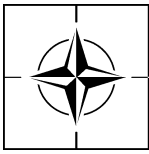

NATO NORTH ATLANTIC COUNCIL

OTAN CONSEIL DE L'ATLANTIQUE NORD

14 September 2012

DOCUMENT

AC/323/NMSG(2012)-015

NATO MODELLING AND SIMULATION MASTER PLAN

NATO MODELLING AND SIMULATION STRATEGIC PLAN

VERSION 2.0

CHAPTER 1 GENERAL INFORMATION

1.1 INTRODUCTION

The North Atlantic Treaty Organization (NATO) Modelling and Simulation Master Plan (NMSMP) Version 1.0 was approved by the North Atlantic Council (NAC) and signed in 1998 by the NATO Secretary General. It has served as the implementing document for Modelling and Simulation (M&S) in NATO since that date. Many of its provisions are as relevant today as they were when written.

The implementation of version 1.0 of this plan has yielded the following achievements:

- Streamlining of the M&S community in NATO through the establishment of the NATO Modelling and Simulation Group (NMSG) and the Modelling and Simulation Coordination Office (MSCO);
- Nomination of the NMSG by Conference of NATO Armaments Directors (CNAD) as the delegated tasking authority for development of NATO M&S standardisation documents;
- Fulfilment of a number of the objectives of the NMSMP version 1.0 including the establishment of:
    - NATO Standardisation documents for M&S interoperability;
    - Education and outreach activities such as tutorials, symposiums and workshops;
    - Cooperative research activities through NATO M&S Task Groups to evaluate and integrate new M&S technology;
    - Key initiatives:
        - The NATO Education and Training Network;
        - The NATO Simulation Resource Library; and
        - The MSCO helpdesk.

However, changes during more than a decade have decreased the relevancy of the 1998 NMSMP and necessitate version 2.0 of the NMSMP to position NATO M&S for the future. The three main factors that account for this are:

- Security environment changes: The increasing complexity of the NATO strategic and operational setting and increasing importance of international cooperation demands a new approach to employing and developing M&S. M&S, which has traditionally concentrated on the kinetic effects of warfare, must now also focus on new aspects such as multiple futures, human behaviour, asymmetric threats, information superiority, high readiness forces;

- NATO and National organizational changes: The Alliance's current bodies and their roles, missions, and responsibilities are different from those described in Version 1.0 of the NMSMP;

- Technology advances: New technologies have changed the M&S approach. These include the increased use of M&S solutions derived from non-defence sectors; the establishment of the NATO Network Enabled Capability (NNEC) concept; and the growing maturity of distributed M&S technologies for training, acquisition, and support to operations.

Under the coordination of the NMSG and in response to these changes, the original document has been revised as the NATO Modelling and Simulation Master Plan Version 2.0. This new version consists of two parts: a NATO Modelling and Simulation Strategic Plan (this document) and a separate NATO Modelling and Simulation Implementation Plan.

1.2 PURPOSE

This document defines the M&S strategic plan for the Alliance. The NMSMP is expected to evolve and be updated as the Alliance and its member nations proceed with implementation, gain experience, react to new missions and develop new technological capabilities.

The NATO Modelling and Simulation Master Plan:

- Articulates the NATO vision and guiding principles regarding the use of M&S in support of the NATO mission;

- Discusses the impact that achieving this vision will have on NATO M&S application areas;

- Identifies the governance mechanisms and bodies, and the primary NATO M&S stakeholders; and

- Presents the M&S objectives and actions required to achieve the vision.

The NMSMP is binding on NATO organizations. Compliance is sought from NATO member nations. It would also inform Nations during development of their M&S strategies. It is explicitly recognised that the Nations may have M&S requirements and activities that are not addressed in this plan.

1.3 DOCUMENT ORGANIZATION

This document is designed to require infrequent updates, while the Implementation Plan containing detailed information can be updated as required.

1.4 SCOPE

The scope of this plan covers current, developmental, and future NATO M&S. It addresses Alliance needs in the different NATO M&S application areas. It also identifies the common and cross-cutting M&S objectives.

1.5 KEY STAKEHOLDERS AND RESPONSIBILITIES

An M&S Roundtable was conducted in March 2012 convening the major M&S stakeholders including Nations, ACT, NC3A, NURC, and M&S Coordination Office. The objective was to define the supply and demand chain for the NATO M&S domain. The updated NATO M&S Master Plan captures how Nations and NATO mutually harmonize their resources and efforts to complement each other and to obtain an optimal benefit from the shared use of the current limited and scarce available resources. A description of this relationship is shown in Figure 1-1.

The demand side for NATO M&S consists of the Customers and the Users. The Customers are responsible for defining the operational needs; the Users fulfil these operational needs with the aid and support of simulation assets, and help to define the technical requirements. On the supply side, the Suppliers provide the simulation assets.

