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Workshop Report Scenario Generation for
Simulation Based Design for a
Next Generation Surface Combatant

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Workshop Report Scenario Generation for Simulation Based Design for a Next Generation Surface Combatant

Probleemstelling

De Duitse, Zweedse en Nederlandse Marines hebben in 2004 een coöperatieve ontwerp studie gestart om alternatieve concept ontwerpen te ontwikkelen voor een zogenaamde Next Generation Surface Combatant. Om deze studie te ondersteunen hebben deze Marines een trilateraal samenwerkingsverband gestart op het gebied van Simulation Based Design. Het hoofddoel van dit samenwerkingsverband is het verbeteren van de capaciteiten van requirements analyse in de vroege ontwerp fasen. Daarom wordt onderzocht hoe de relatie tussen operationele eisen en kritische ontwerpparameters beter inzichtelijk gemaakt kan worden. Om deze relatie te analyseren met behulp van simulaties dienen een aantal werkzaamheden te worden uitgevoerd. Een daarvan, waarover dit onderzoek rapporteert, behelst het opstellen van operationele scenario's waarin de kostenbepalende eisen op de gebieden van snelheid, signaturen en modulariteit een sleutelrol spelen.

Beschrijving van de werkzaamheden

Met experts op de gebieden van simulatie, scheepsontwerp en marine operaties uit Zweden, Duitsland en Nederland is een 2-daagse workshop gehouden waarin een aantal contouren voor operationele scenario's zijn opgesteld.

Resultaten en conclusies

De resultaten bestaan uit een serie gespecificeerde scenariocontouren volgens een overeengekomen formaat en de globale definities van de bijbehorende Measures of Effectiveness.

Toepasbaarheid

De opgestelde scenariocontouren zullen verder worden gedetailleerd. Daarna zullen zij, in een vervolgfase van de trilaterale samenwerking, worden geïmplementeerd



als gedistribueerde simulaties. Deze simulaties ondersteunen de nationale scheepsontwerpprocessen door een verbeterd inzicht te geven in de relatie tussen de operationele performance en de kosten van het schip.

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**Workshop Report Scenario Generation for Simulation Based
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Abbreviations

AAW	Anti Air Warfare
ASCM	Anti Ship Cruise Missile
ASSM	Anti Surface Ship Missile
ASM	Air-to-Surface Missile
ASuW	Anti Surface Warfare
ASW	Anti Submarine Warfare
C3	Command, Control and Communications
C4I	Command and Control, Communications, Computers and Intelligence
CSAR	Combat Search And Rescue
ECM	Electronic Counter Measures
FIAC	Fast Inshore Attack Craft
FPB	Fast Patrol Boat
HVU	High Value Unit
JTF	Joint Task Force
LEDET	Law Enforcement Detachment
MCM	Mine Counter Measures
MIO	Military Interdiction Operations
MLRS	Multiple Launch Rocket System
MOE	Measure Of Effectiveness
MOP	Measure Of Performance
MW	Mine Warfare
NGO	Non-Governmental Organisation
NGSC	Next Generation Surface Combatant
NSFS	Naval Surface Fire Support
NBRC	Nuclear, Biological, Radiological and Chemical
NWC	Network Centric Warfare
PGMM	Precision Guided Mortar Munition
PPI	Political Policy Indicator
RIB	Rigid Inflatable Boat
ROE	Rules Of Engagement
SAR	Search And Rescue
SATCOM	Satellite Communications
SBD	Simulation Based Design
SLOC	Sea Lines Of Communication
TNO	Netherlands Organisation for Applied Scientific Research
TNO-FEL	TNO Physics and Electronics Laboratory
UAV	Unmanned Air Vehicle
USV	Unmanned Surface Vehicle
UUV	Unmanned Underwater Vehicle

1. Introduction

This workshop report describes the results of the first Simulation Based Design for a Next Generation Surface Combatant (SBD for a NGSC) workshop. The workshop was aimed at generating operational scenarios for the NGSC. The workshop context and aims are further described in Chapter 3.

The 2-day workshop was hosted by TNO on 9-10 September 2004 and was conducted in TNO's Group Facility Room (see Appendix B). It consisted of a combination of plenary and electronically supported group discussions in which people from Germany, Sweden and the Netherlands participated (see Chapter 2). The participants brought in expertise in the areas of simulation, ship design and military operations.

We want to thank all participants for their valuable input and D.J.D. Wijnmalen and I.M. Paarlberg for facilitating the workshop.

2. Participants

The table below shows the workshop participants.

Table 2.1: *Workshop participants*

Country	Name	Organization
NL	Mr. PF (Peter) van Terwisga	MARTECH
NL	Mr. C (Kees) van Es	MARTECH
NL	Mrs. LTZ2OC MRA (Michèle) Nieuwenhuis	MARTECH
NL	Mr. Dr. JM (Jeroen) Voogd	TNO
NL	Mr. GA (Ger) Willemsen / Mr. HJ (Hilvert) Fitski	TNO
NL	Mr. Dr. JK (Klaas Jan) de Kraker	TNO
Ge	Mr. M (Marco) Bork	BWB
Ge	Mr. UA (Ullrich) Keil	MTG
Ge	Mr. UF (Udo) Basilius	MTG
Ge	Mr. EW (Ernst) Budde	IABG
Ge	Mrs. Dr. T (Thea) Trenkner	IABG
Sw	Mr. M (Magnus) Ornfelt	FMV
Sw	Mr. H (Hans) Stregnell	MATAI

3. Workshop context & aims

Peter van Terwisga explained the workshop context, which is the cooperation between Sweden, Germany and the Netherlands on SBD for a NGSC. The aims of this cooperation are:

1. to support the requirements analysis for surface combatants with respect to three main cost drivers: speed, signatures and modularity,
2. to demonstrate the added value of integrated simulation models and Product Data Modeling (PDM) systems in the early design stage.

The workshop is part of the cooperation's definition phase in which, among other things, the simulation objectives are defined: to gain insight into the relationship between Measures of Performance (MOPs) and Measures of Effectiveness (MOEs) for the purpose of performance evaluation.

The terminology of the NATO NG6 Small Ship Design Study [1] was adopted for Mission, Operation, Task, Function, and Capability and the NATO NG6 Small Ship Design Operations Template was also adopted (see Appendix A). An initial proposal was created in a preparatory meeting for considering a subset of these operations in this workshop. This proposal was presented (see Figure 3.1) and was accepted.

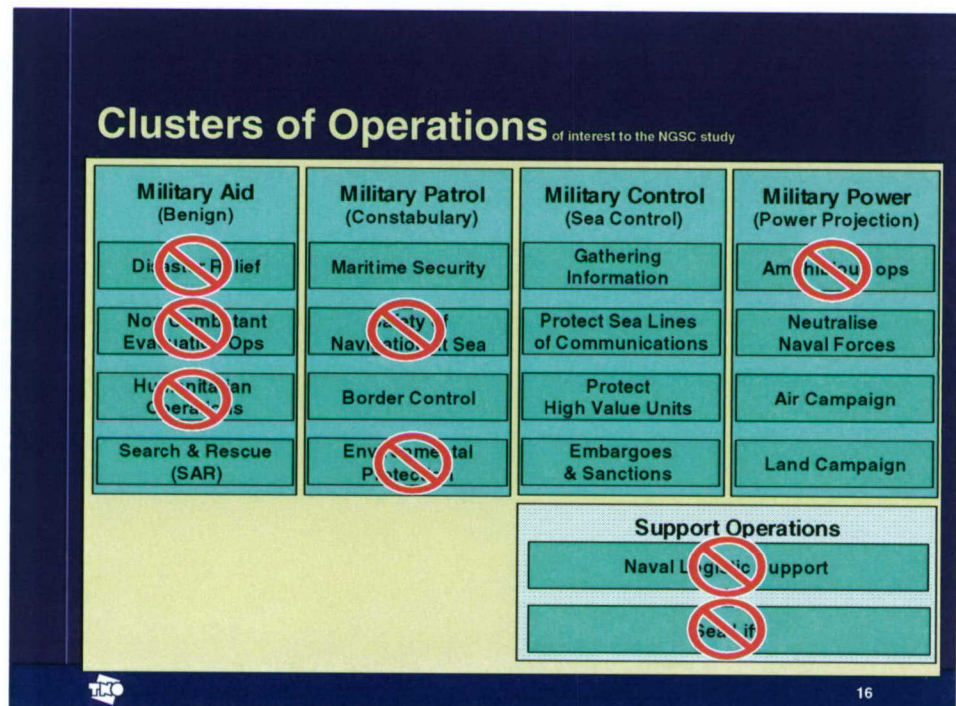


Figure 3.1: Clusters of operations of interest to the NGSC study

The main aim of the workshop was to define operational scenarios for the NGSC, which breaks down into:

1. define its operating environment (natural and threat) - Chapter 4;

2. select tasks that drive the requirements for speed, signatures and modularity - Chapter 5;
3. define a scenario template - Chapter 6;
4. define operational scenarios within the selected tasks - Chapter 7;
5. define MOEs for these tasks/scenarios - Chapter 8.

