Annual Research Plan 2014

Netherlands Defence Academy

Faculty of Military Sciences

NLDA/FMS/Faculty Research Office

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INTRODUCTION TO THE FACULTY OF MILITARY SCIENCES ANNUAL RESEARCH PLAN 2014

In this document the Faculty of Military Sciences of the Netherlands Defence Academy (FMS-NLDA) presents the Annual Research Plan 2014 (ARP2014). Gaining scientific expertise and expanding knowledge in the military domain is at the core of the academic program at the NLDA and forms a valuable addition to the available knowledge within the Ministry of Defence.

The Faculty of Military Sciences is divided into three knowledge domain clusters: War Studies, Military Management Sciences and Military Technical Sciences. Each cluster is currently subdivided, leading to a total of ten research groups in the FMS-NLDA.

This ARP2014 has a different approach and structure, compared to previous years. In agreement with FMS Scientific Advisory Council (Wetenschappelijke Adviesraad, WAR) and the SWOON (Stichting Wetenschappelijk Onderwijs en Onderzoek NLDA) the planning horizon will be extended as of 2014. This implies that the background, rationale and goals for the research programs will be described for a five-year horizon, while the activities and intermediate results and output will be specified for the next year. This is more in line with the actual research process. If necessary, e.g., due to a change in the research context or defence knowledge priorities, there might be a change of course that will have to be incorporated in the research plan for a specific program. The overall effect is a reduced administrative effort for all research groups and can be used as a benchmark basis for a future planned research accreditation.

The faculty is since a number of years in a process of focusing on a limited set of military relevant, multidisciplinary research areas called Strategic Research Orientations (SROs) that involve multiple groups and may stretch across knowledge clusters. This focus yields sufficient critical mass for the research and benefits from the unique character that distinguishes this faculty from other universities: a close grouping of many scientific domains. A set of four SROs was defined in 2010, but undergoes changes as new areas of interest emerge at the Ministry of Defence (MOD). The Strategy, Knowledge and Innovation Agenda (SKIA) 2011-2015 lists the knowledge priorities. A number of these priorities will be covered by the current set of five SROs: 1) Dynamics of War and Peacemaking, 2) Managing Military Coalitions, 3) Clustering Unmanned Military Systems, 4) Deployment and Deployability of Military Systems and 5) The Human(e)e Factor in Present-day Military Practices. As of 2014, a new SRO will be added: 6) Cyber Operations and Capabilities.

The positioning of these research focus areas within the faculty is illustrated in Figure 1.

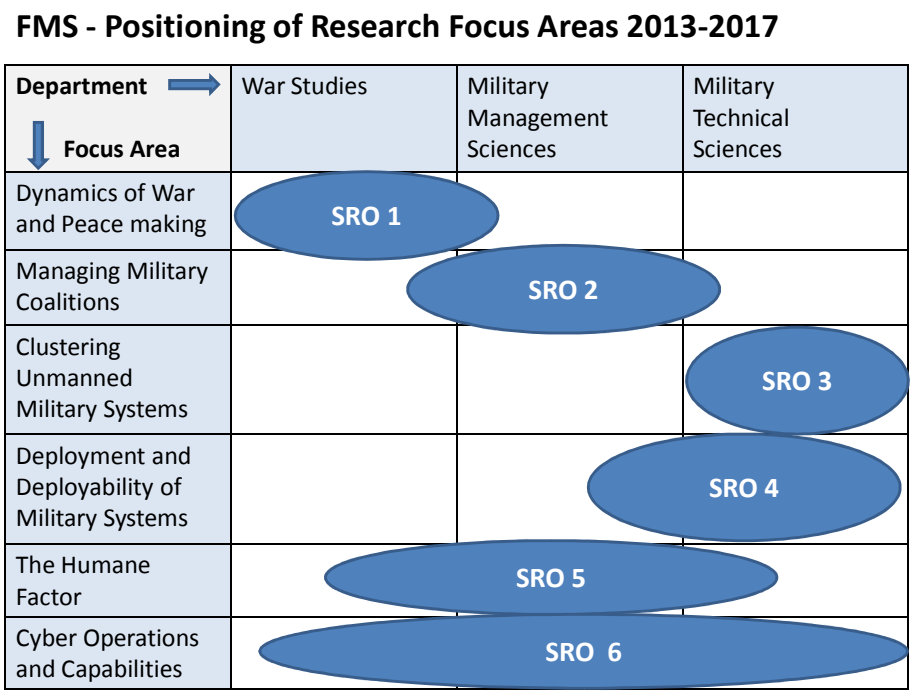

Figure 1: Positioning of the Faculty of Military Sciences Research Focus Areas

Budget cuts and the ongoing reorganization of the Ministry of Defence have seriously affected the research capability of the FMS-NLDA. Manpower and financial resources are significantly reduced. Faculty staff numbers will be reduced to 80 fte in 2014. Running three accreditated scientific bachelor programs and a recently approved masters curriculum in Military Strategic Studies by this unique faculty therefore is an admirable achievement. However, combined with the research activities this puts very strong claims on faculty resources.

The internal funding of FMS PhD researchers has been stopped (current contracts are phasing out during the next two years). A set of five new PhD projects in collaboration with TNO has been identified in 2013: in three cases Phd candidates already have been appointed for the other two vacancies have been published. It is to be expected that these young researchers will yield a significant contribution to the FMS research process in 2014.

The MoD reorganisation also creates opportunities, increasing the value of the FMS as an in-house expertise centre for MoD Staff, Operational Commands and the Defence Materiel Organisation. The current establishment of an NLDA R&D Staff Office will contribute to the implementation of the agreed 'knowledge and innovation' process. At some point in the near future the FMS should be in a position to benefit from this development.

The planned decision process by Defence Staff (Legal and Accounting Office) for the handling of external funding for FMS research from (inter)national sources and organisations has not yet come to a conclusion in 2013. In 2014 there will be another year to investigate these

options and create an acceptable procedure, that enables FMS scientific staff to benefit from this resource and collaboration potential.

The faculty research plan for 2014 is structured in two parts: Part I describes the set of six SROs. Part II lists an overview of the current expertise domains in the Research and Expertise Centre (REC).

On the following pages for each program the background, rationale and research are given. Planned activities, results and allocated manpower for 2014 are listed.

SRO-1 Dynamics of War and Peace Management & War Studies

The research plan describes the period 2014-2018. Starting point for this five-year plan is the cluster as it stands on January 1, 2014. The cluster makes use of its unique position to focus its research on the pivotal object of its very existence: military operations. This focal point is the strength of War Studies for it enables true multidisciplinary research. The research staff benefits from another unique advantage: the combination of civil and military researchers working alongside.

Research results are envisioned to find their way - even more than until now – to the bachelor and master program, as well as the Armed Forces and the Ministry of Defence. Thus, the cluster and this research plan contribute to the Faculty's overarching mission: to contribute to the effectiveness and efficiency of the Netherlands Armed Forces.

Due to the very recent appointment of prof. dr. G. Frerks, the research priorities of the IVS section shall be amended in the near future.

The cluster War Studies, is chaired by air-commodore prof. dr. Frans Osinga and comprises five fields of expertise, chaired by members of the War Studies researcher staff:

Military History & Strategy	Prof. dr. H. Amersfoort
International Security Studies	Prof. dr. G. Frerks
Military Law	Prof. dr. T.D. Gill
Military Operational Art & Science	Cdre prof. dr. F.P.B. Osinga
Cyber Security & Cyber Operations	Col dr. P. Ducheine
Intelligence & Security Studies	Prof. B. de Graaff

The War Studies research cluster is finalising its implementation process. As of 2014 it will be operating as a single multidisciplinary cluster, instead of a combination of four distinct independent fields of study and branches.

After a number of years, in which so called legacy projects played a secondary role, the department is now able to focus on its five themes within the overarching SRO. As offspring of the five themes as well as the legacy projects, the research output was used in both bachelor and non-bachelor programs. In addition, as of 2013, the research also contributed to the master program on *Military Strategic Studies*.

