ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Best Practices of Computer-based Simulation to Support Wargaming in NATO

Authors

Pilar Caamaño Sobrino[1]

Wayne Buck[2]

Alberto Tremori[1]

Lucia Gazzaneo[1]

[1]NATO STO Centre for Maritime Research and Experimentation, Italy

[2]NATO HQ Allied Command Transformation, USA

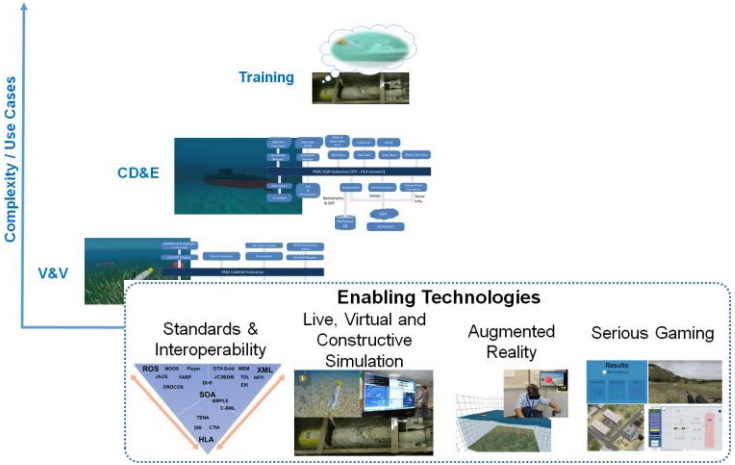
ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

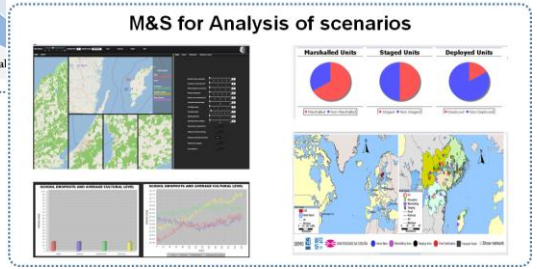
Modelling and Simulation at CMRE

Support the different Programmes of Work at the Centre and investigate innovative M&S approaches and solutions.

Research & Technology
Adoption of M&S in the different phases of the life cycle of autonomous systems at sea.



Consultancy & Analysis
Identification and definition of future trends and requirements for M&S in NATO.



ITEC
14-16 May 2019
Stockholmsmässan, Sweden

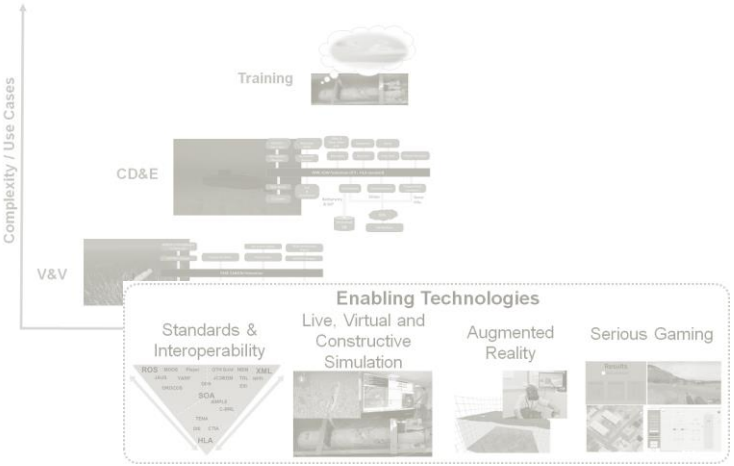
#ITEC2019

Modelling and Simulation at CMRE

Support the different Programmes of Work at the Centre and investigate innovative M&S approaches and solutions.