4. NGSC operating environment

The NGSC will be operating in an environment that has certain general characteristics¹. The following natural environmental aspects and threats were identified in a plenary discussion:

Environmental aspects consist of

- Weather/atmosphere (especially extreme circumstances)
- Ocean/sea/underwater features
- Day/night
- Topography, e.g., harbors, terrain and land features (coastlines, hills, buildings, overgrowth) and borders

These environmental aspects have consequences for

- Crew performance
- Platform performance
- Sensor performance
- Weapon performance
- Decision process

Threats consist of

- Platforms
 - Air (e.g., aircraft, helicopters, UAV)
 - Sea (e.g., frigates, corvettes, FIAC, FPB)
 - Sub-surface (e.g., submarines, divers, UUV)
 - Land (e.g., artillery, tanks, enemy bases and infrastructure)
- Weapons
 - Artillery
 - Ground-launched rockets
 - Missiles
 - Anti ship cruise missiles (ASCM)
 - Air-to-surface missiles (ASM)
 - Surface-to-surface missiles
 - Surface-to-air missiles
 - Anti-tank (guided) missiles
 - Shoulder-launched missile
 - Torpedoes, depth charges
 - MCM equipment (mine sweep)
 - Bombs
 - Precision guided mortar munition (PGMM)
 - Kamikaze craft
 - Nuclear, biological, radiological and chemical (NBRC) weapons
 - Mines
 - Multiple Launch Rocket System (MLRS)
 - Laser damage weapons
- Enemy (Electronic) Counter Measures

¹ The NGSC is expected to enter service in the 2010-2015 timeframe.

- Jammers
- Spoofers
- High-power microwaves
- Decoy
- Soft kill
- Information warfare

5. Shortlist of tasks

The operations from Figure 3.1 and their tasks (see also Appendix A) were further analyzed to select those tasks that are of interest to the NGSC. The selected tasks make up a shortlist of tasks that were used during the remainder of the workshop. A task was selected if (1) speed, signatures, and/or modularity are expected to play a key role in the task, or (2) the task drives the NGSC design. The following decisions were made² after individual brainstorm sessions and plenary discussion.

1. Search and Rescue (SAR), which considers SAR of civilians only and does not drive the design, was not of interest.
2. Under the operation Maritime Security, the task Aid/support to civil authorities, which does not drive the design, was not of interest.
3. Under the operation Maritime Security, the task Combating terrorism is split into two tasks: (1) Anti-terrorism, which is a defensive task, and (2) Counter-terrorism, which is an offensive task.
4. Under the operation Maritime Security, the task Anti piracy was merged with the task Anti-terrorism, because these tasks pose similar requirements on the ship design.
5. The tasks under the operation Border Control pose similar requirements on the ship design as the task Blockades under Embargoes & Sanctions. Hence Border control does not need to be considered.
6. The two tasks under the operation Information Gathering were merged, because they pose similar requirements on the ship design.
7. Under the operation Embargoes & Sanctions, the task Peace Support Operations was considered to be on the wrong level. Also, it does not specify real tasks itself directly, and therefore the task Peace Support Operations was not of interest.
8. From the operation Air Campaign / Land Campaign (JTF campaign), the part Air Campaign was not of interest.

This results in the shortlist of 17 tasks depicted in Table 5.1, which was considered during the remainder of the workshop.

² Note that these decisions have been made only for the purpose of this workshop; It is not attempted to alter the NG6 operation classification.

Table 5.1: Shortlist of tasks

#	Task	Operation	Operation cluster
1	Anti-terrorism/piracy	Maritime Security	Constabulary Operations (Military Patrol)
2	Counter terrorism		
3	Support of Intelligence gathering / Reconnaissance, Surveillance and Target acquisition	Information Gathering	Sea Control Operations (Military Control)
4	Anti Submarine Warfare (ASW)	Protect Sea Lines of Communications (SLOC)	
5	Anti Surface Warfare (ASuW)		
6	Anti Air Warfare (AAW)		
7	Mine Warfare (MW): Mine Laying, Mine counter measures (MCM)		
8	Protection of naval logistic support to forward-deployed battle forces.	Protection of high value units	
9	Force Protection: conserving the fighting potential of the deployed force by countering the threat (ASW, ASuW, and AAW).		
10	Protection of Extraction Force.		
11	Blockades	Embargoes & Sanctions	
12	MIO		
13	UN economic sanction enforcement		
14	Specific targeting of enemy naval forces	Neutralize Naval Forces	Power Projection Operations (Military Power)
15	Destruction of enemy bases/infrastructure		
16	Provide Naval Surface Fire Support (NSFS) gunfire, strike.	Land Campaign (JTF campaign)	
17	Combat Search And Rescue (CSAR).		

6. Scenario template

A scenario template that contains the scenario elements, or attributes, must be agreed upon before scenarios can be described. The scenario template depicted in Table 6.1 was agreed based on an initial proposal and after plenary discussion. Several scenario elements were defined in each of the categories General situation, Environment, Units, Threats and Vignettes. Scenario elements are represented as numbered items and the bullets delineate the elements and give examples.

Table 6.1: Scenario template

<p>General situation</p> <ol style="list-style-type: none"> 1. Timeframe <ul style="list-style-type: none"> ○ Year(s) in which the scenario events will occur. ○ Relevant to, e.g., own units and threats. 2. Generic area of interest <ul style="list-style-type: none"> ○ Indication of geographical location, e.g., Caribbean Sea, Persian Gulf 3. Type of situation <ul style="list-style-type: none"> ○ Peace, Crisis Prevention, Crisis Response, War, Conflict Resolution ○ Indicates type of operations and violence level, Political Policy Indicator (PPI), Rules of Engagement (ROE) ○ Includes political and strategic military objectives 4. Countries/parties involved <ul style="list-style-type: none"> ○ Includes international relations/cooperation ○ Includes level of development of opposing countries/parties ○ Presence/behavior/density of neutrals
<p>Environment</p> <ol style="list-style-type: none"> 5. Environmental aspects <ul style="list-style-type: none"> ○ Weather/atmosphere (especially extreme circumstances) ○ Ocean/sea features/underwater features ○ Day/night ○ Topography, e.g., harbors, terrain and land features (coastlines, hills, buildings, overgrowth) and borders 6. Consequences <ul style="list-style-type: none"> ○ Consequences for crew performance ○ Consequences for platform performance ○ Consequences for sensor performance ○ Consequences for weapon performance ○ Consequences for decision process
<p>Units</p>