Upcoming PhD research on *Counterinsurgency* (Kitzen), the *Law of Maritime Interdiction Operations* (Fink), *NATO Air Operations in Afghanistan* (Sinterniklaas), the *Interplay between IHL and HRL in Counterinsurgency* (Pouw), *Comprehensive Approach on the National Political-Strategic Level* (Hazelbag), *Targeting* (Roorda) and *Cyber Warfare & Operations* (van Haaster) will contribute to ongoing military and civil debate in military issues.

Furthermore, joint research projects, for instance on Exit Strategies & End States, will enable us to work in a true multidisciplinary manner.

The research within this SRO is relevant for operations evaluations and doctrine development as well as for strategic and operational analysis within the context of future operations. It attempts to uncover causes of success and failure of recent employment of western armed forces. It will highlight how those armed forces and (inter)national security organisations have tried to adapt with contemporary challenges. It will also assess the novel methods with which western nations have approached those challenges, including technological solutions. The research involves operational and policy analysis that brings together institutional, (security) political, strategic and operational, technological, legal and historical perspectives.

The multidisciplinary SRO *Dynamics of War and Peacemaking* tries to shed light on those factors that affect the achievement and maintenance of a stable post-conflict situation or strategic victory, which has been one of the main missions of western armed forces in the past two decades. It pays attention to the historical, political, legal and operational dimensions of both conflict and post-conflict situations. It attempts to provide insight in the dynamics of interventions, characterised by contradictions, dilemmas and tension. This SRO thus also encompasses contemporary war fighting. NATO operations in Afghanistan, Libya and Israeli missions against Hamas and Hezbollah clearly demonstrate that peacemaking and the use of military force are not mutually exclusive. These conflicts also hint at the evolution of the nature of the opposing actors and their chosen methods of combat. The missions also gave rise to issues as ‘exit strategies’ (Iraq and Afghanistan), a topic that is new in the current plan. DWPM studies these transitions in the strategic and operational context of western armed forces.

Research themes

The common aim is to increase our understanding of the contemporary international security and military operational environment. To that end it focuses on contemporary problems encountered by western governments and their armed forces in solving security issues. This certainly suggests a very broad scope. However, in light of the focus of the War Studies Bachelor program, the available expertise of the War Studies department and the particular niche of the NLDA/FMS within the dutch academic environment, only a limited number of research topics has been selected that bear a particular relevance for the armed forces.

A number of projects will be completed in cooperation with other universities and, if applicable, will be listed separately. For instance part of the historical research (on transformation) as well as legal research activities is conducted in cooperation with the University of Amsterdam. Operations Research related projects involve the universities of Tilburg, Leiden, Delft and the US Naval Postgraduate School. Several PhD students participate in topic-specific interuniversity research seminars, for instance the seminar on Irregular Warfare at the University of Utrecht and Targeting with the University of Amsterdam.

The majority of the professors chairing the separate fields of studies, as well as the faculty and the department as a whole, benefit from the fact of being 'double hatted', for they are employed by both the NLDA and another academic institution. This goes for Military Law (Gill), Military History (Amersfoort & Klinkert), Intelligence & Security (de Graaff) and International Security Studies (Frerks).

A joint production of NLDA and US Naval War College will result in a handbook on the contemporary challenges in targeting during modern conflict, including the impact and ramifications of technological and doctrinal innovations.

Obviously, the SRO *Cyber Operations* has close ties and overlapping research themes with the current SRO on *Dynamics of War and Peace Management*. For instance in the field of targeting, contributions to new doctrine, strategic questions, irregular and virtual warfare and strategic communication.

Cooperation and collaboration with the recently established Land Warfare Centre and Air Warfare Centre will enable the War Study researchers to benefit from military insights and empirical data, as well as promote relevance to the defence organisation.

With an eye to cooperation in the field of International Law, the FMS has concluded a covenant with the University of Amsterdam (Amsterdam Centre of International Law, ACIL)) on the topic of *Development of Military Operational Law and its Role in Armed Conflict and Peace Operations*, resulting in a collaborative joint research program.

The ACIL, and through it the joint program, also forms part of a collaborative research platform (IHCL Research Platform) under the coordination of the TMC Asser Institute in The Hague in which researchers from ACIL/NLDA cooperate with researchers from Leiden University and the Free University of Amsterdam (VU) in the areas of international humanitarian law and international criminal law. A wide international network of cooperation with research institutes and individual researchers in relevant areas of legal research is maintained and expanded continually and complements the cooperation at the national level.

DWPM-1 Stabilisation (of Conflict) and Reconstruction

This theme includes the current research within the International Security Studies Section, but also that of Military Operational Art & Science and Military Law. It focuses on the generic question why it is so difficult to end hostilities in specific regions and transition to a stable society. This involves the debate about the decisive factors contributing to the explanation of ending conflict situations and stabilising peace. The research also assesses recent approaches applied by western nations such as the Comprehensive or 3D Approach, principally sound concepts but hard to implement effectively.

New are the projects on Libya and on Exit Strategies & End States.

Activities/Results planned

Fink, M. : *The Law of Maritime Interdiction Operation.* This PhD research is executed in cooperation with the Amsterdam Center for International Law.

Gill, T.D. : participation as senior academic advisor and contributor in a project for the drafting of a manual on Peace Operations under the auspices of the International Society of Military Law & the Law of War (Brussels).

Osinga, F. & Noll, J. : research on Exit strategies, End State / End Date debate on stabilisation and reconstruction.

Osinga, F. : *The 3D approach and strategic interventions*, *an assessment* (report)

Voetelink, J. : preparation of a commercial edition of his PhD dissertation on the 'Status of Forces' in English.

DWPM-2 Engaging Violent Non-State Actors

This theme is related to DWPM-1, indeed is a subset of the challenges that DWPM-1 deals with, but resides at a lower level of aggregation. The dramatic terrorist attacks of 9/11, recent NATO experiences in Afghanistan, the US experience in Iraq and Israeli experiences with Hezbollah and Hamas have demonstrated that the current generation of Violent Non-State Actors (VNSAs) pose significant political and operational challenges. In addition, ongoing conflicts in Africa and tensions in South-America similarly highlight the security

problems associated with VNSAs. The variety among such groups reflects their varied interests, motives and objectives but also their commonality concerning the conceptualisation of war, which often is fundamentally different than that of western countries. This has resulted in a lively debate on the nature of future war and warfare and in particular on ways to engage such groups, either as part of a more comprehensive strategy to stabilise a region or with the single aim to reduce the security risk such groups pose. A keen understanding is essential for starting a dialogue (co-opting), but also for, if necessary, forcefully coping with such groups (confronting). Essential research questions address the definition of war by non-state actors, their motives and structure, the importance of myth and tradition, the fighter ethos, the ethical context, the assessment of military action and the importance of tribal structures. A game theoretical and network theoretical perspective add insight into the possible inner dynamics of violent non-state groups. A historical perspective will add insight from colonial warfare against non-western armed groups while the legal perspective in turn addresses the question which legal framework is applicable when engaging such groups. The project will also benefit from the fruit of research into cyber operations conducted against non-state actors (DWPM-4).

Activities/Results planned

Bartels, R. (research fellow): PhD dissertation *Transnational Armed Conflict: Engaging Armed Groups across State Borders.* The project commenced in 2010 and is due for completion in 2015. PhD project in cooperation with the Amsterdam Center for International Law.

Bartels, R. : 'From Jus in Bello to Jus Post Bellum: when do non-international armed conflicts end?', in: Stahn, C. et al. (eds.), *Jus Post Bellum: Mapping the normative foundations*, Oxford University Press, 2013/2014.

Brinkel, Th. : Research on religion and violent non-state actors. Focus on north-west Africa.

Ducheine, P. : *Militaire operaties binnen Nederland– Krijgsmacht & Staatsrecht* (Kluwer 2014).

Kitzen, M. : *Control through cooptation in counterinsurgency campaigns. Experiences from Aceh and Uruzgan* (PhD thesis, due for completion in 2014).