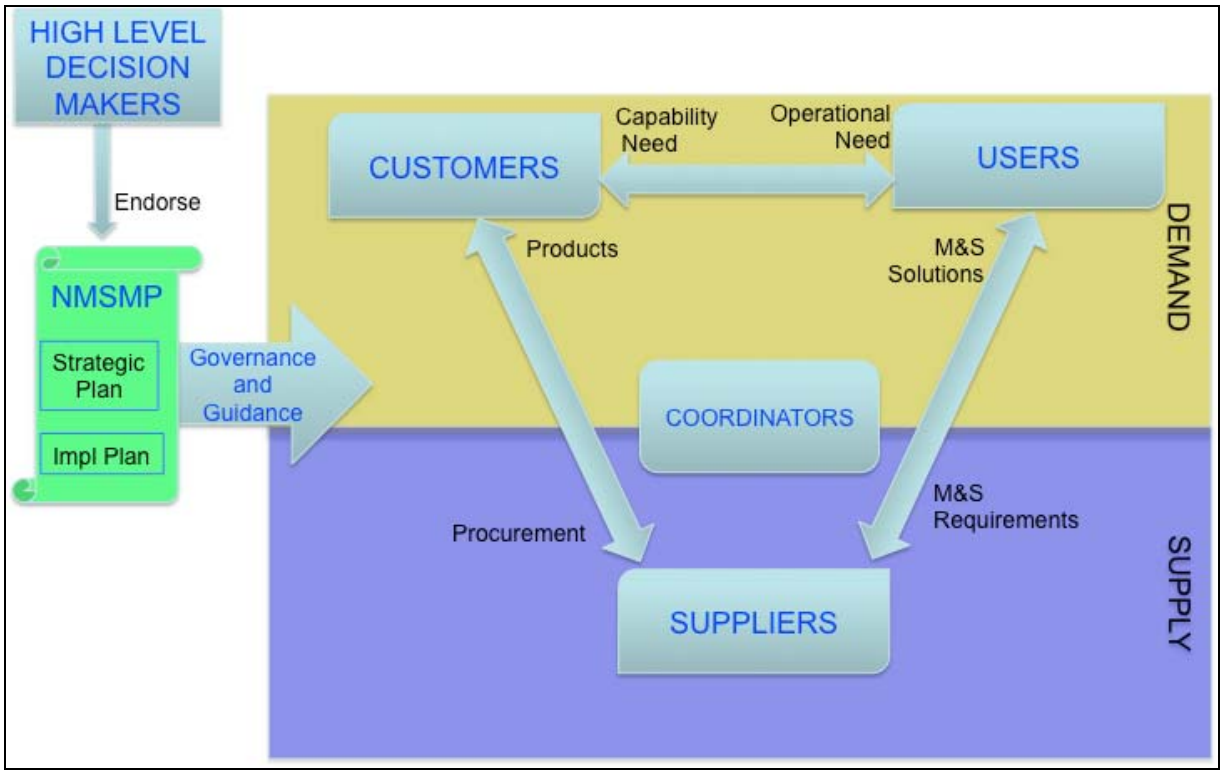

Figure 1-1: Stakeholder Relationships

A large number of stakeholders will benefit from or contribute to the implementation of this NATO M&S Master Plan. A detailed description of stakeholders and their roles and responsibilities in implementing the NMSMP will be provided in the Implementation Plan.

The High-Level Decision Makers provide guidance through the NMSMP; the M&S community reports on progress back to these Decision Makers on a regular basis.

While recognizing that the NMSMP is a NATO-wide effort, there are two key bodies that address NATO M&S Coordination issues on a permanent basis: the NMSG and the NATO Modelling and Simulation Coordination Office (MSCO). They are part of the Science and Technology Organization (STO) and are subject to the governance provisions of the STO Charter. In the general context of the NMSMP, their role is the following:

- The NMSG is the Operational and Scientific-Technical Committee, reporting through the Science and Technology Board (STB) according to the provisions of the STO Charter, in which all NATO M&S stakeholders and subject matter experts meet to initiate,

coordinate and oversee the implementation of the NMSMP. The NMSG will forward updates as necessary of the NMSMP and Implementation Plan through the STB for approval.

- MSCO acts as the executive secretariat for the NMSG for the management of M&S in NATO, and serves as the day-to-day focal point for the coordination of NATO M&S activities and execution of the NMSMP.

Within its means and capabilities, each NATO Nation will endeavour to contribute to the NMSMP, by making available information as necessary to carry out the NMSMP objectives consistent with their own national laws, regulations and practices regarding the disclosure of such information.

CHAPTER 2 NATO'S MODELLING AND SIMULATION GOAL

This chapter presents the NATO Modelling and Simulation Vision, the associated guiding principles, and primary M&S application areas.

2.1 NATO MODELLING AND SIMULATION VISION

The NATO Modelling and Simulation Vision is:

Exploit M&S to its full potential across NATO and the Nations to enhance both operational and cost effectiveness.

2.2 NATO MODELLING AND SIMULATION GUIDING PRINCIPLES

The above vision leads to a NATO-wide cooperative effort guided by the following principles:

- Synergy: Capitalise on, leverage, and share the existing NATO and national M&S to enable more effective and affordable capabilities for NATO.

- Interoperability: Direct the development of common M&S standards and services for simulation interoperability and foster interoperability between C4ISTAR and simulation systems.

- Reuse: Increase the visibility, accessibility, and awareness of M&S to foster sharing and ensure its best exploitation across all NATO M&S application areas.

- Affordability: Employ and develop readily available, flexible and cost-effective M&S to improve NATO effectiveness to address the changing nature and increased complexity of the Alliance strategic environment.

2.3 NATO M&S APPLICATION AREAS AND REQUIREMENTS

The M&S application areas include, but are not limited to: Support to Operations, Capability Development, Mission Rehearsal, Training and Education, and Procurement.

NATO M&S requirements will be derived from the NATO defence planning process. Thus, the stakeholders have access to a common set of resources to provide coherence in addressing their NATO and national M&S needs, with a view to promote multinational initiatives through a process of prioritization encouraging national specialization.

The overlaps between the M&S application areas, inherent in the NATO enterprise, provide the opportunity to identify common and cross-cutting M&S and avoid a stovepiped approach. All of these factors work together to effectively support the M&S vision.

The objectives in Chapter 3 address the M&S opportunities within and between the M&S application areas.

The Implementation plan details the M&S application areas and presents the process used to gather Alliance M&S requirements.

CHAPTER 3 MODELLING AND SIMULATION OBJECTIVES

3.1 INTRODUCTION

This chapter presents five objectives for realising the Alliance M&S vision in accordance with the guiding principles and in support of the M&S application areas.

3.2 OBJECTIVES

The five objectives of NMSMP Version 2.0 are based on the corresponding top-level objectives formulated in the original NMSMP and have been re-validated and refined to emphasise support to military operations. Objective 2 has been adjusted to more clearly express the need for common policies and procedures assuring coordination of the activities required to accomplish the Master Plan across the Alliance. Objective 3 has been expanded to account for the need to develop underlying models as well as simulations. The supporting sub-objectives of the five objectives and their related issues and activities required major additions and adjustments.

Figure 3.1 provides an overview of the top-level objectives and their sub-objectives. All sub-objectives are further elaborated and explained in the Implementation Plan.