<ul style="list-style-type: none">7. Platforms<ul style="list-style-type: none">○ Ships○ Boats○ Submarines○ Aircraft○ Helicopters○ Unmanned vehicles (UAV, UUV, USV)8. Weapons<ul style="list-style-type: none">○ Lethal/non lethal weapons○ ECM, e.g., jamming9. Sensors10. C3 structure<ul style="list-style-type: none">○ Command, Control and Communication
<p>Threats</p> <ul style="list-style-type: none">11. Platforms<ul style="list-style-type: none">○ Air: aircraft, helicopters, UAV○ Sea: frigates, corvettes, FIAC, FPB○ Sub-surface: submarines, divers, UUV○ Land: artillery, tanks, enemy bases and infrastructure12. Weapons<ul style="list-style-type: none">○ Artillery○ Ground-launched rockets○ Missiles: - Anti ship cruise missiles (ASCM) - Air-to-surface missiles (ASM) - Surface-to-surface missiles - Surface-to-air missiles - Anti tank (guided) missiles - Shoulder launched missile○ Torpedoes, depth charges○ MCM equipment (mine sweep)○ Bombs○ Precision guided mortar munition (PGMM)○ Kamikaze craft○ Nuclear, biological, radiological and chemical (NBRC) weapons○ Mines○ MLRS○ Laser damage weapons13. Enemy (Electronic) Counter Measures<ul style="list-style-type: none">○ Jammers○ Spoofers○ High-power microwaves○ Decoy

- Soft kill
- Information warfare

Vignettes/Sequence of events

14. Description of events

- Sufficient detail required for simulation: - Locations -
Movement - Timing
- Actions of own units and of threats

7. Scenario contours

Four groups of 3-4 people were formed such that each of the different nations and expertise were represented as far as possible and each group was then assigned a number of the selected tasks. The tasks were prioritized according to the importance of the tasks for the purpose of this workshop. The objective for all the groups was to define a scenario contour using the scenario template for each of their tasks.

It was only possible to define scenario contours for 7 out of 17 tasks in the available time. The scenario contours were presented and discussed in plenary group and the resulting scenario contours are shown below.

7.1 Maritime Security: Counter-terrorism

Post-workshop note:

This scenario contour actually does not deal with counter-terrorism as such; instead it describes a smuggling interdiction operation. Hence the task in which this scenario contour occurs actually is the task of Maritime Security: Border Control. A new scenario contour for Maritime Security: Counter-terrorism may be defined later.

This scenario contour describes the catching of drugs smugglers within the task Maritime Security: Counter-terrorism.

General situation

1. Timeframe
 - 2010, two weeks
2. Generic area of interest
 - Caribbean Sea
3. Type of situation
 - Crisis prevention, de-escalation, show presence
4. Countries/parties involved
 - LEDET, high level technique of smugglers, density of neutrals high

Environment

5. Environmental aspects
 - clear weather conditions, seastate < 3
 - day and night
 - topography to be described
6. Consequences

<ul style="list-style-type: none"> ○ performance unaffected
<p>Units</p> <ul style="list-style-type: none"> 7. Platforms <ul style="list-style-type: none"> ○ one ship incl. RIB, UUV for detection of smuggler submarines, no aircraft, one helicopter, one UAV (sensor + weapon) 8. Weapons <ul style="list-style-type: none"> ○ non-lethal weapon 9. Sensors <ul style="list-style-type: none"> ○ No specific requirements 10. C3 structure <ul style="list-style-type: none"> ○ No specific requirements
<p>Threats</p> <ul style="list-style-type: none"> 11. Platforms <ul style="list-style-type: none"> ○ aircraft, boat, submarines 12. Weapons <ul style="list-style-type: none"> ○ small guns, torpedoes 13. Enemy (Electronic) Counter Measures <ul style="list-style-type: none"> ○ Not specified
<p>Vignettes/Sequence of events</p> <ul style="list-style-type: none"> 14. Description of events <ul style="list-style-type: none"> ○ It is tried to stop and arrest the smugglers using non-lethal weapons. If the smugglers start firing, the situation changes and a variant of this scenario comes into effect.

7.2 Protect Sea Lines of Communication: Anti-Surface Warfare

This scenario contour describes the control and dominance of sea routes that connect an operation military force. This includes their supplies and reinforcements, with their bases of operations within the task of Protect Sea Lines of Communication: Anti-Surface Warfare (ASuW).

<p>General situation</p> <ul style="list-style-type: none"> 1. Timeframe <ul style="list-style-type: none"> ○ long time cruising speed, seldom sprint speed 2. Generic area of interest <ul style="list-style-type: none"> ○ blue and brown water, SLOC runs from Indonesia to Australia 3. Type of situation <ul style="list-style-type: none"> ○ To ensure control and dominance of sea routes that connect an operation military force including their supplies and reinforcements with their bases of operations. Include taking
--

<p>the initiative for offensive actions</p> <p>4. Countries/parties involved</p> <ul style="list-style-type: none"> ○ (large) countries + alliances
<p>Environment</p> <p>5. Environmental aspects</p> <ul style="list-style-type: none"> ○ 24 h and 30 days in operation <p>6. Consequences</p> <ul style="list-style-type: none"> ○ Blue water: motion sickness and fatigue affect crew performance ○ Platform motions affect operability of sensors and weapon systems and organic systems ○ boredom degrades crew performance -> affects human decision process
<p>Units</p> <p>7. Platforms</p> <ul style="list-style-type: none"> ○ supported by ships, naval aircraft, organic helicopters, UAVs <p>8. Weapons</p> <ul style="list-style-type: none"> ○ Lethal weapons: ship-ship missiles, 5 or 6 inch gun ○ standard self-defense weapons <p>9. Sensors</p> <ul style="list-style-type: none"> ○ Not specified <p>10. C3 structure</p> <ul style="list-style-type: none"> ○ Standard
<p>Threats</p> <p>11. Platforms</p> <ul style="list-style-type: none"> ○ frigates, corvettes, destroyers, FPB exclude smaller brown water boats (see: maritime security) <p>12. Weapons</p> <ul style="list-style-type: none"> ○ Not specified <p>13. Enemy (Electronic) Counter Measures</p> <ul style="list-style-type: none"> ○ Not specified
<p>Vignettes/Sequence of events</p> <p>14. Description of events</p> <ul style="list-style-type: none"> ○ signatures are affected by sea state and ship motions

7.3 Protect High Value Units: Naval logistic support

This scenario contour describes the protection of naval logistic support to forward-deployed battle forces within the task of Protect High Value Units: Naval logistic support.

General situation

1. Timeframe
 - 2010-2015
2. Generic area of interest
 - littoral in Middle-East
3. Type of situation
 - Land forces are engaged in peace enforcing ops, high level of violence, mix of symmetric/asymmetric threat. Naval units provide logistic support and protect from seaside. Most supplies must go to one harbor, under control of own troops. Insufficient airports available for supply.
4. Countries/parties involved
 - Own: coalition of 3 NATO and 3 other nations.
 - Enemy: failed state XXX with warlord factions. Paramilitary troops try to prevent supply. Control area at 20 km from harbor and various parts along coast. Attacks with small craft on sea-based and land-based platforms. Paramilitaries are supported by part of population (tribe/religion).

Environment

5. Environmental aspects
 - Tropical conditions, adverse effects on propagation. Nearby coastlines, islands, limited deployment space. Day/night. Enemy exploits night conditions for attack. Large amount of civilian traffic in region. Area around harbor is densely populated. Two civil airlines complicated air picture.
6. Consequences
 - Not specified

Units

7. Platforms
 - In total there are 6 own ships available to protect supply over a 300 km route. Military and civil supply, incl. tankers, average 5 ships in harbor and 5 ships at sea.
8. Weapons
 - Up to designer
9. Sensors
 - Up to designer
10. C3 structure
 - Shared surveillance. Inputs by troops on land. Situational awareness complicated by large amount of unidentified civil traffic.

Threats

<p>11. Platforms</p> <ul style="list-style-type: none"> ○ Sea: FIACs ○ Land: ASSMs and anti-tank missiles. Attacks from densely populated area make counter-attack very difficult (collateral damage). ○ Suicide attack in harbor: cars with explosives. <p>12. Weapons</p> <ul style="list-style-type: none"> ○ FIACs armed with anti-tank weapons, rockets, automatic guns. ○ ASSMs with a range of 100 km, subsonic, fired from land/islands. <p>13. Enemy (Electronic) Counter Measures</p> <ul style="list-style-type: none"> ○ None
<p>Vignettes/Sequence of events</p> <p>14. Description of events</p> <ul style="list-style-type: none"> ○ Not specified

7.4 Protect High Value Units: Extraction force

This scenario contour describes the protection of an extraction force within the task of Protect High Value Units: Extraction force.