Pouw, E. : *The Relationship and Application of the Law of Armed Conflict and International Human Rights Law in Contemporary Counterinsurgency Operations: Exploring the Faultlines* (PhD commercial edition 2014, Oxford or Asser/Springer).

Rothman, M. : literature study, theory development and study of the Arab Spring.

DWPM-3 (Leadership) Targeting and Robotisation

As part of a repertoire of instruments to engage VNSA, the west is increasingly employing airpower against insurgent group leadership. This practice has come under close media scrutiny, in particular when executed by armed Unmanned Aerial Vehicles (UAV). It raises a number of questions: What are the favourable operational and strategic effects? What is the logic behind the target allocation process? How are authority and accountability assigned in the 'kill chain'? What is the legal framework for this type of UAV deployment, taking into account that 'political assassination' has been banned? What are the ethical limits of long-distance attacks on specific individuals with highly automated military systems? What are the side-effects (media spin-off, collateral damage) and the consequences on the longer term? How did this concept of operations come about? What are the merits and drawbacks of enhancements in 'robotisation' in warfare? This research is related to the ongoing research on Unmanned Aerial Systems within the Military Technical Studies cluster.

Activities/Results planned

Ducheine, P. & Osinga, F. : Edited volume on *Targeting: The Challenges of Targeting in Modern Warfare*, in cooperation with the US Naval War College (to be published by TMC Asser Press). Separate chapters are written by F. Osinga (A history and evolution of targeting), M. Kitzen (counterinsurgency and key leader management), P. Ducheine (non-kinetic targeting) and T. Gill (ius ad bellum).

New PhD research is planned in collaboration with TNO on Targeting Methodologies (including and focusing on unmanned systems). Period 2014-2018.

DWPM-4 Virtual War and Strategic Communication

Studying the concept of Virtual War will contribute to the understanding of how violent non-state actors and states use the virtual domain for their goals. Starting point will be the literature on counterterrorism, guerrilla campaign studies, counterinsurgency operations, marketing, cyber warfare, soft power concepts, branding and media studies.

There is an increasing awareness that maintaining legitimacy, political backing and public support, locally and at home, are key success factors in military operations. Publications in the field of counterterrorism demonstrate how the social media proliferation contributes to a high degree of transparency of military operations, but also provide potential opponents with new and powerful means of gathering, manipulating and distributing information; real time and on a global scale. This might include many ideological messages. Consequentially, groups like Al Qaeda and Hezbollah are deliberately using the virtual domain as their battlefield.

The result is a worldwide increased attention for media influence, the importance of narratives and counter narratives, the role of ideology and religion in communications and

manipulation of the public perception. According to Freedman, this is the core element of the 'transformation of strategic affairs', which leads to problems for democratic countries. Local events on the battlefield attract global attention and yield disproportional effects at the home front. Media spin-off and propaganda however are counterproductive and a retrospective correction has no effect. In the military domain this has resulted in a focus on Information Operations. This somewhat limited field should be replaced by Strategic Communications; an approach chosen by a number of western armed forces. In addition, the increasing utility of but also dependence on the internet has opened up the spectre of *cyberwar* in which the internet is not only used to distribute messages but also to disrupt information and threaten critical civilian and/or military infrastructure. This research is also covered in more detail in SRO-6 *Cyber Operations & Cyber Security*.

Activities/Results planned

Bosch, G. van den: PhD dissertation on the rules regulating cyber operations, not being attacks (2013-2017).

Brinkel, Th. & Rothman, M. : *Legitimizing war: just war traditions and securitization* (book).

Ducheine, P. & Osinga, F. : supervising external PhD R. Bierens concerning the Development of Cyber as a Military Domain.

Ducheine, P. & Osinga, F. : supervision of PhD dissertation of lnt(A) J. van Haaster, concerning the role of cyber capabilities in fighting power (2013-2017).

DWPM-5 Adaptation and Transformation

This final theme focuses on how nations, institutions and armed forces have adapted to changes in the security, political and operational environment, how they have responded to performance gaps, to the challenges of a novel and very comprehensive task of state building and counterinsurgency and how they have dealt with operational experiences of engaging violent non-state actors. This also touches on the question how nations have incorporated these experiences in their defence planning that affect force structures, doctrine development, training requirements, technology development and investment priorities. The theme encompasses the field of organisational learning and military innovation studies (which combines historical case studies and organisation theory). Operations in Iraq and Afghanistan offer relevant contemporary cases, as do the Israeli Defence Forces (IDF) experiences against Hezbollah and Hamas.

Following the publication of two book length studies (on military transformation in Europe and on military adaptation in Afghanistan) the main research effort on this topic will be 'the learning intelligence organisation'. The multi-year project focuses on the organisational learning ability of intelligence and security services and their opponents. The research explores the competitiveness of these organisations in an uncertain task environment vis-a-

vis both 'friendly' and non-friendly organisations . This research will address both state and non-state actors and their intelligence functions.

Separate from this topic, others will focus on the legal consequences of the changes in the operational and strategic environment.

Activities/Results planned

Ducheine, P. : member of the Study Group on the 'Conduct of Hostilities' within the International Law Association to conduct in-depth study and produce a report on challenges to the application of international humanitarian law in contemporary armed conflict; report planned for publication in 2016).

Gill, T. : Chairman Study Group on the 'Conduct of Hostilities' within the International Law Association to conduct in-depth study and produce a report on challenges to the application of international humanitarian law in contemporary armed conflict; report planned for publication in 2016).

Gill, T. : Revision of *Handbook of the International Law of Military Operations* (Oxford University Press, 2nd revised edition planned for publication in 2014/ 2015).

Graaff, B. de : A book on recent Russian humint operations in the west, which shows how little has changed on the Russian side and how little adaptation was needed after the end of the Cold War and the demise of the Soviet Union and the Warsaw Pact. On the other hand it shows the swiftness with which western intelligence and security agencies reduced their core business of counterespionage to the bare minimum as they became preoccupied with their fight against the newly discovered threat of terrorism, thereby opening up the playing field for Russian espionage to an extent that exceeds the Cold War levels, not only with regard to economic espionage but also in the fields of political and strategic intelligence.

Graaff, B. de : A volume of approximately fifteen individual, national contributions on lesser known European intelligence and security agencies and the ways they adapted to their changing threat environments over the past century. A major problem in intelligence studies is that the overwhelming majority of the literature is about the United States, United Kingdom, Russia and Israel. This volume, to be produced together with professor James Nyce (Ball State University, USA) is expected to become a new standard for comparison in the field of intelligence studies.

Graaff, B. de : *Who will win the intelligence wars?* (book), which will be a culmination by the author of his previous studies about organisational (dis)advantages of respectively state and non-state actors, intelligence reform and intelligence revolution, new threats, the concept of eternal war and the impossibility of a global counterterrorism or counterinsurgency strategy.

In this book the emphasis will be on western intelligence organisations on the one hand and Al Qaeda and its affiliates on the other.

Graaff, B. de : A study of the Chinese intelligence service based on available material in English, German and French to establish the organisational culture, expediency and working patterns of the Chinese services.

Mengelberg, S. : theory development and case study of NATO and EU. Outline for dissertation.

Ruiter, R. de : *Fault Line 1989* (PhD thesis). Public defence in 2014.

Cultural Heritage and Identity

This is a collaborative research program together with the University of Amsterdam (Faculty of Humanities) and the NIOD Amsterdam

The program deals with questions of violence within society and in the international context. The military-historical part of the program is the responsibility of the section Military History and Strategy of the FMS. This part concerns in particular the preparation for war of the Netherlands armed forces in the period of active neutrality (1900-1940). The increase in the scale of warfare before and more so during and after the First World War confronted the armed forces with the unprecedented challenge as to how a small power with scarcely any strategic depth and limited means could expect to mount to an effective defence in case of large-scale warfare in Europe. The reaction to this challenge has been the prime concern of the political-military leadership of the Netherlands in the period 1900-1940.