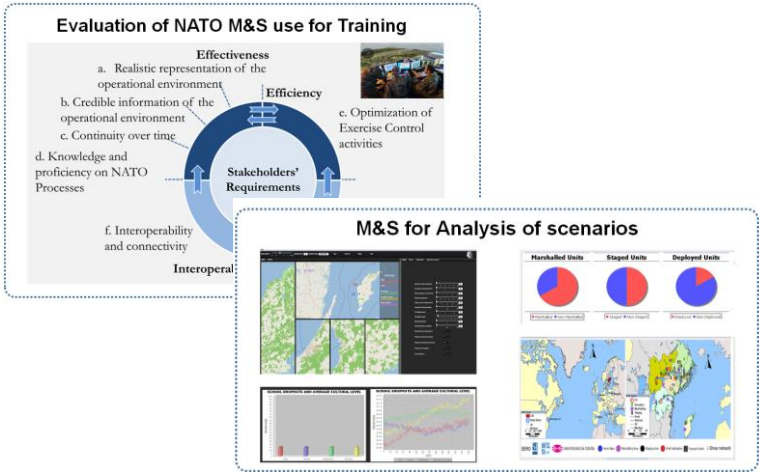
Research & Technology

Adoption of M&S in the different phases of the life cycle of autonomous systems at sea.



Consultancy & Analysis

Identification and definition of future trends and requirements for M&S in NATO.



ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Introduction

Modelling and Simulation (M&S) can be applied to areas other than training.

NATO has begun to apply M&S based tools and methodologies in decision support, course of action (CoA) studies and other areas that require data-driven analysis.

This work aims to identify and build upon existing NATO best practices, to increase the quality, consistency and effectiveness of M&S based methodologies beyond training.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Agenda

- Motivation
- End-state, objectives and areas of application
- Wargaming and Modelling & Simulation (M&S) Overview
- Examples of NATO best practice
- Way-ahead
- Conclusions

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Motivation

New warfare scenarios characterized by:

- More rapidly evolving landscapes.
- Larger amounts of diverse information.
- Increased complexity and interaction intricacy.

Covering military and non-military factors, including:

Actions on the

DIME power elements

Diplomatic, Information, Military and Economic

Effects on the

PMSEII dimensions

Political, Military, Societal, Economic, Infrastructure and Information

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

End-State

The **improved and standardised** use of M&S-based methodologies to support **data-driven analysis**.

Actionable insights* elicited from data and information.

The ability to **confirm suppositions, refute or challenge knowledge,** and **quantify the outcomes of decisions**.

***Actionable insights:** Result of an extensive data analytics and processing enabling the drawing of conclusions to make better informed decisions.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Objectives

1. Set the conditions and identify the key enabling elements, methods and tools to **stimulate, encourage and foster alternative, critical and creative thinking**.

2. Investigate **how M&S-based methods and tools can inform alternative thinking methodologies** allowing a wider set of possibilities to be explored, discovering unintended consequences, or managing risk in a safe-to-fail environment.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Areas of Application

Extend M&S in NATO to application areas
<u>other than training.</u>

New areas of application

- Warfare Development
- Planning
- Operations
- Assessment

Methodologies

- Wargaming
- Analysis of alternatives
- Course of action exploration
- Decision support
- Red teaming
- Pre-mortem analysis

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Wargaming

Qualitative methods

- Seminar games
- Matrix games

To encourage discussion and gain insights in a given scenario, aiming at learning the impact and effects of the decisions taken.

Quantitative methods

- CoA Analysis
- Analytical wargames

Designed to collect and analyse data from wargame playing with the goal of identifying shortcomings and challenging plans or concepts.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Wargaming and M&S