<p>General situation</p> <ol style="list-style-type: none"> 1. Timeframe <ul style="list-style-type: none"> ○ 2010-2015 2. Generic area of interest <ul style="list-style-type: none"> ○ Somalia or West Africa 3. Type of situation <ul style="list-style-type: none"> ○ Peacekeeping situation escalates, support withdrawn. Forces from small coalition (2 nations) must be withdrawn. Extraction by naval force necessary. At same time evacuation of civilians, NGO people. No harbor facilities available. Forces are attacked by rebels. Situation escalates fast. Extraction within one night necessary. 4. Countries/parties involved <ul style="list-style-type: none"> ○ Own: troops (100) on land from 2-nation coalition. Only one ship available.
<p>Environment</p> <ol style="list-style-type: none"> 5. Environmental aspects <ul style="list-style-type: none"> ○ Not specified 6. Consequences <ul style="list-style-type: none"> ○ Not specified

Units <ul style="list-style-type: none">7. Platforms<ul style="list-style-type: none">○ Not specified8. Weapons<ul style="list-style-type: none">○ Not specified9. Sensors<ul style="list-style-type: none">○ Not specified10. C3 structure<ul style="list-style-type: none">○ Not specified
Threats <ul style="list-style-type: none">11. Platforms<ul style="list-style-type: none">○ Not specified12. Weapons<ul style="list-style-type: none">○ Not specified13. Enemy (Electronic) Counter Measures<ul style="list-style-type: none">○ Not specified
Vignettes/Sequence of events <ul style="list-style-type: none">14. Description of events<ul style="list-style-type: none">○ Land groups assemble at one location. Extracted in groups of 20 by helicopter.

7.5 Embargoes & Sanctions: Military interdiction operations

This scenario contour describes a military interdiction operation within the task of Embargoes and Sanctions: Military interdiction operations.

General situation <ul style="list-style-type: none">1. Timeframe<ul style="list-style-type: none">○ Through the whole in-service life.2. Generic area of interest<ul style="list-style-type: none">○ All strategic positions in the world (e.g., Horn of Africa).3. Type of situation<ul style="list-style-type: none">○ Crisis prevention or stabilization operation.○ PPI X or Y○ In principle political objectives from, e.g., UN, NATO.4. Countries/parties involved<ul style="list-style-type: none">○ Cooperations between NATO/PfP and UN nations.○ Opposing countries/parties with lower level of development.○ Normal commercial activities at any time and place => limiting

operational freedom.
Environment <ul style="list-style-type: none">5. Environmental aspects<ul style="list-style-type: none">○ Tropical climate : high temperatures (water and air), high humidity, danger of any kind of storms○ Whole day operations.○ Open sea in connection with coast lines (beaches, hills, islands).6. Consequences<ul style="list-style-type: none">○ Crew and platforms: long endurance in tropical circumstances.○ Part of NCW community and distance to politicians.
Units <ul style="list-style-type: none">7. Platforms<ul style="list-style-type: none">○ Ships/boats○ Submarines○ Aircrafts/helicopters○ Whole spectrum of drones.8. Weapons<ul style="list-style-type: none">○ Whole spectrum of weapons, with a focus on : guns, decoys, weapon systems for up to hull operations (air, sea, sub-sea), water-gun9. Sensors<ul style="list-style-type: none">○ Whole sensor spectrum : 360deg., shorter range up to hull, high refresh-rate10. C3 structure<ul style="list-style-type: none">○ Normal NATO C3 with NCW aspects
Threats <ul style="list-style-type: none">11. Platforms<ul style="list-style-type: none">○ All possibilities with a focus on asymmetric threats12. Weapons<ul style="list-style-type: none">○ Not specified13. Enemy (Electronic) Counter Measures<ul style="list-style-type: none">○ Not specified
Vignettes/Sequence of events <ul style="list-style-type: none">14. Description of events<ul style="list-style-type: none">○ Not specified

7.6 Protection of high value units: Force Protection

Post-workshop note:

This scenario contour describes the protection of merchant ships whereas the task Protection of high value units: Force Protection actually concerns naval ships. Hence, to fit this task, this scenario contour should be adjusted. The ASW aspects of this scenario contour are still considered to be relevant.

This scenario contour describes the protection of merchant ships within the task Protection of high value units: Force Protection: conserving the fighting potential of the deployed force by countering the threat (ASW, ASuW, AAW).

<p>General situation</p> <p>The task is to protect high value units which are merchant ships including tankers.</p> <ol style="list-style-type: none"> 1. Timeframe <ul style="list-style-type: none"> ○ Timeframe is selected to 2010, Length of the operation 3 days 2. Generic area of interest <ul style="list-style-type: none"> ○ North Sea from Norway to the Netherlands 3. Type of situation <ul style="list-style-type: none"> ○ A hostile country is trying to create economic and environmental disturbances ○ Crisis prevention ○ Includes political objectives 4. Countries/parties involved <ul style="list-style-type: none"> ○ Norway and the Netherlands protect the tanker with 1 ship each. ○ A hostile country from another part of the world.
<p>Environment</p> <ol style="list-style-type: none"> 5. Environmental aspects <ul style="list-style-type: none"> ○ Normal weather conditions sea state 3 wind from the north 12 m/s and clear. ○ The under water conditions are of importance, the bottom profile and depth ○ Day and night 6. Consequences <ul style="list-style-type: none"> ○ Crew performance has degraded somewhat due to sea state and duration/boredom. ○ The ship's signature is increased due to sea state. ○ The performance of the ship's sensors is decreased by the environment.
<p>Units</p>

<p>7. Platforms</p> <ul style="list-style-type: none"> ○ Two ships (ASW frigates) are taken part in the operation, both equipped with helicopters <p>8. Weapons</p> <ul style="list-style-type: none"> ○ The helicopters have anti-submarine torpedoes ○ The ships have ship launched anti-submarine torpedoes <p>9. Sensors</p> <ul style="list-style-type: none"> ○ The ship's sonar is used to detect torpedoes. A better alternative is to have a towed array sonar. <p>10. C3 structure</p> <ul style="list-style-type: none"> ○ 3D presentation of the sub-surface situation picture ○ Engagement planning functions for the engagement of own ships underwater weapons and engagement planning for self defense.
<p>Threats</p> <p>11. Platforms</p> <ul style="list-style-type: none"> ○ Enemy surface ships are likely to be spotted from the land -> they use submarines. <p>12. Weapons</p> <ul style="list-style-type: none"> ○ Heavy torpedoes to attack the tanker <p>13. Enemy (Electronic) Counter Measures</p> <ul style="list-style-type: none"> ○ Not specified
<p>Vignettes/Sequence of events</p> <p>14. Description of events</p> <ul style="list-style-type: none"> ○ Enemy submarine is lying on the bottom of the North Sea and waits for the convoy to arrive ○ If the convoy is detected the submarine maneuvers to a waiting position such that the tankers will come into range ○ The waiting submarine is detected by a frigate ○ A helicopter is send out to launch an anti-submarine torpedo at the waiting submarine ○ The submarine launches a torpedo at the tanker ○ The enemy torpedo must be stopped

7.7 Information Gathering

This scenario contour describes the gathering of intelligence in a hostile area within the task Information Gathering (Support of Intelligence gathering, Reconnaissance, Surveillance and Target acquisition). This scenario contour actually contains two variants, which are indicated below by V1 and V2.