Activities/Results planned

Amersfoort, H. : 'The Dutch army in transition. From all-volunteer force to cadre-militia army 1795-1830'. Article for collection and project *Fighting for a Living* of the International Institute for Social History (Amsterdam, The Netherlands).

Amersfoort, H. : 'The end of an enterprise. Swiss regiments in the Royal Dutch Army' in: Streit, P. (ed.), *Je Maintiendrai. Troupes et soldats suisses au service de la Hollande* (Morges, Switserland).

Amersfoort, H. : 'Dienstplicht en de modernisering van Nederland 1810-1813', in: Hallebeek, J. & Sirks, A. (eds.), *Het Franse Nederland: de inlijving 1810-1813'* (Amsterdam, The Netherlands).

Distinct Research Projects

Bon, A. : Finalising dissertation on US-Japan bashing. Due for completion in 2014.

Donker, P. : *Clausewitz on the relation between political and military ends* (PhD research). Due for completion in 2014-15.

Woudstra, N. : *Maritime Security and Strategy* (PhD research). Due for completion in 2015.

Manpower Resources Allocated

Participants	Section	Hours	Remarks
Prof. dr. H. Amersfoort	MH&S	400	DWPM-2 en 5
Dr. F. Baudet	ISS/Cyber	350	DWPM-5
Drs. A. Bon	ISS	480	DWPM-1
LCol G. van den Bosch LLM	MIL	480	DWPM-4
Col A. Bouwmeester MA	MOAS	480	tbd
Dr. Th. Brinkel	ISS	480	DWPM-2 en 5
LtCol R. Brunsting	MOAS	480	DRP Air Power Doctrine
Drs. P. Donker	MH&S	480	DRP PhD research
Col dr. P. Ducheine	Cyber	80	DWPM- 1 up to 5
LTZ1 M. Fink LLM	MIL	480	DWPM-1
Prof. dr. G. Frerks	ISS	240	tbd
Prof. dr. T. Gill	MIL	240	DWPM-1, 2, 4 en 5
Prof. dr. B. de Graaff	MOAS	240	DWPM-2, 4 en 5
Drs. H. de Jong	MH&S	480	DWPM-2 en 5
Dr. M. de Jong	MH&S	300	DWPM-2
Drs. M. Kitzen	MOAS	480	DWPM-2, PhD research
Prof. dr. W. Klinkert	MH&S	480	DWPM-5
LtCol A. de Koster	MOAS	480	DRP Air Power Doctrine
Dr. R. Lindelauf	MOAS	480	DWPM-2 en 4
Drs. S. Mengelberg	ISS	250	DWPM-5
Cdre prof. dr. F. Osinga	MOAS	480	DWPM-1 up to 5 supervision
LCol P. Pijpers	MOAS	480	DWPM-5, PhD research
Dr. M. Rothman	ISS	480	DWPM-2 en 4
Maj C. Sellmeijer	MOAS	480	tbd
Maj R. Sinterniklaas	MOAS	1530	DWPM-5, PhD research
Col J. Voetelink LLM	MIL	480	DWPM-5
Cap Mr. N. Woudstra	MOAS	480	DRP PhD research
PhD researcher	MOAS	1530	DWPM-1
		14600 h.	= 10.2 vte

SRO-2 Managing Military Coalitions

Military missions have become increasingly complex due to the growing number and diversity of participants. Besides other armed forces, participants may include representatives of other government departments, international aid organisations, local government representatives, local security organisations, non-governmental organisations, commercial suppliers and even the media. Within the Netherlands, emergency services may also participate. Both in homeland operations and abroad, success of the mission largely depends on the cooperation of many partners, each with their own perspectives and vested interests. This practice is called the *Comprehensive Approach*.

For the Netherlands armed forces, the *Comprehensive Approach* means that units are not focused only on war fighting or peace enforcement, but also must be capable to participate in a larger coalition of organisations, supporting diplomacy and development as well as defence. The diversity of perspectives and interests means that it is not possible to form a unified hierarchical command structure with a supreme commander and an overall commander's interest. By contrast, coalitions are networks of organisations with complex and layered objectives and a diversity in tasks and participants.

Although the potential benefits of working with coalition partners are vital to mission success, many new challenges emerge. These include goal ambiguity, diverging mandates, cultural diversity, conflicting organisational cultures and operational styles, a lack of oversight mechanisms, different capabilities, different styles of communication, languages and terminologies, different types of resources, different ways of integrating safety systems and a lack of interoperability between information systems. All these challenges influence the forming, organising, managing and measuring the effectiveness of a coalition. The possibility of a conflict of interest is always present and cooperation with other partners requires constant vigilance. Collaborating with other partners under the *Comprehensive Approach* requires a strong emphasis on negotiating skills and strategies, building a common understanding of capabilities, requirements and tasks, maintaining working procedures and monitoring ongoing operations to ensure unity of effort.

The military only just begin to understand the complexities that coalition operations and the *Comprehensive Approach* involve. This SRO intends to contribute to their comprehension.

The core of the title of this SRO is the word *coalition*, which can be described as a network of organisations, working together towards a common goal. The word military has been added in order to stress that this research focuses on coalitions in which the Dutch military play an important part. The goals of these military coalitions can vary from disaster control in the Netherlands through securing and rebuilding a failed state as to fighting a common enemy. Coalitions formed to achieve these diverse goals differ enormously, depending on the politico-strategic goals, on their specific situation and the geographical environment. Finally,

the title indicates that the focus is on the internal management, planning and control of the coalition.

Some recently finished missions (Uruzgan in particular) are still very much under scientific scrutiny. New missions as well as excercising for new missions are a logical follow-up in this research program. African Winds (see below) is a good example. If and when the government decides to participate in the UN-peacekeeping force for Mali, this will provide a prime new example of studying military coalitions. No doubt, up until 2018, other missions will present themselves for research. New missions are a permanent challenge in a volatile world, of course first of all to the armed forces themselves, but also to the scientific community of the FMS: to respond quickly and adequately to new missions, big and small, abroad and at home.

Research themes

The Managing Military Coalitions SRO strives to provide insight in the working of military coalitions, contributing to the implementation of measures to improve the effectiveness and efficiency of collaborative relationships in a comprehensive environment. The SRO covers topics in the four stages of the so-called planning-and-control cycle: 1) deciding on the specific organisation of a coalition requires attention to the strategy and legitimacy of the coalition in which the Dutch military will be involved; 2) formation of coalition operations involves personnel, organisational and supportive aspects; 3) performing coalition operations with a vast variety of partners that are more or less willing to cooperate; 4) evaluating and learning from past coalition operations. The topics in the four stages will be studied both with respect to homeland operations as well as missions abroad.

In terms of institutional cooperation the research program has developed strong ties with Rotterdam University (Faculty of Business), Utrecht University (Department of Conflict Studies) and Tilburg University (Organisation Studies Department). Nyenrode University and Leiden University (Institute for Political Science) can also be considered standing partners. As far as the specific military aspects are concerned, there are active working relations with the Belgian Royal Military Academy, the Swedish National Defence Academy and various other national military research institutes, in particular in Germany.

The researchers are embedded in a number of international networks which consist of scholars working for universities, Ministries of Defence, the Research Committee 01 Armed Forces and Conflict Resolution (RC-01), that is part of the International Sociological Association (ISA), the Interuniversity Seminar on Armed Forces and Society (IUS-AF), the European Research Group on Military and Society (Ergomas), the International Military Testing Association (IMTA), the International Applied Military Psychology Symposium (IAMPS), the Comparative International Governmental Accounting Research Group (CIGAR) and the International Conference on Accounting, Auditing & Management in Public Sector Reforms.

Activities/Results planned

Soeters, J., Shields, P. & Rietjens, S. (eds.): *Handbook on Research Methods in Military Studies*, (edited volume, Routledge-London). Several researchers of the FMS will contribute a specific chapter to this volume.