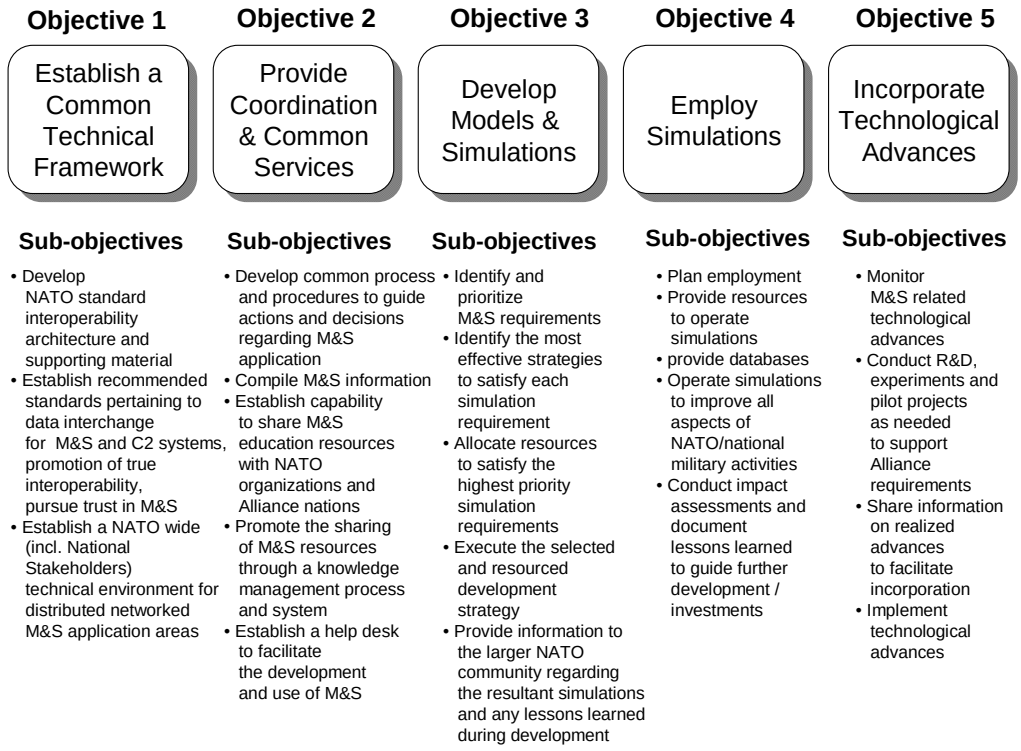

Figure 3-1: NATO Modelling & Simulation Master Plan Objectives

3.2.1 OBJECTIVE I - ESTABLISH A COMMON TECHNICAL FRAMEWORK TO FOSTER INTEROPERABILITY AND REUSE

This objective establishes a common, open standard technical framework to promote the development of a capability for interoperability and reuse of models, data and simulations across the Alliance. The technical framework includes:

- A common standard interoperability architecture and supporting material;
- Common standards that promote common understanding of data across models, simulations and live systems (e.g., C2 systems, Communication and Information Systems (CIS), weapon systems on instrumented ranges, hardware-in-the-loop, etc.);
- Common standards that promote “true” interoperability, i.e., interoperability up to the conceptual level including a common understanding of the static and dynamic

representation and the context of the piece of the world to be simulated (thereby guaranteeing a fair fight in training and exercise applications);

- Common standard processes and recommended practices, (e.g., Verification, Validation and Accreditation (VV&A) to pursue a level of trust in simulations); and

- A NATO-wide, including national stakeholders, technical environment for distributed networked M&S application areas.

3.2.2 OBJECTIVE II - PROVIDE COORDINATION AND COMMON SERVICES TO INCREASE COST-EFFECTIVENESS

This objective establishes coordination and common services to improve the cost-effectiveness of M&S activities through satisfying common requirements by common means to exploit economies of scale. The Alliance should leverage existing NATO and national capabilities and resources and pursue the co-operative provision of common services. Accomplishing this objective also requires applying common processes and procedures to guide effective and efficient actions and decisions regarding the governance, development, resourcing and employment of M&S across the M&S application areas.

3.2.3 OBJECTIVE III - DEVELOP MODELS AND SIMULATIONS

This objective supports M&S development, allowing NATO and Nations to maximise cost-effectiveness for the different M&S application areas (see Chapter 2) by reusing and networking existing capabilities whenever practical. In many cases, cost-effective solutions to Alliance requirements may be found in the evolution (modification) of existing simulations. New development projects should be co-operative in nature and follow a common development process. Accomplishing this objective could also include pooling resources to build single applications or co-operatively developing a multi-organization and/or multi-national distributed simulation network.

3.2.4 OBJECTIVE IV - EMPLOY SIMULATIONS TO ENHANCE NATO MISSION EFFECTIVENESS

This objective employs simulations that effectively allow the Alliance to realise its M&S Vision to enhance NATO, Member Nations, and Partner operations in all application areas. To maximise the effective employment of simulations, planning, resourcing, database preparation and sharing, and execution/assessment issues utilizing a common process and common procedures or best practices in a distributed simulation environment must be addressed.

3.2.5 OBJECTIVE V - INCORPORATE TECHNOLOGICAL ADVANCES

M&S-related technology advances are expected to occur continuously and will provide opportunities for targeted interventions, such as increasing functional capabilities, performance and overall M&S effectiveness. To assist M&S users in maintaining awareness of such M&S-related technology developments, a process is needed to monitor, assess and implement technology developed by others and to conduct its own technology-development activities in key areas not addressed elsewhere.

NATO OTAN
NORTH ATLANTIC COUNCIL
CONSEIL DE L'ATLANTIQUE NORD

14 September 2012

DOCUMENT

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NATO MODELLING AND SIMULATION MASTER PLAN

NATO MODELLING AND SIMULATION IMPLEMENTATION PLAN

VERSION 2.0

CHAPTER 1 INTRODUCTION

The NATO Modelling & Simulation (M&S) Master Plan (NMSMP) is the NATO policy document that provides a global strategic vision and guidance for the coordination and utilization of M&S in NATO. M&S is developed, applied, and sustained by Nations, and NATO clearly has seen state-of-the-art M&S technologies as a cost-effective way to fulfill its requirements.

This document was significantly influenced by the outcome of a November 2011 Roundtable held between Allied Command Transformation (ACT) and the NATO Research and Technology Organization (RTO) emphasizing the importance of well-defined supply and demand relationships; this meeting was co-chaired by SACT and the Chairman of the NATO Research and Technology Board (RTB).

Subsequently, a specific M&S Roundtable was conducted in March 2012 convening the major M&S stakeholders including Nations, ACT, NC3A, NURC, and M&S Coordination Office. The objective was to define the supply and demand chain for the NATO M&S domain. The updated NATO M&S Master Plan captures how Nations and NATO mutually harmonize their resources and efforts to complement each other and to obtain an optimal benefit from the shared use of the current limited and scarce available resources. This is consistent with the NATO “Smart Defence” initiative.