General situation

1. Timeframe
 - 2010-2015
 - No time-related influences
2. Generic area of interest
 - Worldwide area of threat or interest
3. Type of situation
 - Could be any type of conflict (situation)
 - PPI X for own, PPI Z for enemy
 - Strategic to tactical emphasis
4. Countries/parties involved
 - Individual task is usually done by the ship alone, embedded in alliance operations

Environment

5. Environmental aspects
 - Undetected surveillance of coastlines during nighttime (daytime is possible)
 - Atmospheric and underwater conditions are of importance to the success of the gathering of information
6. Consequences
 - Not being detected is of great importance; therefore, silence of crew and equipment. Low signatures possible in different environmental conditions.
 - decision processes depend on gathered information and must be flexible, well-informed (C4I). Networks, SATCOM, etc., must be robust.

Units

7. Platforms
 - Own ship with extensive sensor equipment and organic units (RIB, AUV, helicopter)
 - Marine type forces which are prepared to land with RIB or helicopter in small groups
8. Weapons
 - Weapons on ship to (1) provide fire support, (2) defend against hostile small ships (V2 operations in the presence of bigger hostile ships must be avoided)
 - Landing marines carry small weapons
 - ECM to defeat engagement or to prevent detection
9. Sensors
 - All types of on-board sensors, additional sensors in airborne and sub-surface organic units
 - Landing marines carry equipment for land observation (night

vision, etc.)

10. C3 structure

- Own operations are usually supported by alliance network
- Observation results are reported back to the alliance network
- During operations, communications may be prohibited; network (C3) access before and after operations or in emergency cases
- All sensor information should be processed in real-time.

Threats

11. Platforms

- In V1: all observed units (any surface and sub-surface ship class plus aircraft) may become aggressive
- In V2: it is assumed that no bigger hostile surface ships are in the vicinity of the operation. Threat from small boats and land platforms.

12. Weapons

- in V1: the whole suite of naval weapons incl. torpedoes
- in V2: coastal artillery, infantry weapons

13. Enemy (Electronic) Counter Measures

- Enemy uses all ECM types, they normally use for defense purposes; if known they can be omitted to stay undetected.
- In V1: enemy ECM (wave forms) are subject of information gathering
- in V2: passive counter-measures (camouflage) may create problems
- Use of jammers, perhaps decoys. Use of mis-information in C3?
- underwater counter-measures

Vignettes/Sequence of events

14. Description of events

- V1: long-term observation of hostile operations esp. in maneuvers, with strategic and political objectives
- V1: own ship observes from significant distance the operations with all kind of sensors (eye, radar, etc. over full spectrum of electromagnetic frequencies)
- V1: ship mostly tries to stay undetected
- V1: own signature should be low
- V1: ship must be able to escape (speed)
- V2: observation of a specific geographical region (e.g., for preparation of own operations)
- V2: ship uses on-board and airborne sensor platform to survey the area
- V2: ship sends special forces with organic boats to region

- V2: ship uses special NBCR sensors
- V2: ship and RIB may become subject of hostile attacks and must be prepared to escape in short time (RIB must return, must be recovered, and the ship must leave national waters in short time)
- V2: If special forces on land come under hostile fire, fire support from own ship may be provided

8. Measures of Effectiveness

Hilvert Fitski explained the current view on defining a Measure of Effectiveness (MOE). A high-level MOE often breaks down into several lower-level MOEs. MOEs are often expressed as probabilities. For example, the probability of catching a smuggler (high-level MOE) could consist of the probability of detecting the smuggler, the probability of identifying the smuggler and the probability of boarding the smuggler ship. The high-level MOE can be calculated from the lower-level MOEs using probability calculus.

MOEs were defined for each of the scenario contours.

8.1 Maritime Security: Counter-terrorism

Post-workshop note: see section 7.1.

This scenario contour describes the catching of drugs smugglers and it is assumed that there is only one smuggler to be stopped. All MOEs in this subsection should be interpreted as probabilities.

High-level MOE

- Stop and board the smuggling vessel and identify the contraband.

Low-level MOEs

- need for proper intelligence: amount, accuracy, reliability
- surveillance: detection
- positive identification
- interception (speed is considered important: own speed, helicopter, small organic fast boats; signatures are also considered important for counter-detection)
- force the smuggler to stop (important: type of ROEs, presence of helicopter, performance of weapons)
- board the smuggling vessel
- identify the contraband

8.2 Protect Sea Lines of Communication: Anti-Surface Warfare

This scenario contour describes the control and dominance of sea routes that connect an operation military force, including their supplies and reinforcements, with their bases of operations.

High-level MOE

- The percentage of undamaged convoys reaching their destination
- Other measures/factors
- The time it takes for the ship to maneuver itself between the convoy and an identified threat
 - The task is to protect a convoy. The convoy has a speed that depends on the secured speed delivered by the frigate (secured speed depends on the area of sensors of the frigate) and the helicopters (secured speed depends on the speed of the frigate itself, its sensors and the influence of the helicopters if needed to expand the area to observe, which depends on possible threats). A MOE can be defined as the percentage of convoy's speed without the presence of the frigate to the reduced speed with the frigate securing the convoy
 - If different types of convoys are to be handled: the time it takes to change the sensor and weapon systems from those specific for brown water to those specific for blue water.
 - The time it takes to positively identify a threat.

8.3 Protect High Value Units: Naval logistic support

This scenario contour describes the protection of naval logistic support to forward-deployed battle.

High-level MOE

- Level of deterrence achieved = probability that ships being protected are not attacked

Other measures/factors

- Probability that ships being attacked survive
- Probability of killing/detering aggressors
- Total value of protected goods (including ships)
- Self-survivability
- Number of own ships needed to produce a certain protection level (can be a function of speed)
- Softkill self-protection capability (low signature, active counter-measures, escape maneuvers)

8.4 Protect High Value Units: Extraction force

This scenario contour describes the protection of an extraction force.

High-level MOE

- Number of extracted soldiers in a time period

Other measures/factors

- Number of extracted civilians in a time period
- Number of extracted materiel per time
- Survivability of extracted personnel
- Survivability of own ship
- Probability to protect the location of embarkation
- Ability to remain undetected during operation

8.5 Embargoes & Sanctions: Military interdiction operations

This scenario contour describes a military interdiction operation which concerns sailing along a border or covering an area of open sea.

MOEs/factors

- Detection: successful picture updates per time (e.g., hour, day, week) for the area which must be controlled.
- Classification:
- Identification:
- Reaction time: probability of successful interception within the reaction time.
- Probability of covering the surveillance area in relation to the reaction time for reaching the target (probability will almost never be 1).
- Relationship between reachable reaction time and possible intercept time (should be <1). If the reaction time is too long for intercepting (>1) the single task will fail.

8.6 Protection of high value units: Force Protection

Post-workshop note: see section 7.6.

This scenario contour describes the protection of merchant ships.

High-level MOE:

- Probability for the HVU to survive

Low-level MOEs:

- Probability to detect, localize and classify torpedo
- Probability to neutralize torpedo
- Probability to detect submarine

- Probability to locate submarine
- Probability to classify submarine
- Probability to neutralize submarine

8.7 Information Gathering

This scenario contour describes the gathering of intelligence in a hostile area.

High-level MOE:

- Permanent coverage of the whole electromagnetic frequency band.

Low-level MOEs:

- in V1 and V2: completeness and correctness of gathered information
- Probability to stay undetected (low signature)
- Probability of own survival (ship, organic units, special forces, divers)
- V1 and 2: ability to maneuver and respond quickly to detection. This implies high speed and flexible propulsion.
- In V2 and V1: probability of escaping severe hits
- Ability to launch and recover organic units
- Hit accuracy during fire support
- Capability to coordinate fire support closely with own forces on land
- Ability to evaluate received/recorded signals
- Flexibility in layout and combination of sensors and other equipment (modularity)

9. Closure

The workshop participants were asked to express their thoughts, concerns and ideas on the cooperation between Sweden, Germany and the Netherlands on SBD for a NGSC, especially on the workshop itself and the future work of the cooperation, using individual brainstorm sessions and plenary discussion. The results are summarized in the following:

1. It was commonly agreed that the scenario work is not yet finished. For example, more scenarios should be developed, scenarios should be further detailed and the definition of MOEs should be completed – all with more input of operational people – (parts of) scenarios that are suitable for simulation should be selected, requirements for the simulation environment should be specified, etc.
2. It was agreed that the Netherlands will prepare a project proposal that specifies the work, including the work under item 1, that should be done. This proposal should be ready at the start of November 2004 and should be finalized before the end of 2004.
3. The participants were very happy with the workshop's tool support and in particular with the way the workshop was organized and conducted.
4. It was agreed that Klaas Jan de Kraker will create a workshop report (this report) which will be reviewed by all participants.