MMC-1 Deciding: Mission Goals and Legitimacy

The decision on whether or not Dutch military forces will participate in an (expeditionary) coalition takes place at the political-military interface. While ultimate responsibility always rests in the hands of government and parliament, the military will be involved in assessing the feasibility of the goals as well as the needed resources. This process is all about developing and applying organisational strategies in an environment of multiple (inter)national stakeholders, including public opinion and media. Convincing the latter two actors of the mission's legitimacy must be looked upon as a sine qua non for success, inseparable from the mission's effectiveness. Research in this context focuses on the politics of legitimising the goals and means as well as the costs and sacrifices that missions bring with them.

Ongoing research includes the following topics: dimensions of the legitimacy of coalitions in political decision-making and in the public debate, effects of military and civilian casualties on mission support, engaging the home-front (partners, families and the population in general), images of professionalism: selling the military and/or embedding the media and information operations

Activities/Results planned

Studies among veterans will continue.

Andres, M. & Moelker, R. : two longitudinal, large-scale survey projects have been added. The first one focuses on the roles of families with regard to the deployability of personnel from the Naval Forces. In 2014 a first wave of questionnaires will be dispersed among sailors of all ranks and their homefronts. A first analysis of data shall be presented during international conferences and in journal publications.

Andres, M. & Soeters, J. : This second project (2012-2015) is part of the HFM RTG-226 NATO working group. It aims at getting insight in the work relations between civilian and military personnel within defence organisations. In the spring of 2014 a questionnaire will be put online and data will be analysed soon after. The results will be published in international journals and defence magazines. A NATO-report will be published with data and analysis from all participating countries.

Andres, M. & Coulthard, J. : 'Children and deployment, a cross-country comparison' in: Moelker, R., Andres, M., Bowen, G., & Manigart, P. (eds.), *Military Families on Mission, Comparative Perspectives* (book chapter).

Andres, M., De Angelis, K., & McCone, D. : 'Marriage, reconciliation and reintegration, divorce' in: Moelker, R., Andres, M., Bowen, G., & Manigart, P. (eds.), *Military Families on Mission, Comparative Perspectives (*book chapter*)*.

Grandia-Mantas, M. : *The Stabilisation of South Afghanistan: Translating Political Ambitions into Military Operations. A comparative case study between the Netherlands and the United Kingdom* (PhD research). Due for completion early 2015.

Moelker, R., Andres, M., Bowen, G., & Manigart, P. (eds.) : *Military Families on Mission, Comparative Perspectives* (London -Routledge) (book).

Ender, M. , Moelker, R. & Resteigne, D. : 'Virtual Support! New Media, Network Society and Military Families' in: Moelker, R., Andres, M., Bowen, G., & Manigart, P. (eds.), *Military Families on Mission, Comparative Perspectives* (book chapter).

Lebel, U. & Moelker, R.: 'Grieving Parents, Politics and Coping of Bereaved Family Members' in: Moelker, R., Andres, M., Bowen, G., & Manigart, P. (eds.), *Military Families on Mission, Comparative Perspectives* (book chapter).

Moelker, R. : Translation of Riding with Veterans (Springer Verlag). (Book translation)

MMC-2 Preparing: Training and Organising

The military personnel, the organisation and the resources should be allocated to and prepared for the mission. With which partners do the armed forces have to cooperate, in what kind of coalition and how? What problems concerning cooperation can be expected? How do military professionals prepare themselves for this cooperation?

Ongoing research includes:

1) organisational aspects: networks and coalitions, formation of units from the standing parent organisation, the choice of units, requisite variety, doctrine; crew resource management and adaptable military performance?

2) supporting information-related aspects: language, information processes, interoperability of information and communication systems, information management and information security?

3) sourcing aspects: which activities have to be performed by the core organisation as well as within the coalition and what can be contracted out to public and private organisations?

4) military asset aspects: how can military organisations manage processes related to their military key assets in an integrated manner and in close alignment with operations (military training, exercises and actual operations); moreover, how do they manage their associated relationships with vendors?

Activities/Results planned

Bijlsma, T. : 'Cultural Change by Speech. Team Learning and the Role of Interaction' in: Dievernich, F., Tokarski, K.O. & Gong, J. (eds.), *The role of the human being in Change Management* (Springer-Verlag) (book chapter).

Bijlsma, T. : 'Reflective Military Team Learning: Penetrating Frontline Learning' in: *British Army Review*, early 2014 (article).

Heeren-Bogers, J., Kaptein, M. & Soeters, J.: 'Managing towards proper employee behaviour: the hard or the soft way? Or both?' in: *Journal of Business Ethics* (article submitted).

Heeren-Bogers, J. : articles in *Militaire Spectator* and *Accountancy & Bedrijfseconomie*.

Heeren-Bogers, J.J.D. : *Money, people, hardware. The soft-side of management control* (PhD research). Due for completion in 2014. This study investigates the relationship between the ways in which defence employees exercise control over money and materiel. The focus is on the soft-side of management control, by way of behavioural accounting research.

Heuvel, G. van den, Soeters J. & Goessling, T. : 'Global business, global responsibilities: comparing social responsibility orientations in a multinational bank' in: *Business & Society*, 2013 (article).

Uiterwijk, D., Soeters J. & Fenema, P. van: ' The alignment of logistics in a military helicopter program' in: *Defence & Security Analysis* (Vol. 29/1) (article).

Waard, E. de (et al) : 'Flexible organizing' in *Journal of Management and Organisation* (article).

Waard, E. de : 'Drivers of Organizational Responsiveness: Experiences of a Military Crisis Response Organization' in: *International Journal of Managing Projects in Business* (article).

Waard, E. de, Volberda, H. & Soeters, J. : 'Engaging Environmental Turbulence: Drivers of Organisational Flexibility in the Armed Forces' in : *European Security* (Routledge), forthcoming.

MMC-3 Performing: Military and Civilian Partners

During the mission the military cooperates with all kinds of partners: other services (joint operations), armed forces from other countries (combined operations), aid organisations as well as other civil organisations (interagency cooperation), local armed forces and police. These coalitions can be considered multiteam systems that have to cooperate to reach the goals they are aiming for. Furthermore, leadership plays an important part in their success. Coalitions can be built on hierarchical relations (in which a certain entity has the lead) or on peer-to-peer or network relations where no partner formally has the lead. The development

ethical and cultural competencies, cultural diversity, negotiation skills and well-being fit in as well.

Of special importance is the cooperation of military and civilian actors in the context of (humanitarian) missions in complex and violent circumstances. Afghanistan and the Democratic Republic of Congo (DRC) offer mind- and heartbreaking examples of exactly such circumstances. The insight and lessons which can be taken from this kind of case, have a general value for understanding and improving civil-military cooperation.

A new project relates to the Navy's endeavour to diffuse military professionalism in West-Africa (African Winds, in the framework of US-led African Partnership Station). In African Winds cooperation with western allied forces such as from the US, UK, Spain and Italy is practised. In addition one collaborates with host national armed forces such as from Senegal, Nigeria and Ghana. This project studies these activities by means of analysing quantitative evaluation results of the various training elements and by doing fieldwork at sea, studying the micro interaction of the crew on His Majesty's Rotterdam.

Activities/Results planned

Raab, J. & Soeters, J. : 'Peace operations as temporary network organisations' in: Seibel, W. et al (eds.), *When public administration meets peacekeeping* (Lynne Reiner New York) (book chapter).

Rietjens, S. & Soeters, J. : 'Partnering for peace in Afghanistan in: Ruffa, Ch. (ed.), *Small Wars and Insurgencies* (article in special issue).

Schut, M. : *Cross-cultural competences in military action* (PhD research). During missions in the context of foreign cultures, soldiers are faced with dilemmas that at the same time can be operational, professional and ethical. In these circumstances cultural competences are called for. This study theorises the scope of these competences and tests insights won in the context of real-world missions as well as the prospects and limits of training and simulation. Due for completion in 2014.

MMC-4 Evaluating: aftermath and learning

After the mission the organisation as well as individuals need time to recover and to draw lessons. The organisation evaluates what has been accomplished, which best practices have worked well and how successful performance has been in comparison to other countries. Individual soldiers have to make sense of their experiences. They sometimes struggle with questions about the mission.