The Supply-Demand paradigm is built on two pillars, bringing together the demand side (customers and users), and suppliers of M&S in a cooperative approach:

The first pillar is the NATO Nations and Partner Nations that have National Forces demands being met by cooperation within the NATO Science & Technology Organization (STO). The Nations voluntarily contribute to the Technical Activities and Multinational Programs within the STO providing operational representatives, scientists, experts, engineers, systems, tools and knowledge.

The second pillar is NATO organizations with M&S demands led by the NATO Commands and the STO coordinating the supply side.

Both pillars interact jointly through the STO-led Technical Activities in the NMSG and STO Panels and/or through ACT-led Multinational Programs.

The complete NATO M&S Master Plan is composed of two documents:

- The NATO M&S Strategic Plan stating the policy, M&S vision, goals and objectives for M&S in NATO.

- The NATO M&S Implementation Plan (this document) introducing the different actors and stakeholders, and assigning their roles and responsibilities in M&S in NATO.

The NATO M&S Strategic Plan is expected to have lasting endurance, whereas the NATO M&S Implementation Plan is expected to be updated on a more frequent basis to reflect accomplishments as well as changes within NATO (for instance, to remain consistent with the NATO Defence Planning Process (NDPP)).

This document is composed of 5 chapters:

- Chapter 1: Introduction
- Chapter 2: Stakeholders and Roles.
- Chapter 3: M&S Application Areas & Requirements.
- Chapter 4: Objectives, Roles and Responsibilities, and Schedule.
- Chapter 5: List of Acronyms and References.

CHAPTER 2 STAKEHOLDERS AND ROLES

A successful implementation of the NATO Modelling and Simulation Vision is based on operational needs, technological and financial feasibilities. Therefore, it requires a coherent coordination and collaboration of the entire spectrum of the M&S stakeholders in NATO.

As stated in its terms of reference, the mission of the NMSG is to promote cooperation among NATO bodies, member Nations and partner Nations to maximize the effective utilization of M&S.

The NMSG is, thus, the body in which stakeholders meet to coordinate, share information and seek for collaboration opportunities to advance on the objectives of the NATO M&S Master Plan (NMSMP).

In order to ensure representation of all key M&S stakeholders, the NMSG includes one voting member from each NATO nation. Partner Nations are also invited. NATO organizations and the Centres of Excellence (COE's) should provide ex-officio members. Other organizations may be invited to attend NMSG meetings as appropriate.

To support the NMSG, the NATO Modelling and Simulation Coordination Office (MSCO) provides the Executive Secretariat for the management of M&S in NATO and serves as the day-to-day focal point for the coordination of NATO M&S activities and execution of the NMSMP

Several types of stakeholders (see Figure 1) can be identified depending on their role on the M&S enterprise:

- M&S Customers that determine the operational needs for the M&S capabilities;
- M&S Users that demand the M&S capabilities or the capabilities supported by M&S;
- M&S Suppliers that develop M&S solutions or provide research on M&S solutions.

Two other kinds of stakeholder are identified to manage M&S:

- M&S Coordinators for consistency and legitimacy between the different stakeholders.
- M&S Advisors that serve as an advisory role to Customers, Users, and Suppliers.

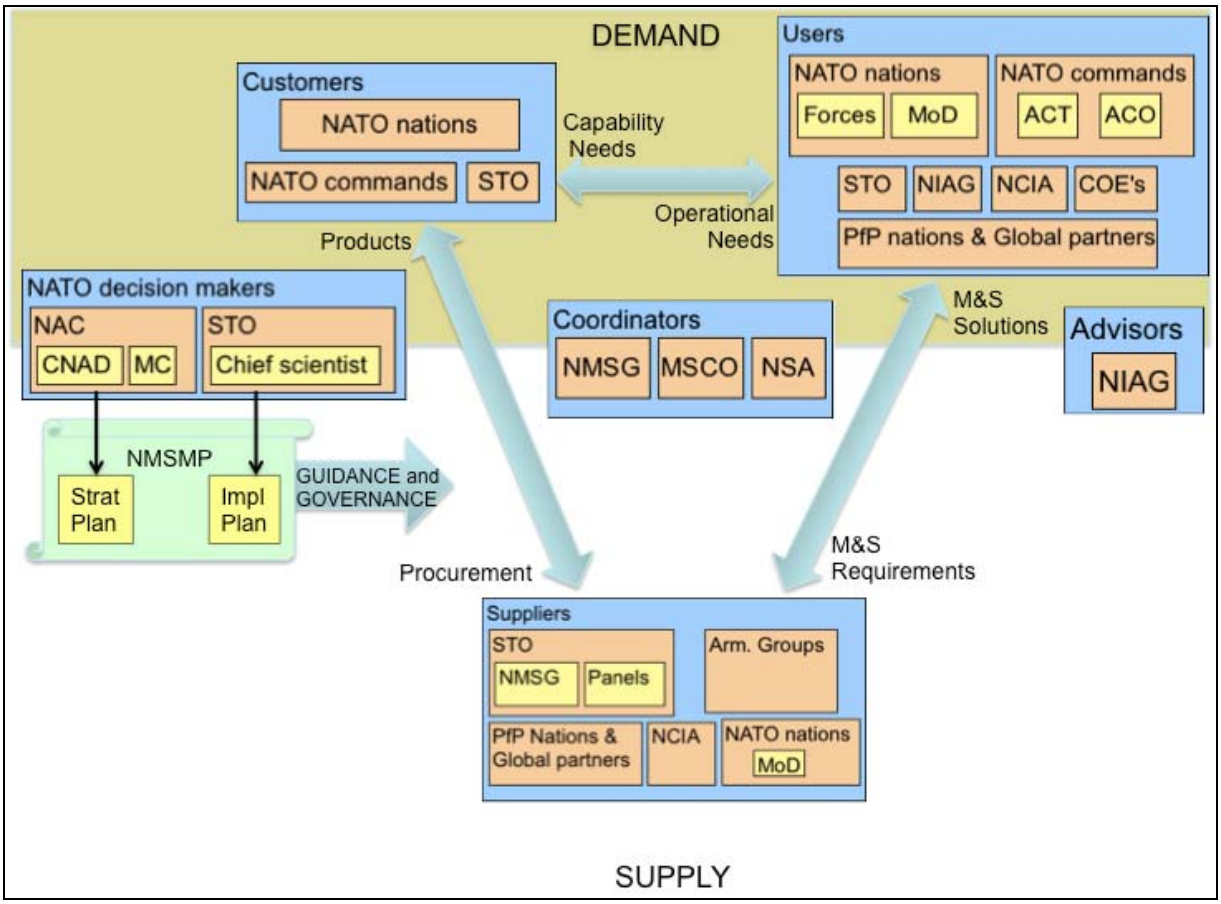

Figure 1: Stakeholder Relationships

The following table discusses a comprehensive list of M&S stakeholders that may be involved on the undertaking of the NMSMP, and their main roles as customers, user and/or providers.