10. References

- [1] NATO NG6; *Small Ship Design Study*; NATO; November 2003.

11. Signature

A handwritten signature in black ink, consisting of several vertical strokes and a horizontal line extending to the right, positioned above a dotted horizontal line.

Dr. G.J. Jense
Project leader/Group leader

A handwritten signature in black ink, featuring a series of overlapping, curved strokes, positioned above a dotted horizontal line.

Dr. J.K. de Kraker
Author

Appendix A Chapter 3 General Mission Requirements from NATO NG6 Small Ship Design Study

3.0 General Missions Requirement

INTRODUCTION

This chapter provides a general methodology for defining and analysing the missions to be executed by small surface combatants. A mission analysis is a very important part of the design process of new warships, and particularly where a requirement-based (also referred to as requirement-driven) design process is being used. The success of any requirement-based mission analysis depends on the accurate definition of mission requirements which are determined by its operations, tasks and capabilities.

DEFINITIONS

In this methodology the following definitions (see also figure 3.1) are used:

Mission:

A Mission is an assignment with a purpose that clearly indicates the military actions to be taken and the reasons therefore and consists of operations to be carried out simultaneously or in succession.

Operation

An Operation is a military action based on doctrines that supports a Mission and consists of Tasks.

Task:

A Task is a discrete event/action that enables a Mission to be accomplished by individuals or organizations.

Function:

A Function is a specific unit action that delineates how a particular aspect of a task is to be performed.

Capability:

A Capability is a type of system(s) or an individual that is required to accomplish a particular Function.

Missions and Operations are closely related and often interrelated when defining the same set of tasks to be carried out. Whereas a mission defines high level goals determined by actual threats or undesirable situations, an operation is dictated by a specific supporting pre-defined goal, such that military doctrines can be used. Operations, therefore, are the “toolbox” of the armed forces, used to plan and organize the execution of a mission by dividing the job to be done into pre-defined and well-trained parts.

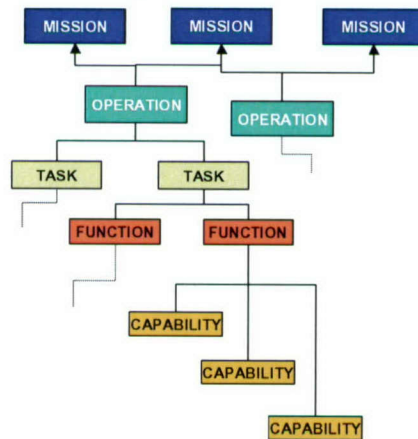


Figure 3.1 : Hierarchy of Missions, Operations, Tasks, Functions and Capabilities

Small Ships: displacement vs. capabilities

This Working Paper has been developed for both Offshore Patrol Vessels (OPV) and Small Surface Combatants (SSC). Both naval ship types, compared to frigates, are defined as “small ships” varying from 600 to 2000 tonnes. However, contrary to this thinking, it is the limitations of its capabilities of these types of ships rather than its displacement that provides a more adequate discriminator. Therefore, a small displacement could be the result of limited capabilities but not necessarily the vice versa.

The frigate, varying in displacement from 3000 to 5000 tonnes, remains an important point of reference among navies, because it represents the smallest combatant that can conduct extended blue-water missions in a high-threat environment. It is, as a result of these capabilities, also a relatively sophisticated and therefore expensive platform.

The missions of SSC’s like Corvettes and Fast Attack Craft, however, mostly involve regional operations as these ships have limited endurance, range and sea keeping qualities. Also their combat-suite has a limited fighting capacity with respect to certain threats. Nonetheless, these platforms can prove extremely useful when supporting or conducting Power Projection, especially with respect to littoral operations.

The OPV is specially designed for patrolling the waters of an Exclusive Economic Zone (EEZ) and, therefore, specialized in conducting constabulary operations, which is its primary mission. Often humanitarian and disaster relief operations are tasks also performed by these types of vessels. As these operations are executed in a low threat environment these vessels are generally lightly armed (a medium-sized gun). As boarding capabilities are essential to their operations, these vessels are often equipped with one or two small fast boats.

The difference between a frigate, OPV and Corvette, as defined by the spectrum of their military employment, is presented in the graph in figure 3.2a.

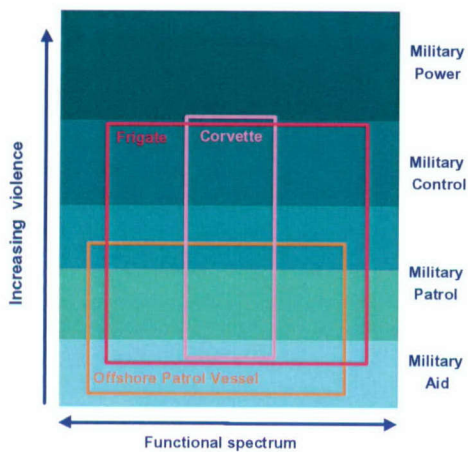


Figure 3.2a: Military employment versus functional spectrum

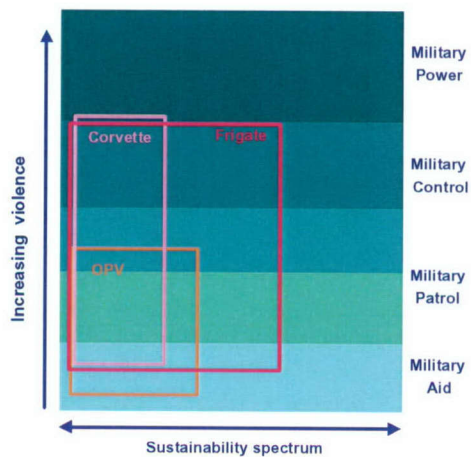


Figure 3.2b: Military employment versus Sustainability spectrum

A similar relationship can be derived by comparing the military employment and the sustainability of these different types of ships (see figure 3.2b).

NAVAL OPERATIONS TEMPLATE FOR SSD

Naval operations can be categorized according to four operational clusters: *Military Aid*, *Military Patrol*, *Military Control* and *Military Power*. *Military Aid* refers to all benign operations like humanitarian assistance and disaster relief operations. *Military Patrol* refers to all law enforcement or constabulary operations. *Military Control* refers to all naval Sea Control¹ operations. *Military Power* refers to all Power Projection² operations.

Both *Military Control* and *Military Power* clusters are related to operations often conducted in a medium- or high-threat environment. They are, therefore, operations typically conducted by SSC's. The OPV is specialized in conducting *Military Patrol* operations, which is its primary role. Often OPV's also have built-in capabilities to conduct humanitarian and disaster relief operations. As an alternative, SSC's can also be used to conduct *Military Aid* and *Military Patrol*. These operations, however, are often defined as their secondary mission. A similar cluster, often used when defining these secondary missions related to surface combatants, is "Peace Operations" or "Operations other than war". This cluster is the NATO-equivalent of "Non-Article 5 Crisis Response Operations (NA5CRO) and not only refers to *Military Aid* and *Military Patrol* operations but also includes *Military Control* (or Sea Control) insofar as these are limited to "Peace Support Operations" as defined by the UN and implemented by NATO.