Several issues are relevant: assessing military and coalition performance, organisational lessons such as after action review and lessons learned, effectiveness and efficiency of cooperation with specific partners, procedures and systems (hardware and software), education and training: lessons with respect to the (lack of) competences of soldiers, NCOs

and officers, conclusions about educational and training programs, coping, healthcare, well-being and role-ambiguity, stress and the position of veterans.

Activities/Results planned

Beeres, R. & Kouwenberg, B. : ' European Armed Forces in Austerity' in: *Defence Studies* (article).

Bogers, M. & Beeres, R . : 'Burden sharing in combating terrorist financing' in: *Defence and Peace Economics* (article under review).

Bogers, M. & Beeres, R. : 'Comparing performance of US and European Armed Forces' in: *Financial Accountability & Management* (article).

Bogers, M. : *Windows on burden sharing: an analysis of burden sharing behavior between different alliances in a new security environment.* (PhD research). This study investigates performance assessment on input, throughput and output steering in an international benchmarking. In this way, the defence organisation may gain better insight into the deployable potential of personnel and means. Due for completion in 2015.

Kleinreesink, L.H.E: *What Soldier-Authors Write About. Cross-Cultural Images from Afghanistan* (PhD research). This study focuses on autobiographical books written by western soldiers about their recent deployment to Afghanistan. Content analysis is applied to demographics, motives and events in autobiographical books written between 2001 and 2010 by soldiers from several western countries. Due for completion in 2014.

Manpower resources allocated

Participants	**Section**	**Hours**	**Remarks**
Dr. M. Andres	MODE	500	MMC-1 - 3, PhD supervisor
Prof. dr. R. Beeres	MODE	500	MMC-4
Drs. M. Bogers	MODE	350	MMC-4, PhD research
Dr. M. Bollen	MODE	300	MMC-3
Dr. T. Bijlsma	MODE	425	MMC-2
Capt M. Grandia-Mantas MA	MODE	1530	MMC-1, PhD research
Drs. J. Heeren-Bogers	MODE	350	MMC-2, PhD research
LtCol Drs. E. Kleinreesink	MODE	400	MMC-4, PhD research
J.B. Maas MSc.	MODE	1530	MMC-2, PhD research
Dr. R. Moelker	MODE	500	MMC-1 and 4
Prof. dr. J. Soeters	MODE	500	MMC-1 – 4, supervisor
Dr. E. de Waard	MODE	425	MMC-2
		7710 h.	= 5.4 vte

Military Logistics & Information Management

The Military Logistics & Information Management group of the capacity group Military Business Sciences focuses on the development and application of new concepts for assets, logistics and innovation management. Extending Alberts' *Power to the Edge* concept[1], we refer to 'value' to the edge, denoting the importance for the Ministry of Defence to develop capabilities while facing financial constraints. The group cooperates with researchers from SRO-4 in the area of maintenance and asset management concepts. For instance, the Dinalog/Maselma project combines maintenance, control tower and interorganisational cooperation to enhance value creation and sustainment from MoD and supplier perspective.

Activities/Results planned

Value of Military Logistics Services and Asset Management and Interorganisational Cooperation (project of prof. dr. P. van Fenema)

Research projects combine cooperative efforts with researchers from the SRO-2 and SRO-4 groups, as well as researchers from other MoD departments and organisations such as KLPD. Two subjects are studied in this project. Firstly assets and ICT focus on ERP implementation (SPEER), business IT/asset alignment and analytics. Secondly, service-oriented research elaborates on the value of military (strategic) logistics services, asset service logistics (Dinalog/ Maselma with B. Keers as full time PhD), facility management (cooperation with CDC), operational command concepts, strategic-operational cooperation and sourcing. Examples of expected outputs on the short term include:

Maas, J.B., Fenema, P. van, & Schakel, J.K. : 'Business Analytics as a Method for Military Organisations' in: Shields, P. Soeters, J. & Rietjens, S. (eds.), *Routledge Handbook on Research Methods in Military Studies* (London: Routledge).

Fenema, P. van, Rietjens, S. & Besters, B. : 'New Ties, New Routines: Command and Control as Deconflicting Civil-Military Networks' in Grant, T., Janssen, R. & Monsuur, H. (eds.), *Network Topology and Military C2 Systems: Design, Operation, and Evolution* (Hershey, PA: IGI Global).

Research outputs from cooperative projects with for example J.B. Maas (PhD SPEER), B. Keers (PhD DMI/MaSelMa), E. de Waard (strategic-operational cooperation), facility management researchers, R. Beeres (sourcing) and J.K. Schakel (KLPD, on operational command concepts).

Dynamic Maintenance Concepts (project of ir. F. Wubben, in cooperation with SRO-4)

Over the past years, a theoretical foundation has been developed for building dynamic maintenance concepts. Patterns of usage load influence physical failure and may contribute

[1] Alberts, D.S., & Hayes, R.E. (2005). Power to the Edge: Command and Control in the Information Age. Washington DC: CCRP Publication Series.

to predict the remaining asset lifetime. Maintenance frequency depends on the maintenance concept in use. Less insight has been generated into physical failure models of usage load. More empirical research is required on this topic involving a variety of military systems. The research plan focuses on condition-monitoring methods and their application in practice. Data thus generated will be useful for analysis of maintenance requirements. Results of this analysis underpin variables driving dynamic maintenance and allow for validation of these variables. The research is aimed at high and moderate capital-intensive assets from all services of the Ministry of Defence.

The influx of new weapon systems such as the NH-90 generates new patterns of use data. This calls for modification of analysis methods. Designing and applying such methods are the first cornerstone of this research program. Second, a maintenance management simulation game will be developed in response to the demand from the operational organisation. While early results have been achieved, over the next years this game will be further developed.

Logistics Concepts: Integrated Warehouse Management (PhD research of ir. N. Faber)

Warehousing is an integral part of every logistics system. It is the primary link between producers and customers. As more and more production is off-shored, warehouse operations become increasingly important in providing a desired level of customer service at the lowest possible total cost. Warehouse management generally refers to the planning, control and optimisation of the flow of goods through a warehouse and the utilisation of the resources (such as space, equipment and labour). So far, research on warehouse management has been dominated by analysis-oriented research on isolated (sub)problems and is for this reason fragmented. Consequently, research so far has primarily contributed to partial insights. But as a consequence of the increasing use of information systems supporting warehouse management, a total approach concept for designing or structuring warehouse management is needed to appreciate or develop warehouse management information systems. Therefore, this research focuses on how to structure warehouse management. Due for completion in 2014.

Operational Concepts, Information and Innovation Management (dr. ir. B. Rietjens)

Research focuses on three different, but overlapping domains: 1) operational concepts: civil-military interaction/comprehensive approach, 2) information management (situational awareness/ information sharing) and 3) innovation and adaptation.

In doing this Rietjens will employ different research methods and gather primary data from current operations and field exercises. The expected output consists of two international refereed journal articles per year; one conference article per year; one international book chapter per year and one article in a Dutch (military) journal every two years.

In addition, he will complete two edited volumes in 2014 and/or 2015. The first volume is edited in cooperation with Joseph Soeters and Patricia Shields and is titled *The Routledge*

Handbook on Research Methods in Military Studies (Routledge Publishers, expected 2014). The second edited volume is done together with Gerard Lucius and is titled *The Soldier's Handbook on Civil-Military Interaction in Peace Operations* (Springer Publishers, expected 2014 or 2015). Finally, he supervises five PhD-theses that will most likely be successfully defended in the coming years.

Kitzen, M., Rietjens, S. & Osinga, F. : 'Soft Power, the Hard Way: Adaptation by the Netherlands' Task Force Uruzgan' in: Ferrel, T., Osinga, F. & Russel, J. (eds.): *Fighting the Afghanistan War* (Stanford University Press) (book chapter).

Rietjens, S. : 'Civil-Military Interaction: The Uruzgan experiment' in: Maley, W. & Schmeidl, S. (eds.), *Statebuilding in Afghanistan* (New York: Oxford University Press) (book chapter).