Table 1: Stakeholders and Roles

Stakeholder (alphabetic order)	General role	Cust	User	Supply	Coord	Advs
Academia	Conducts M&S-related research.			X		X
ACO (JFC's, CC's, NRF, Operations)	Provides operational requirements for M&S planning tools, decision making tools, operational support tools and training tools.	X				
ACT (incl. JWC, JFTC)	Facilitates and leads development of capabilities and interoperability for medium and long-term solutions. Provides Bi-Strategic-Commands military requirements to NMSG. Responsible for Defence Planning CD&E, training & exercise and analysis M&S solutions.	X	X	X	X	
ACT/NTG	Provides training requirements.	X				
Industry	Develops M&S solutions.			X		

Stakeholder (alphabetic order)	General role	Cust	User	Supply	Coord	Advs
M&S COE	Provide resources and requirements for M&S capabilities.		X			
MSCO	Support NMSG and focal point for NATO M&S.				X	
NATIONS	Provide resources and requirements for the capabilities. Final users of most of the capabilities provided by implementation of this NMSMP. Provide most of the assets/ capabilities needed to implement this NMSMP.	X	X	X		
NATO HQ	Provides requirements and guidelines.	X				
NATO main armament groups	Provides requirements and studies.	X				
NATO schools	Provides requirements for M&S tools for education.	X	X			
NCIA	Provides M&S solutions. Provides communications and IT support.			X		
NIAG	Provides studies and solutions			X		X
NMSG	Coordinates NATO and National M&S requirements derived from military shortfalls. Creates and oversees working groups in support of the creation of Long / Medium / Short Term M&S Solutions and Standards. Interfaces with other stakeholders.			X	X	
NSA	Provides support for standardization.				X	
Other COE's	Provides requirements and studies.	X				
Partner Nations	Same as NATO Nations	X	X	X		
Standards Development Organizations	Develop international standards.			X		X
STO Panels	Creates and oversees working groups in support of the creation of Long / Medium / Short Term M&S Solutions on specific areas.		X	X		
STO-CMRE	Develops Maritime Research and Models (NURC) Studies on future solutions.	X	X	X		

CHAPTER 3 M&S APPLICATION AREAS AND REQUIREMENTS

The NMSMP identifies the following application areas that can capitalize on M&S: support to operations, capability development, mission rehearsal, training and education, and procurement. Individual Nations may use different taxonomies to classify M&S application areas, but this plan identifies the application areas to accommodate the M&S stakeholders.

The M&S requirements will be in accordance with the NDPP. The intent is for M&S to support the application areas and leverage opportunities to promote, employ and develop common and cross-cutting M&S policies, standards, tools and services which can ensure the best exploitation of M&S, and achieve the NATO M&S vision and goals.

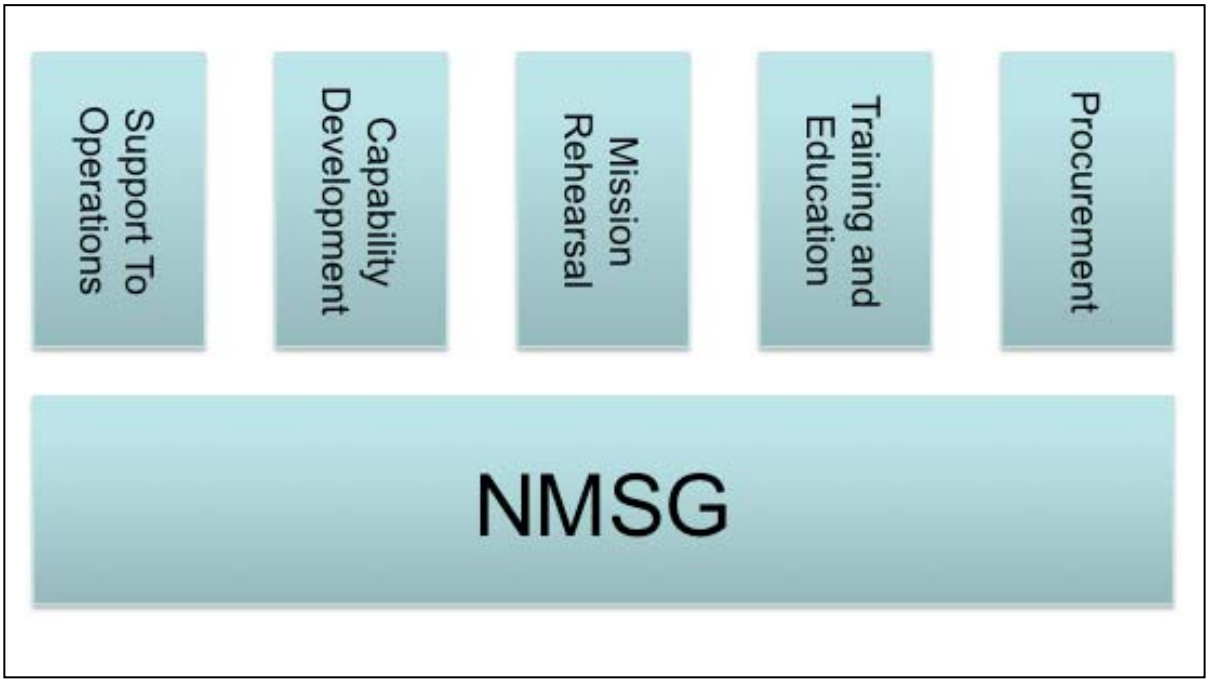

Figure 2: Application Areas and the NMSG

The following section provides a general description of each application area and introduces typical stakeholders based on their association to that area.

3.1 APPLICATION AREAS

SUPPORT TO OPERATIONS (OPERATIONAL PLANNING, ANALYSIS, DECISION-MAKING)

This application area encompasses activities conducted to ensure that NATO and Nations decision makers and operational commanders have access to capabilities required to decide on, initiate, sustain, and successfully conclude operations.

Associated stakeholders include, but are not limited to, organizations that define strategy, or plan and execute operations.