As cost-effectiveness becomes more and more an issue in naval ship design, there is a tendency to design multi-mission SSC's. To prevent the costs of SSC's from rising, modularization is used as an alternative. New OPV's are often equipped with a helicopter deck and hangar to enhance its patrol capabilities. Some nations include space and weight margins for future weapons upgrades with a view to using these ships for expeditionary Peace Support operations or the equivalent of low threat *Sea Control* operations. From these developments as visualised in figure 3.3, it can be concluded that the overlap between OPV's and SSC's becomes more and more profound as far as operations are concerned.

This trend supports the possible use of a general template for Small Ship Design (SSD), defining missions to be carried out by both SSC's and OPV's. Based on the same four operational clusters, a template has been defined which summarizes all naval operations to be conducted by both types of ships. This template is shown in figure 3.4 and can be used as a "toolbox" for mission analysis purposes.

The generic naval operations as shown in this template covers a cluster of operations based on mission similarity. To complete this naval operations template a separate cluster, normally not conducted by surface combatants, is added for conducting mission *Support Operations*. Within the context of this template these operations concern Naval Logistic support and Sealift.

¹ Sea Control: to attain and maintain a desired degree of freedom of action within an area of the sea (surface, sub-surface, air above and coastal areas) for one's own purposes for a period of time and, if necessary, deny its use to an opponent.

² Power Projection: the ability to project force from a maritime force into the territory of another state.

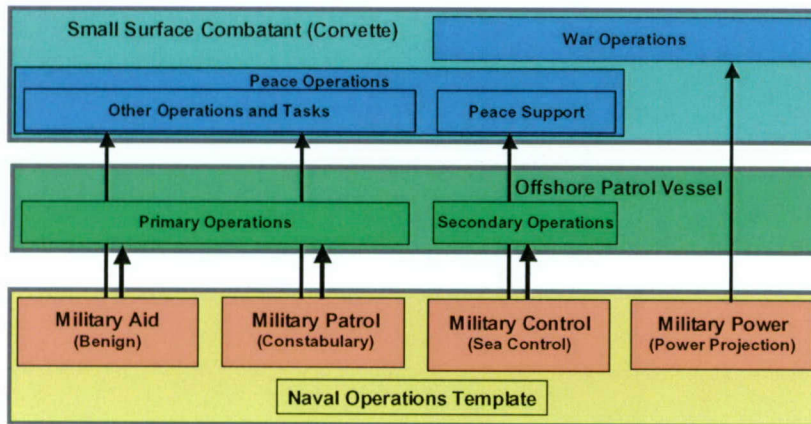


Figure 3.3: SSD Operations Template versus OPV's and SSC's

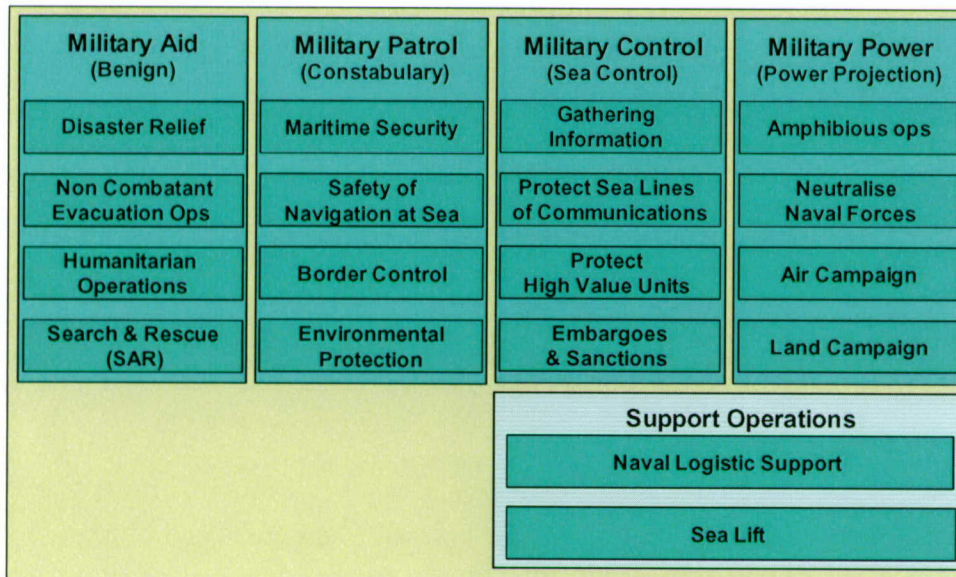


Figure 3.4: SSD Operations Template

Naval Logistic Support in general extends the naval operation providing spares, maintenance, re-supply of consumables and manpower “at sea”. Sealift operations are transport operations conducted to deploy, reinforce and re-supply expeditionary land forces. Both operations mainly concern the support of *Military Control* and *Military Power*.

DEFINITIONS OF SSD OPERATIONS TEMPLATE

To have a better understanding of the naval operations mentioned in the template each cluster of operations is now defined in more detail.

Benign Operations (Military Aid)

Disaster Relief

Supporting efforts to relieve or reduce the results of natural or manmade disasters that might present a serious threat to life or can result in great damage to, or loss of, nature or property.

Humanitarian Relief

Supplementing or complementing the efforts of the responsible authorities to relieve or reduce the results of natural or manmade disasters or other endemic conditions that might present a serious threat to human life or result in great damage to, or loss of, property.

Non-combatant Evacuation Operations (NEO)

Supporting the safe and quick removal of civilian non-combatants from an area where they are being, or may be, threatened.

Search and Rescue (SAR)

The search for and rescue of personnel in distress on land or at sea by means of aircraft, surface craft and submarines, specialized rescue teams and equipment.

Constabulary Operations (Military Patrol)

Maritime Security

- Combating terrorism:
 - Antiterrorism: the protection of individuals and properties at sea to reduce vulnerability for terrorist acts.
 - Counter terrorism: offensive measures taken to prevent, deter and respond to terrorism.
- Anti piracy: the protection of individuals and properties at sea to reduce vulnerability for acts of piracy.
- Aid/support to civil authorities: providing legally authorized military assistance to civil communities or authorities to counter civil disturbance (riots, group acts etc.) and quarantine operations.

Safety of Navigation at sea

- Support of vessel safety inspections.
- Support of maritime traffic control.

Border Control

- Enforce drug interdiction.
- Enforce smuggling interdiction.
- Prevention of illegal immigration.

Environmental Control

- Marine pollution enforcement and response: responses to hazardous material releases, restoring contaminated land and water, and conserving national natural and cultural resources.

- Control of observance of legislation on protection of living marine resources (fishing policing).

Sea Control Operations (Military Control)

Information Gathering

- Support of Intelligence gathering: proactive collection of information to produce useful predictive intelligence to be disseminated to those who need to know.
- Reconnaissance, Surveillance and Target acquisition: systematic observation of areas, places, persons, objects and targets in order to monitor change or movement of military significance i.e. to support military operations relevant to strategic, operational and tactical information related to the following areas:
 - Indications and warning;
 - Planning and employment;
 - Assessment.

Protect Sea Lines of Communications (SLOC)

To ensure control and dominance of sea routes that connect an operating military force including their supplies and reinforcements with their bases of operations by conducting:

- Antisubmarine Warfare (ASW);
- Anti Surface Warfare (ASuW);
- Anti Air Warfare (AAW);
- Mine Warfare (MW):
 - Mine Laying: to establish and maintain control of essential sea areas through the use of naval mines to inflict damage on enemy shipping, submarines, and/or to hinder, disrupt and prevent enemy sea operations;
 - Mine counter measures (MCM): offensive and defensive operations for countering a mine threat, including the prevention of enemy mine-laying.

Protection of high value units

- Protection of naval logistic support to forward-deployed battle forces.
- Force Protection: conserving the fighting potential of the deployed force by countering the threat (ASW, ASuW, and AAW).
- Protection of Extraction Force.

Embargoes & Sanctions

- Blockades: to isolate a place, especially a port, harbour or part of a coast to prevent enemy forces from entry or exit;
- MIO: the enforcement of sanctions that employ coercive measures to interdict the movement of certain types of designated items into or out of a nation or specified area. (Military objective is to establish a selective barrier);
- UN economic sanction enforcement ;
- Peace Support operations;
 - Peacekeeping: monitor and facilitate implementation of an agreement (cease-fire, truce, etc.).
 - Peace Enforcement: application of military force, or threat of its use, to compel compliance with resolutions or sanctions designed to maintain or restore peace and order (intervention, forcible separations of belligerents, establishment and supervision of exclusion zones).