Rietjens, S., Fenema, P. van & Essens, P. : 'Train as you fight revisited: Preparing for a Comprehensive Approach' in: *Prism* (article).

Rietjens, S., Goedee, J., Sommeren, S. van & Soeters, J. : 'Meeting needs: Value chain collaboration in stabilisation and reconstruction operations' in: *Journal of Humanitarian Logistics and Supply Chain Management* (article).

Keenan, Y. , Rietjens, S. & Tatham, P. : 'Defence Logistics Special Issue Editorial: An Important Research Field in Need of Researchers' in: *International Journal of Physical Distribution and Logistics Management* (article).

Tatham, P. & Rietjens, S. : 'Integrated disaster relief logistics: a stepping stone towards viable civil-military networks?' in: *Disasters* (article).

Manpower resources allocated

Participants	**Section**	**Hours**	**Remarks**
Ir. N. Faber	L&I	160	PhD research
Prof. dr. P. van Fenema	L&I, MODE	500	MMC-2-3, DDMS
Dr. B. Rietjens	L&I	500	MMC-3
Prof. Dr. ir. T. Tinga	MTS	50	DDMS
Ir. F. Wubben	L&I	200	MMC-2, DDMS
PhD researcher	L&I	1530	PhD research
		2940 h.	= 2.1 vte

SRO-3 CLUSTERING OF UNMANNED MILITARY SYSTEMS (UMS)

Worldwide technological developments lead to an expansion of unmanned military platforms on all kinds of terrain (air, land and see). Clustering these military systems in an operational setting requires knowledge in various fields of military technical sciences, for instance a careful match between sensor technology and navigational tasks is required. Relevant aspects are multimodal sensor data fusion, integration and quality of navigation information. Remote and autonomous navigation also requires platform control modeling. Also knowledge on weapon systems and performance is required when assigning armed missions to these systems, which is the international trend. The presence of unmanned military systems (UMS) in a conflict zone offers new potential for handling a wide range of threats, without endangering own troops.

The research will focus on several topics, that are currently studied both by staff of the NLDA and by Netherlands Defence Material Departments within material renewal projects. The aim here is to combine the topics in such a way that a substantial contribution can be made in the field of deploying both current and new platforms in an operational setting using unmanned systems.

This SRO combines several research areas of the Military Technical Sciences: 1) safe navigation, 2) sensor data & systems, 3) distributed C2 systems and 4) weapon systems.

Collaboration within the scientific community

Delft University of Technology, University of Amsterdam, Radboud University Nijmegen, École Royale Militaire (Belgium), TNO Defence & Safety, Thales Netherlands, JIVC-KIXS, Security and Safety, D-CIS Lab, NATO C2 Centre of Excellence, CAMS/Force Vision, Ohio University (USA), Netherlands Forensic Institute, National Aerospace Laboratory, Maritime Research Institute (MARIN), University of Nottingham (United Kingdom) and Defence Navigation Platform.

Research Themes

1. Safe Navigation

Safe Navigation of (semi)autonomous/unmanned systems requires timely detection of all objects that may cause a collision in case the planned path is maintained. A last line of defence is typically implemented in the form of a (autonomous) collision avoidance system. The contribution of such a system to safety can be expressed as a risk reduction ratio, i.e. the amount of actual collisions divided by the amount of collision hazard situations in which the system ‘saved the day’. For a given risk reduction performance, safety can only be increased if the probability of collision encounter geometries is reduced. Earlier research has investigated possibilities for involving supervisors of autonomous systems in the separation task. Such a concept raises the question how to define the separation boundary that is to be

respected, i.e. not violated. Based on similarities with Air Traffic Control, the use of a spatial separation volume (defined by both a horizontal and vertical distance) has been explored. The research received several international awards and also resulted in a PhD thesis.

Follow-on studies have indicated that the use of a spatial threshold yields not the most optimal results in terms of combining the desired reduction in probability of collision encounter geometries with the lowest possible false alarm rate. This had led to pursue the idea of using an equal probability risk threshold as the basis for a separation boundary. Analysis of potential conflict geometries supports the idea that a hybrid spatial/temporal boundary provides the possibility to approximate such a threshold. Future research will address:

- Further development of a rationale for the specification of such a boundary and associated rules to define a self-separation threshold.
- Concepts to provide supervisors of autonomous/unmanned systems with directly actionable information about the situation.

The results are applicable to all domains in which supervised autonomous/unmanned systems are used.

A PhD project will start in 2014 in collaboration with TNO and TU Delft on underwater navigation and obstacle avoidance for mine countermeasure operations. Furthermore, a maritime navigation support system for surface vessels will be further developed.

High level input from (navigation) sensors is a first requirement to guarantee safe navigation. Studying threats for these sensors is also a topic of research. In the near past jamming of satellite positioning (GNSS) systems has already been studied and reported in journal articles for both maritime and land operations. In the near future we will address research questions on the operational consequences of both intended and unintended jamming of GNSS. Mainly thesis work will be used to investigate these questions.

2. Sensor data & systems

A special research topic is the study of ”smart dust”, a wireless ad-hoc network of distributed sensors, to detect intruders and to navigate submarines. This network can be used within an operation by unmanned surface vessels. Research will focus there on the organisation of communication in a network with more than 1000 nodes.

Image processing and optical sensors are also topic of research for recognition of actors in an operational setting. Spectral line cameras will be used to investigate their possibilities to get additional information from the received images. These cameras are also often used in UAVs.

The spontaneous emergence of co-operative or synchronised behaviour in homogeneous network of agents with various competing interaction mechanisms may be considered as a

paradigm of sensor fusion using uncertain data, which is of interest in the research of autonomous decision-making, e.g. in unmanned systems. Research using computer simulations is ongoing.

A final research topic in the field of sensor systems is related to magnetic sensor. Experiments on producing changing magnetic fields using superconductivity will be conducted. Results may be of interest for degaussing strategies when operating with vessels in a mine field.

3. Distributed C2 systems

Modern military operations are more and more characterised by (sometimes ad-hoc) parties or units that have to collaborate in a distributed setting. Also the operations themselves are different, for instance anti-piracy operations, war against terror or counter drugs operations. Currently existing C2 systems are not flexible enough to support these operations. For this research we focus on both C2 processes and the structure of future C2 systems to support these operations as on development and implementation techniques for realising these processes and systems.

Command and control is at the heart of the use of any military system. New systems, like unmanned systems, require new C2 concepts that enable complex cooperation between partners in distributed settings using these systems. The iTasks formalism and programming environment enable rapid prototyping of innovative C2 systems. iTasks implements the Task Oriented Programming Paradigm, which is a new way to model processes that involve several collaborators in a distributed setting with highly interdependent activities. Therefore, iTasks appears to be a useful system for developing C2 concepts for unmanned systems. Within this theme we both contribute to the development of iTasks and build prototype systems that demonstrate the usefulness of the system.

Research questions that will be discussed are amongst others:

a) During an anti-piracy operation a new type of drone becomes available (asset from a foreign ally). The control of the system and sensor information obtained from this unit should be integrated on-the-fly in the existing C2 system. What are the demands on the C2 systems to make this possible?

b) During a peacekeeping operation one has to collaborate with unknown partners like NGO's. For this collaboration extensive exchange of information between the partners is necessary. How can this be established without compromising security of information that is not intended for external partners?

c) A new integrated combat management system (CMS), platform management (PMS) and integrated bridge management system (IBMS) including resource management has to be developed for a new type of vessel. This new system should lead to a significant reduction of

crew. Therefore, an evolutionary development, using the current system as a starting point, is no option. The new CMS should be developed from scratch using rapid prototyping in close cooperation with domain experts. What are the best tools for doing this and how should this be done?

4. Weapon Systems

To counter the threat posed by ballistic missiles, NATO is developing a missile defence shield for Europe, in which Royal Netherlands Navy ships will play an important role. They will be part of a network that includes different platforms with a variety of interceptors and sensors spread out over a large area.