CAPABILITY DEVELOPMENT (DEFENCE PLANNING, CONCEPT DEVELOPMENT & EXPERIMENTATION)

These activities address the preparation for the future to foster continuous improvement of military capabilities in order to enhance the interoperability and effectiveness of NATO and Nations.

The associated stakeholders include, but are not limited to, organizations that perform doctrine validation, operational analysis in support of operational requirements definition and collection; research and technology; and concept development and experimentation.

MISSION REHEARSAL

These activities pertain to the preparation and rehearsal for a planned mission or course of action to reduce risk and surprise and to improve the knowledge and awareness of situations.

Associated stakeholders include, but are not limited to, military commands and units at all levels that plan and execute missions and operations.

TRAINING and EDUCATION

These activities pertain to collective training, individual education, exercises and training events which involve audiences belonging to NATO and National Headquarters, Combined Joint Task Force and Component Commands, NATO and Partner Nations, as well as non-governmental and international organizations essential to conduct their assigned tasks.

Associated stakeholders include, but are not limited to, organizations that plan and conduct training and education.

PROCUREMENT

This application area pertains to the support of total lifecycle management of assets and systems including design risk reduction, test and evaluation. It facilitates appropriate allocation of resources and optimal management for the NATO and Nations defence procurement to ensure the best value for money and to fulfill its missions.

The associated stakeholders include, but are not limited to, organizations that are involved in NATO or national defense procurement, industry, and consultants.

3.2 M&S REQUIREMENTS

The NMSG will determine M&S requirements from a variety of sources related to the application areas. These military and technical sources include NATO and National requirements captured in the NDPP[1] process (through the STO) and requirements nominated through the membership of the NMSG.

[1]In accordance with PO(2009)0042, the NDPP provides a framework within which national and Alliance defence planning activities can be harmonized to meet agreed targets in the most effective way. It facilitates the timely identification, development and delivery of the necessary range of forces that are interoperable and adequately prepared, equipped, trained and supported as well as the associated military and non-military capabilities to undertake the Alliance's full spectrum of missions.

CHAPTER 4 OBJECTIVES, ROLES AND RESPONSIBILITIES, AND SCHEDULE

The following table provides the details of each Master Plan Objective and Sub-objective.

Table 2: Objectives, Stakeholder Roles/Responsibilities, and Schedule

Master Plan Objectives Matrix	**Stakeholders** LS= Lead-Stakeholder, X = Stakeholder								**Schedule**						
									Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
Objective I - Establish a Common Technical Framework to Foster Interoperability and Reuse															
Sub-objective 1.1 - Develop a NATO standard interoperability architecture for simulation applications and supporting material.															
1) Establish a NATO STANAG for an interoperability architecture (evolution of the present HLA STANAG).	LS	X			X					**X**		**2007**	**HLA**	**2012**	**HLA evolved**

Master Plan Objectives Matrix	Stakeholders LS= Lead-Stakeholder, X = Stakeholder								Schedule Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
2) Participate in architecture standards-development processes that support interoperability.	LS	X	X		X						**X**	**1998**	**SISO**		
3) Create curriculum around the accepted NATO interoperability architecture standard to educate the M&S workforce.	X	LS	X	LS	X			X		**X**		**1998**	**MSCO Simulation Course**		
4) Enable NATO interoperability architecture standard and products are readily available for compliance certification.	LS	X	X	LS							**X**	**1997**	**HLA certification**	**2012**	**HLA evolved**
5) Encourage Nations participating in NATO M&S activities to implement the accepted interoperability architecture standard in newly developed M&S tools.	X	LS	X			X					**X**	**2009**	**NMSMP 1. version**	**2012**	**NMSMP 1. upgrade**
6) Transition NATO-owned or used and national legacy simulations to agreed interoperability architecture standard.	LS		X	LS	X					**X**		**1998**	**HLA**	**2012**	**HLA evolved**
7) Identify metrics for measuring compliance to agreed interoperability architecture standard and start an effort to track the number of compliant modelling and simulation tools.	LS	X	X	LS	X					**X**		**2004**	**HLA certification, MSCO**	**2012**	**HLA evolved**

Master Plan Objectives Matrix	Stakeholders LS= Lead-Stakeholder, X = Stakeholder								Schedule Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
8) Evaluate the current NATO interoperability architecture standard against industry best practices of that standard (e.g. HLA evolved). Adjust / change current standard if needed.	LS		X	X	X			X			**X**	**2010**	**HLA evolved**		
9) Identify the means for NATO M&S tools using the NATO interoperability architecture standard to be interoperable with other interoperability standards/architectures (e.g. TENA, DIS)	X		LS		X			X		**X**				**2012**	**SISO DMAO**
9a) Develop corresponding STANAG	LS	X	X		X	X				**X**				**2014**	
10) Develop architectural concepts to implement higher level interoperability (e.g. semantic, dynamic, pragmatic, conceptual level)	LS		X	LS	X			X			**X**			**2015**	
10a) Develop corresponding STANAGs	LS	X	X		X			X		**X**				**2017**	
Sub-objective 1.2 - Establish recommended data interchange standards for M&S applications and C2-systems.															
1) Establish recommended data interchange standards incorporating existing NATO and external data standards to the maximum practical extent.	LS		X		X			X		**X**		**2009**	**MS3**		

Master Plan Objectives Matrix	Stakeholders LS= Lead-Stakeholder, X = Stakeholder								Schedule Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
2) Ensure easy, effective NATO community access to the data interchange standards.	LS	X	X								**X**	**1998**	**e.g. DIS**		
3) Establish curriculum with periodic update. This action will be accomplished in coordination with Sub-objective 2.2..	LS	X	X					X		**X**		**2009**	**MS3**		
Sub-objective 1.3 - Establish a NATO wide (incl. National Stakeholders) technical environment for distributed networked M&S application areas.															
1) Provide broadband physical network	X		X	X	LS		X				**X**	**2004**	**e.g. MNE4 utilizing e.g. CFBL**		
2) Develop a comprehensive concept for networked distributed M&S utilisation and optimum use of national and NATO resources	LS	X	X	LS	X		X	X		**X**		**2010**	**NETN**	**2014**	
3) Develop and provide technical pre-requisites (e.g. corresponding technical agreement documents)	LS		X	LS	X					**X**		**2010**	**NETN**	**2014**	