- Matrix Games
- Seminar Games
- Red Teaming

Qualitative Wargames

Refine

Modelling & Simulation

Quantitative Wargames

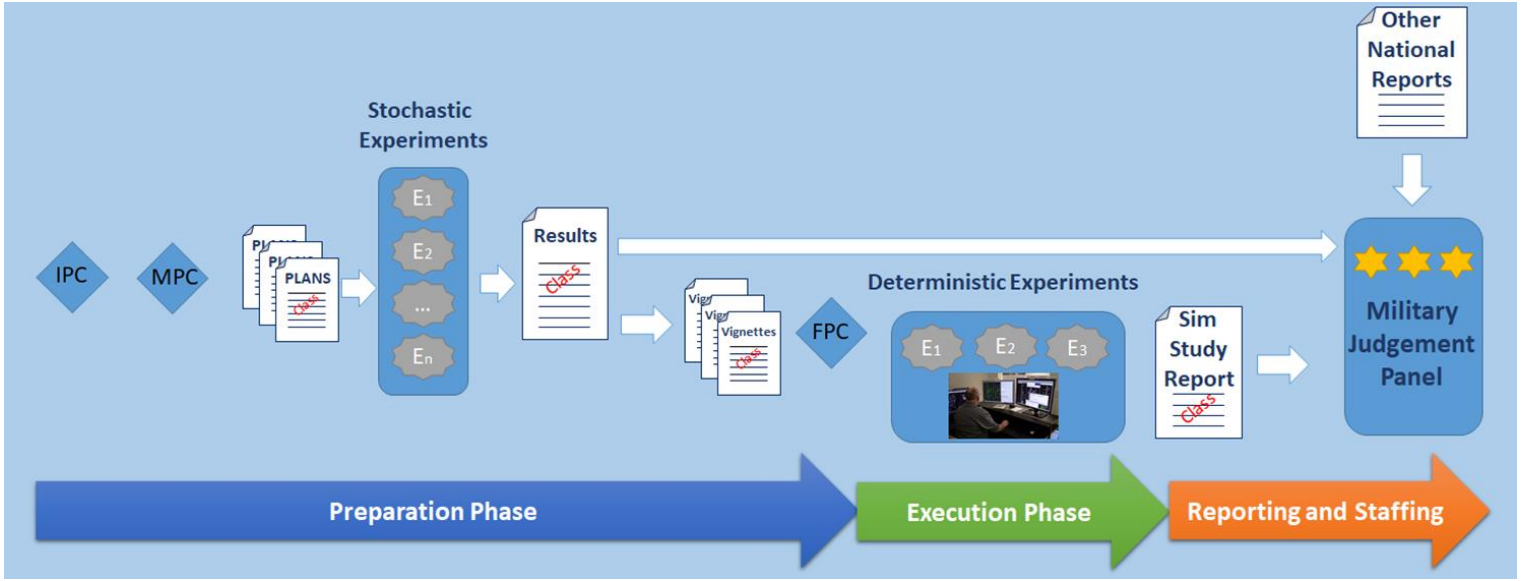
- COA Wargame
- Computer-Assisted Analytical Wargame

Proposal

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Example: A2AD Simulation Study



Two computer based simulation tools were used to support and inform Operational Planners in CoA development and analysis.

This promoted discussion, leading to **better informed products**.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Example: NATO Conceptual Study on Urbanization

Development of a capstone concept for Joint Military Operations in Urban Environments.
Two Seminar Wargames (2014, 2016) + Matrix wargame (2018)

Two M&S-based models to support the Matrix Wargame

Archaria (M&S CoE)

Model of a city with large amount of data on all the PMSEII layers.

Basic calculations of the impact of decisions on the dynamics of the city.

MARVEL (TNO)

System dynamics model depicting resiliencies of the city and interactions due to events.

Used to show the 2nd, 3rd, and 4th order effects of the actions.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Way ahead

Identified Areas of Best Practice

- Stakeholders
- Culture
- Material
- Data
- Processes

- Conceptual modelling
- Verification, Validation and Accreditation (VV&A)
- Use of standards and interoperability
- User friendliness and accessibility
- Software engineering and reliability

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Way ahead

DOTMLPFI
Lines of effort

- Data Availability for Simulations,
- Sharing Data for use in Simulation,
- Shared Lexicon and Definitions,
- Relationships between M&S Specialists and Professional Analysts,
- Training to ensure Leadership and Decision-Makers awareness,
- Awareness and relationships with other NATO and STO activities, or
- Improving awareness of National and NATO Simulation Capabilities.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Way ahead – STO Cross Panel Activity

NMSG – SAS RTG Activity on

Using Simulation to Better Inform Decision Making for Warfare Development, Planning, Operations, and Assessment

July 2019 – December 2020

Expected Achievements

1. Promote and enhance the use of standardized and homogenized M&S-based methods to inform and support decision making within NATO.

2. Outline a NATO M&S-based capability to inform and support decision making and the elements to address for its implementation across the DOTMLPFI spectrum.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Conclusions

- Wargaming provides methods and tools to recreate a scenario and investigate the effects of the decisions taken.

- Computer-based M&S provides means:
  - To improve and enhance analytical wargaming.
  - To generate and process data to elicit actionable insights, and better informing the decision making processes.

The use of M&S for application other than training within NATO is an area to be explored.

ITEC
14-16 May 2019
Stockholmsmässan, Sweden

#ITEC2019

Thank you for your attention.
Questions, suggestions, comments…

Pilar Caamaño Sobrino, PhD.
M&S Scientist
Pilar.caamano@cmre.nato.int