strategically positioned throughout the vessel and the ship's own CCTV system. The second type of data collected comprised validation data for ship based evacuation models. This consisted of identifying the starting locations of each passenger, which assembly station they went to and the arrival time at the assembly stations. This data was collected using a novel data acquisition system consisting of Infra-Red beacons, each emitting unique IR signals and data logging tags worn by each passenger. The third type of data consisted of a questionnaire completed by each of the participants.

In total some 2366 response time data points, 3680 assembly data points and 3648 completed questionnaires were collected making the SAFEGUARD data-set the most comprehensive maritime evacuation data-set ever collected. This talk will describe the methodologies used in the collection of this unique maritime evacuation data-set.

RESPONSE TIME DATA AND RECOMMENDATIONS TO IMO
Mr. Rob Brown, OSSC

This talk outlines research that was carried-out under the EU FP7 project SAFEGUARD and presents five sets of passenger response time data generated from full-scale semi-unannounced assembly trials at sea. The data-sets were generated from three different types of passenger ships, a RO-PAX ferry without cabins, a cruise ship, and a RO-PAX ferry with cabins. The trials on each of the RO-PAX vessels were repeated with different passengers. In total, response times from over 2366 people were collected making it the largest response time data-set ever collected – on land or sea. The paper presents the analysis methodology used to extract the response time data and the resultant response time distributions (RTD). A number of key findings from the data analysis are presented, which includes: (a) all generated RTDs are log-normal; (b) RTDs from the two repeat trials on each of the RO-PAX vessels using different populations are very similar; (c) The combined RTD for the RO-PAX ferry without cabins is almost identical to the RTD generated from the earlier published data for the same type of vessel; (d) The public space RTD from the RO-Pax vessel without cabins was significantly different to that for the RO-Pax vessel with cabins, the difference is believed to be due to the significant differences in population demographics, with the later being populated primarily by adolescents; (e) The RTD derived for the public spaces on the Cruise Ship is significantly different to that of the RO-PAX without cabins, this is an important finding that suggests different RTDs are required for different classes of vessel; (f) The RTD for public spaces and cabins are significantly different.

VALIDATION DATA SETS, MODEL PERFORMANCE AND RECOMMENDATIONS TO IMO
Professor Ed Galea, University of Greenwich

Two evacuation model validation data-sets collected as part of the EU FP7 project SAFEGUARD are presented. The data-sets are based on two semi-unannounced assemblies at sea for a Ro-Pax ferry with 1349 passengers and a Cruise ship with 2292 passengers. The trials took place at an unspecified time, however passengers were aware that on their voyage an assembly exercise would take place. The data-sets consist of passenger: response time data, starting location, end location - assembly station and arrival time at the designated assembly stations. The response time data was collected using digital video cameras while the other data was collected using a novel data acquisition system consisting of ship-mounted beacons, each emitting unique Infra-Red (IR) signals and IR data logging tags worn by each passenger. The collected data is used to define two unique validation data-sets for ship evacuation models. The data-sets are considered unique for a number of reasons, primarily because unlike most validation data-sets, they contain information defining; occupant response times, starting locations and final arrival times. Furthermore, the trials were conducted on real ships, at sea and were semi-unannounced making the results relevant, credible and realistic.

HEEL BENCHMARK, MODEL PERFORMANCE AND RECOMMENDATIONS TO IMO
Mr. Ian Nicholls, Safety at Sea

A key aim of SAFEGUARD was to explore an additional benchmark scenario involving heel. This talk will explore the process of the scenario development. Development came in three main stages; identification, implementation and testing. To identify the correct scenario, a vast amount of research was completed from a range of sources, chiefly – the current legislative framework, casualty data, and model test results. Research was collated on how heel, trim and motions would affect a person's ability to evacuate, and how to implement this effect into the software will be discussed. How the new scenario was then tested and the true effect of heel and trim on the evacuation will be discussed. Finally, how this scenario is recommended to fit into the wider scenarios of SAFEGUARD will be presented.

FIRE BENCHMARK, MODEL PERFORMANCE AND RECOMMENDATIONS TO IMO
Professor Ed Galea, University of Greenwich

In the present IMO MSC Circ 1238 guidelines fire is not considered to explicitly impact passenger performance. While evacuation scenarios 3 and 4 in MSC Circ 1238 are intended to represent a damage situation – including a potential fire situation – these scenarios do not represent the impact of the fire on the evacuating population. In these scenarios, the "fire" is only considered to force the passengers in the affected vertical fire zone to move into the neighbouring fire zones. However, it is possible that the passengers within the affected zone will be impacted by spreading fire hazards and as a result their movement rates are likely to be affected. The aim of this work was to include a representation of the impact of the fire on the passengers in the affected zone. he most straight-forward way to do this would be to undertake a fire simulation for a prescribed fire scenario and couple the results to an evacuation simulation. However, this would have the disadvantage of being prohibitively expensive in terms of time, resources and computational power. Furthermore, not all ship evacuation simulation software products have the ability to incorporate the impact of fire hazards on individuals.

SAFEGUARD
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30 November 2012, London, UK

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