Master Plan Objectives Matrix	Stakeholders LS= Lead-Stakeholder, X = Stakeholder								Schedule Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
4) Enable NATO systems operate with the technical environment and enable national systems participating in the technical environment to operate with it	LS		X	LS	X						**X**	**2010**	**NETN**		
Objective II - Provide Coordination and Common Services to Increase Cost-Effectiveness in NATO M&S Activities															
Sub-objective 2.1 - Compile and synthesise widely required M&S information, to include lessons-learned, impact assessments and recommended practices for critical processes such as federation development, VV&A practices, etc.															
1) Periodically survey users, developers and managers to determine the type of M&S information that is commonly needed to reduce costs or to improve the quality and utility of M&S applications.	X	LS	X	LS	X					**X**					
2) Identify sources and collect required information.		LS	X	X	X					**X**					
3) Evaluate and synthesise the information.		LS	X	X	X					**X**					

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4) Provide the resulting information to the education programmes, Knowledge Management system and help desk described in the following sub-objectives.		LS	X	LS	X					**X**					
Sub-objective 2.2 - Establish a capability to share M&S education resources with NATO organizations and Alliance Nations.															
1) Conduct M&S orientation courses on a regular basis.	X	LS	X		X			X		**X**		**1998**	**MSCO simulation course**	**2012**	**MSCO**
2) Conduct a periodic NATO M&S conference.	X	LS	X							**X**		**1998**		**2012**	
3) Sponsor other M&S-related seminars and workshops, as appropriate.		LS	X							**X**		**1998**	**e.g. lecture series**	**2012**	
4) Publish a periodic newsletter.		LS	X							**X**		**2004**	**MSCO**		
5) Make NATO organizations and Alliance Nations aware of other M&S educational resources and opportunities.		LS	X		X			X			**X**	**1998**	**NMSG Meeting**	**2012**	**NMSG meeting**
Sub-objective 2.3 - Promote the sharing of M&S resources such as through a knowledge management process and system															

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	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
1) Develop a comprehensive concept for knowledge management including policy, process and organisation	X	X	X	LS	X	LS	X	X	**X**					**2013**	
2) Establish a knowledge management system (including a Knowledge Base) that will allow easy discovery, population and provision of information of all M&S-related topics	X	X	X	X	X	LS	X	X	**X**					**2015**	
3) Populate the knowledge base	X	X	X	X	X	LS	X	X			**X**			**2015**	
Sub-objective 2.4 - Establish a help desk to facilitate the development and use of M&S.															
1) Define requirements to be supported by a help desk to facilitate cost-effective utilisation of M&S assets across the Alliance.	LS	X			X		X	X		**X**		**1998**			
2) Explore cooperative means to provide help desk support.	X	LS			X		X	X		**X**				**2011**	
3) Provide human resources to operate the help desk.	X	LS									**X**	**2004**			
4) Establish communications to support help desk operations.	X	LS			X			X	**X**			**1998**			

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	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
5) Identify metrics to measure helpdesk effectiveness.	X	LS			X			X		**X**					
6) Analyse the effectiveness of help desk operations on a periodic basis, and revise as appropriate.	X	LS			X		X	X		**X**					
Objective III - Develop Simulations															
Sub-objective 3.1 - Identify and prioritise M&S requirements.															
1) Identify simulation requirements.	LS	X		LS		X					**X**	**2007**	**MORS**		
2) Submit requirements to MSCO that should be considered for cooperative development and/or central resourcing assistance.	LS	X		X		X				**X**		**2007**	**MORS**		
3) Prioritise simulation requirements.	LS	X		X		X				**X**		**2007**	**MORS**		
4) Suggest ET / TAP	LS	X		X	X			X		**X**		**1998**	**PPC**		
Sub-objective 3.2 - Identify the most cost-effective strategies to satisfy each simulation requirement, with a preference for reuse, federation of existing capabilities and co-operative development.															

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	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
1) Conduct activities to test the viability of the co-operative development of multi-national distributed federations	LS	X	X	X	X			X		**X**		**2004**	**MSG-027**	**2014**	**MSG-106**
2) Identify the reuse, modification and development alternatives to satisfy each simulation requirement.	LS	X	X		X		X	X		**X**					
3) Identify the most cost-effective alternative.	LS	X	X		X		X	X		**X**					
4) Identify appropriate focal points for execution of the selected alternative.	LS	X	X	LS	X		X	X		**X**		**2004**	**VMASC**	**2010**	**JWC, MSG-068**
Sub-objective 3.3 - Allocate resources to satisfy the highest priority simulation requirements.															
1) Provide project justification/rationale to potential resource sponsors (organizational or NMSG).	X	X	LS	X	LS		LS	LS		**X**		**2004**	**MSG-027**	**2010**	**MSG-068**
2) Allocate resources.	LS			LS						**X**		**2004**	**ACT, Nations, --> MSG-027**	**2010**	**ACT, Nations, -->MSG-068**
Sub-objective 3.4 - Execute the selected and resourced development strategy.															

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									Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
1) Establishment of a process to support NATO M&S development programmes	X		LS		X			X		**X**		**1998**	**FEDEP**	**2010**	**DSEEP**
2) Identify recognised information sources regarding the application domain(s), and entities and processes to be represented	LS		X	LS	X		X	X		**X**					
3) Acquire from these sources the quality-checked real-world (or projected) information ("raw material") necessary for development of the simulated problem space.	X		LS	X	LS		X	X		**X**					
4) Develop a conceptual model for the simulation	X		LS	X	X		X			**X**					
5) Conduct system design and software development, to include any interfaces with live systems.	X		LS		X		X			**X**				**2012**	**use NETN FAFD**
6) Accomplish verification, validation and testing including standards compliance	LS		X	LS	LS		X	X		**X**					
7) Provide for life-cycle management.	LS		X	LS	LS		X			**X**					
Sub-objective 3.5 - Provide information to the larger NATO community regarding the resultant simulations and any lessons-learned during development.															