Power Projection Operations (Military Power)

Amphibious operations:

To establish an area of operations for power projection ashore and support of amphibious operations.

- Establish & protect Sea Lines of Communications.
- Provide Naval Surface Fire Support (NSFS) (gunfire).
- Conduct beach survey, Rapid Environmental Assessment (REA).

Neutralize Naval Forces

- Specific targeting of enemy naval forces to ensure:
 - protection of own force;
 - open and protected sea lines of communications to and from the (joint) operation area, by conducting AAW, ASuW and ASW
- Destruction of enemy bases/infrastructure (to destroy or neutralize the enemy's ability to control and support their naval forces)

Air Campaign / Land Campaign (JTF campaign)

- Provide Naval Surface Fire Support (NSFS) gunfire, strike.
- Combat Search And Rescue (CSAR).

Appendix B TNO Group Facility Information

Group Facility Room

The trouble with meetings...

Are these familiar? Talkative meeting participants who always have or take the floor and never give others the opportunity to speak. Domineering managers who throw their weight around. Meeting fanatics who disrupt the process with arguments, return to earlier points of discussion and can go on endlessly. Meeting facilitators who have trouble identifying the essence of a discussion and establishing priorities. Meeting reports that inaccurately and incompletely reflect the discussion, resulting in the loss of good ideas, useful comments and information. Waiting your turn to share your ideas and insights, only to be greeted with quick and off-the-cuff criticism before you have even finished.

Do you think that your policy-making and decision-making meetings can be conducted faster and more efficiently?

Meetings can be faster and more efficient!

An interactive electronic meeting system could make your meetings more efficient and effective. The special hard- and software used in our Electronic Conference Room - or Group Facility Room (GFR) - make this possible. Working in groups becomes working together and interacting, with a view to obtaining practical results.

What are the advantages?

Using an interactive electronic meeting system offers the following advantages:

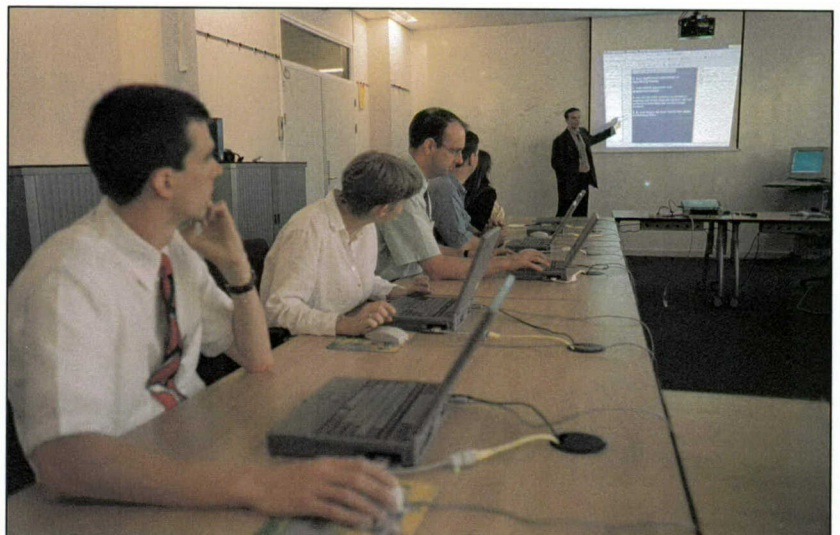
- Balanced interaction. Each meeting participant has an equal opportunity to make contributions and respond to contributions without disruptive dominant behaviour or hierarchical barriers.
- Working while the information is processed automatically. This can be tremendously time-saving.

- Completeness. Every contribution is saved so that nothing is lost in drafting the meeting reports.
- Structure and organisation. The electronic meeting system offers such aids as the ability to categorise visually the ideas that have been contributed.
- Ability to focus. Each participant can determine the ideas or statements to which he/she will respond. The use of opinion polling/voting enables groups to identify the ideas that offer the most perspective or are the most essential.
- Anonymity (if so desired). This enables participants to contribute new ideas freely and to offer comments in response to other ideas and opinions.

Our GFR offers an environment in which you can use these advantages to the full.



Equipped with hard- and software, the Electronic Conference Room - or Group Facility Room (GFR) - is ideal for efficiently and effectively conducting meetings. At the heart of the GFR is a system of interconnected laptops. Both civil and military clients of TNO Physics and Electronics Laboratory (TNO-FEL) have benefited from this, primarily during exploratory brainstorming and policy-making sessions.



The Electronic Conference Room Group Facility Room

How does it work?

Each meeting participant has a laptop computer at his/her disposal. These laptops are linked to one another so that the automatic exchange of information not only takes place between laptops, but the information is also centrally processed and presented by the meeting facilitator. Despite the fact that each participant uses his/her own computer, the 'esprit de corps' is maintained because each participant can follow the contributions of the other participants using his/her own computer. Moreover, plenary sessions are always possible. The secret to a good process is alternating between electronic and spoken discussions.

The GFR 'workstations' are flexible and can be set to a variety of configurations. This makes all manner of meetings possible.

The other facilities...

In addition to the electronic meeting system and its computer network, our GFR offers additional supporting equipment. These include electronic white board systems and various types of video and overhead projection systems.

In addition, we have software packages for such applications as making diagrams that outline interrelationships to evaluate possible choices and to consider objectives and criteria during policy making and decision-making processes.

Applications and results

The use of an electronic meeting system has demonstrated its worth during a variety of meetings with TNO-FEL clients, both civil and military. These meetings involved such issues as strategic analyses for an organisation (strength/weakness, competition, policy and environmental analyses), creative brainstorming sessions (for instance, for product development, knowledge inventories and selection criteria), meetings to determine a new marketing strategy, expert workshops for the exchange of knowledge and experience, Delphi meetings, consensus conferencing and scenario workshops.

In general, these meetings can involve:

- generating and/or taking inventory of (possibly new) ideas, insights, consequences, knowledge, solutions, objectives, limitations, do's and don'ts', etc.;
- offering commentary, assessing, ranking and/or selecting alternative solutions, aspects, ideas, etc.;
- other group activities, including jointly writing a report, possibly even while a series of presentations are being made.

The report including all of the information contributed is available nearly immediately following the session.

We help you, together with you

The GFR is particularly useful if an exceptional problem must be discussed, for instance if several parties or interests have a complex problem that must be analysed or solved or if it is imperative that a decision be taken quickly.

During the preliminary consultation, we will discuss with you the most suitable approach to achieve the meeting objective. We will then facilitate the meeting. However, it is possible that you have the expertise in house. In that case, you lead the discussion, while we provide the technical support during the meeting.

TNO Physics and Electronics Laboratory (TNO-FEL), The Hague (The Netherlands), is one of the institutes of the Netherlands Organization for Applied Scientific Research (TNO).

Although research at TNO-FEL is done mainly on behalf of the Netherlands Ministry of Defence, projects are also carried out for other ministries, institutions and companies.

TNO-FEL employs a staff of about 600.

The following products form the main output of TNO

Physics and Electronics Laboratory:

- Operational Research & Business Management
- Command & Control and Simulation
- Electronic Systems & Electronic Warfare
- Observation Systems
- Telecommunications and Security.

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	Primary List	Likelihood	Impact
1	A new product line means new competitors	10	9
2	Our current customers could become confused about our focus	8	5
3	Other companies are already successful and entrenched in the	8	
4	Increased spending on R&D could cause a cash crunch		
5	Without a creative marketing strategy, we won't succeed		
6	Loss of existing market share to other soft drink companies		
7	Increased sales of sports drink could cannibalize our soft drink		

After the brainstorming session is completed and the ideas/aspects are divided into categories, the votes are cast.



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