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	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
1) Populate the knowledge base of the M&S Knowledge Management system (--> sub-objective 2.3) with information across the complete simulation development and execution process (e.g. FEDEP, DSEEP).	X	X	LS	X	LS		X				**X**				
2) Submit development lessons-learned to the MSCO.	X	X	LS	X	X		X				**X**				
Objective IV - Employ Simulations to Enhance NATO Mission Effectiveness															
Sub-objective 4.1 - Plan employment.															
1) Develop and execute employment plan, to include a clear description of required actions, required resources, responsible organizations, schedule and reports.	X		X	X	X		LS	X		**X**		**2010**	**MSG-068**	**2014**	**MSG-106**
2) Accredit simulations and federations for their intended uses.	X		X	LS	X		LS	X		**X**					

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									Time Frame			First time completed		Prognosis (Plan) for first / next completion	
	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
Sub-objective 4.2 - Provide resources to operate simulations.															
1) Provide the staff and facilities required to use simulations.	X		X	LS	X		LS	X			**X**		**e.g. JWC, JFTC**		
2) Provide hardware, software, communication equipment, security devices and other enduring resources required to operate simulations.	X		X	X	X		LS	X			**X**		**e.g. JWC, JFTC**		
3) Provide funding to prepare the necessary execution-specific, scenario-specific databases (e.g., terrain, order of battle) and communication services.	LS			LS			LS			**X**					
Sub-objective 4.3 - Provide databases.															
1) Define the required databases and their characteristics (e.g., attributes, level of resolution, fidelity).			X	LS	X		LS			**X**					
2) Identify any reuse or co-operative production opportunities.	X	X	LS	X	LS		X	X		**X**					
3) Produce or procure databases, as required	LS		X	LS	X		X			**X**					

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	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
4) Verification, validation and accreditation of databases	LS		X	LS	X		X	X		**X**					
Sub-objective 4.4 - Operate simulations to improve all aspects of NATO / national military activities.															
1) Train operators in the use of simulations.	X		X	X	X		LS	X			**X**		**e.g. JWC**		
2) Establish a curriculum for application of simulation in support of military activities	LS	X	X	LS	X		X	X	**X**					**2014**	**MSG-106?**
3) Execute simulation operations	X		X	X	X		LS			**X**					
4) Collect appropriate data.	X		X	X	X		LS				**X**				
5) Conduct post-execution review.	X			X	X		LS			**X**					**after each simulation execution**
Sub-objective 4.5 - Conduct impact assessments and document lessons-learned to guide further development/investments.															
1) Identify issues of interest and candidate MOE's.	LS	X		LS	X		X				**X**				

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2) Capture M&S employment issues and lessons learned and document this information in the knowledge management system	X	X		X	X		LS				**X**				
3) Assess the impact of simulation employment in terms of objective satisfaction, cost avoidance and other selected MOE's and document this information in the knowledge management system	X			X	X		LS				**X**				
Objective V - Incorporate Technological Advances															
Sub-objective 5.1 - Monitor M&S-related technological advances.															
1) Create a baseline list of M&S related technology-development activities, which will be periodically updated	X	X	X			LS	X	X		**X**		**2010**	**RTB E2DTs, RTHPs**		
2) Establish procedures and develop interfaces with these information sources, as appropriate.	X	X	X			LS	X			**X**					
3) Conduct information-gathering activities.	X	X	X	X	X	LS	X	X			**X**				

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	Nations / NMSG	MSCO	M&S Community e.g. SISO or Simulation Developers	NATO Commands	NATO Agencies	STO	Users	COEs	**fixed**	**periodic**	**continuous**	**date**	**comment**	**date**	**comment**
Sub-objective 5.2 - Conduct research and development, experiments and pilot projects, as needed, to support Alliance requirements.															
1) Identify and prioritise M&S-related technology issues not being addressed elsewhere.	LS	X	X		X	LS	X	X		**X**					
2) Allocate resources for selected research and development, experiments and pilot projects.	LS		X	LS			X			**X**					
3) Conduct resourced technology-development projects.	LS		X	X	LS	X	X	X		**X**					
Sub-objective 5.3 - Share information on realised advances to facilitate incorporation.															
1) Provide easy, cost-effective access to M&S-related technology information via the knowledge management system	LS		X		X	LS	X	X			**X**				
2) Conduct technology interchange meetings/workshops, as appropriate.	LS	X	X	X	X	LS	X	X		**X**					
Sub-objective 5.4 - Implement technological advances.															

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1) Evaluate information received.	X		LS		X	X		X			**X**				
2) Modify/build simulations to apply the technical advances as resources permit.	X		LS	X	X					**X**					

CHAPTER 5 LIST OF ACRONYMSAND REFERENCES

5.1 ACRONYMS

ACT- Allied Command Transformation

ACO- Allied Command Operations

C2- Command and Control

CC- Component Command

CD&E- Concept Development and Experimentation

CFBL- Combined Federated Battle Laboratory

CMRE- Centre for Maritime Research and Experimentation

CNAD- Council of National Armament Directors

COE- Centre of Excellence

DIS- Distributed Interactive Simulation

DMAO- DSEEP Multi-Architecture Overlay

DSEEP- Distributed Simulation Engineering and Execution Process

E2DT- Emerged and Emerging Disruptive Technologies

FAFD- Federation Architecture and FOM Design

FEDEP- Federation Development and Execution Process

FOM- Federation Object Model

HLA- High Level Architecture

HQ- Headquarter

IT- Information Technology

JFC- Joint Forces Command

JFTC- Joint Forces Training Centre

JWC- Joint Warfighting Centre

LS- Lead Stakeholder

M&S- Modelling and Simulation

MC- Military Committee

MNE- Multi-National Experiment

MoD- Ministry of Defence

MOE- Measure of Effectiveness

MORS- Military Operational Requirements Subgroup

MS3- Modelling and Simulation Standards Subgroup

MSCO- Modelling and Simulation Coordination Office

MSG- Modelling and Simulation Group

NAC- North Atlantic Council

NATO- North Atlantic Treaty Organization

NC3A- NATO Consultation, Command, and Control Agency

NCIA- NATO Communications Information Agency

NDPP- NATO Defence Planning Process

NETN- NATO Education and Training Network

NIAG- NATO Industry Advisory Group

NMSG- NATO Modelling and Simulation Group

NMSMP- NATO Modelling and Simulation Master Plan

NRF- NATO Reaction Forces

NSA- NATO Standardization Agency

NTG- NATO Training Group

NURC- NATO Underwater Research Centre

PfP- Partnership for Peace

PPC- Plans and Programmes Committee

RTB- Research and Technology Board

RTHP- Research and Technology Hard Problems

RTO- Research and Technology Organization

SACT- Supreme Allied Command Transformation

SISO- Simulation Interoperability Standards Organization

STANAG- Standardization Agreement

STO- Science and Technology Organization

TENA- Test and Training Enabling Architecture

VMASC- Virginia Modeling, Analysis, and Simulation Center

VV&A- Validation, Verification, and Accreditation

5.2 REFERENCES:

PO(2009)0042 - Action Sheet: Outline Model for a NATO Defence Planning Process