We have developed a computer model for calculating ballistic missiles trajectories, initially as a tool to rapidly evaluate the performance of potential threats. It has been used to simulate trajectories of the North-Korean Unha-3 space launcher and to evaluate the performance of the Chinese DF-21D anti-ship ballistic missile, with a maneuverable re-entry vehicle. The model already has been modified to include interceptors, to allow assessing whether ballistic missile threats are within range of an interceptor. In the future, we want to be able to also model the challenging terminal phase of ballistic missile intercepts in more complicated scenarios relevant to the navy. To this end, we will incorporate modern guidance laws and develop a more sophisticated model of the missile aerodynamics (enabling maneuvering in three dimensions) as well as a model of the Kill Vehicles used on the interceptors.

Furthermore, a missile guidance simulation software library will be constructed for both education and applied research. Several activities are planned for realising this goal. Amongst others we plan to implement both a set of classical guidance algorithms with various forms of Command-To-Line-Of-Sight and Proportional Navigation as well as a set of modern guidance algorithms using game theory.

For relatively small unmanned systems analysis expertise and modeling of bullets can become an interesting featuring, e.g., when considering armed unmanned fast interceptors at sea. Research on this terrain will deal with so-called acoustic vector sensors (AVS) to detect projectiles. Experimental data have been obtained in collaboration with the Netherlands Forensic Institute and Microflown and projectile-target experiments have also been performed in a ballistic laboratory (DMO, ‘t Harde). The future focus of this research will be qua experiment on data analysis and qua theory on acoustics. It may turn out that AVS can be very relevant for defence and security, e.g. the detection of snipers using AVS-equipped UAVs and the detection of ricochets.

Manpower Resources Allocated

Participants	Section	Hours	Remarks
Prof. dr. ir. F. Absil	SEWACO	400	UMS-4
KLTZ dr. ir. F. Bolderheij		500	UMS-1
C. de Groot MSc		170	UMS-1
Ir. R. Hordijk		400	UMS-3
Dr. J. Jansen		400	UMS-3
Dr. L. Koene		400	
Dr. ir. B. Lijnse		240	Post Doc (with Radboud University)
Dr. H. Monsuur		100	UMS-3
Ir. D. Meuldijk		400	UMS-4
Prof. dr. ir. P. Oonincx	NAV	400	UMS-1
Dr. ir. R. Savelsberg		400	UMS-4
C. Scheele MSc		170	UMS-1
Dr. O. Somsen		400	UMS-2
Prof. dr. ir. E. Theunissen		300	UMS-2
Dr. ir. A. Vermeulen		500	UMS-4
Dr. A. van der Wal		200	UMS-2
to be appointed		400	assistant prof CS systems
to be appointed		400	associate prof Naval Systems
to be appointed		200	assistant prof Naval Operations
to be appointed		1530	
		8910 h.	= 6.2 vte

Military Engineering Science (MESC)

The MESC research is about the way in which building and construction (BC) related departments within the defence organisation (including the Army Corps of Engineers and Infrastructure Agency Group) can benefit from BC innovations, which originate from the civil BC practices and research efforts. The rationale of the program is to provide solutions for the increased pressure from society to increase the efficiency, effectiveness and quality of the current military BC processes, services and products in general and the operability of the military BC engineers working under high pressure and ever-changing circumstances in particular.

Based on the available expertise within the MESC group and the expectation that additional research funding will be scarce, the MESC group will, during the period 2014-2018, focus on the following limited number of two research topics and one specific research project:

1. Design and asset management for military BC

The objective of this research topic is to increase the efficiency, effectiveness and quality of the current design and asset management processes for military BC. In order to reach this objective, solutions provided by the civil BC practice and research will be made applicable for the military organisation by adapting and modifying these solutions to the specific needs and characteristics of the military BC processes. In addition, a holistic approach that covers all different aspects of both military design and asset management processes, including technology development, information and process management is required. Partners: Knowledge Centre Corps of Engineers, Delft University of Technology, University of Twente and Eindhoven University of Technology.

2. Explosion safety

The objective of this research project is that the Dutch military forces are better protected against the effects of both accidental and intentional explosions. The threat of an explosion is present in all missions of the Dutch military forces. The threat spectrum is broad, varying from small AP mines (50g) to large VBIED's (up to 5000 kg). In order to supply sufficient protection, new constructions or structural elements are continuously developed. Obviously these new structures need to be tested before being applied.

Previously structural testing was not possible because the large threads could not be tested on test sites in the Netherlands. A new development in scaled testing methods now enables us to simulate large explosions in a tunnel test set-up with only a fraction of the actual explosive weight. Structures to be tested can be both standard constructions (since these are cheap and easy to obtain and therefore often used in compounds) and newly developed high-tech materials (like safety concrete, UHSC, laminated glass).

Next to this explosive thread, explosions are also applied by the military forces, for example when breaching a wall or door for quick entrance. Safe use of explosives obviously is a must,

but these special forces want to minimise the distance as well as maximise the chance of a successful breach. This requires a thorough knowledge of the effects of all breach methods in combination with the possible breaching constructions. Partners: Knowledge Centre Corps of Engineers, Royal Military School (Belgium), Eindhoven University of Technology and Organization for Applied Scientific Research.

3. The development of a quantitative toolbox for analyzing intelligence data (PhD research)

The main objective of this specific research project is to develop quantitative data-driven analysis methods that support intelligence processes. The main rationale of this project is the non-availability of such quantitative methods in the current (Dutch) intelligent service practice (and education). In order to determine the potential application areas of such quantitative methods a thorough analysis of the current intelligence processes will be part of this research project. In addition an analysis of the state-of-the-art of quantitative methods in related disciplines (both national and international) will be performed and matched with the specific needs of the (Dutch) intelligence service. Partners: Netherlands Defence Institute for Security and Intelligence and University of Amsterdam.

Activities/Results planned

Borgers, J.: *Design of a tubular blast test*, PhD thesis, University of Twente.

Borgers, J., Vantomme, J. & Stoel, A. van der : 'Scaling rules for tunnel testing' in: *International Journal of Protective Structures* (article).

Borgers, J., Vantomme, J. & Stoel, A. van der : 'The Equivalent Volume Approach' in *Journal of Shock Waves* (article).

Dado, E. : *The value of IT investments in construction* (conference/journal paper).

Dado, E., Koenders, E. & Carvalho, D.: *A Web-based Multi-Scale Modeling Platform for Cementitious Materials*, 1st International Conference on Ageing of Materials and Structures (conference paper).

Mevissen, S. : *A strategic model for mass-evacuation planning*, PhD Thesis, University of Twente.

Goldbach, O. & Dado, E. : 'It's not the amount, it's the type of training that matters - On the role of training on the quality of intelligence analysis' in: *Journal of Intelligence Analysis* (article).

Goldbach, O. & Dado, E.: *The role of intelligence analysts on the quality of intelligence analysis* (conference/journal paper).

Wijnmaalen, J.: *The influence of identity on multi-team system effectiveness*, PhD Thesis, University of Twente.

Manpower resources allocated

Participants	Section	Hours	Remarks
Dr. ir. E. Dado	MESC	400	MESC-1
Ir. J. Borgers	MESC	400	MESC-2, PhD research
J. Wijnmaalen MSc	MESC	700	PhD research
Capt R. Krosenbrink MSc	MESC	1530	PhD research
Capt O. Goldbach MSc	MESC	400	MESC-3, PhD research
		3030 h.	= 2.1 vte

SRO-4 Deployment and Deployability of Military Systems (DDMS)

The switch in the operational situation from Cold War training to current operational missions all over the world has changed the deployment of military systems considerably. Consequently the ways in which deployability of the systems is achieved must be changed. Recent developments such as the increase in asymmetric conflicts and increased joint and combined missions imply operations in widely diverging circumstances in unfamiliar locations.

On the one hand, this requires a solution for the increasing complexity of finding the optimal deployment, coordination and operational logistics of the available military systems. Therefore, it should be explored how operational capability can be enhanced through the exploitation of new technologies, new focus of organisation or new concepts of operations. Current issues are the design of decision tools that can cope with uncertainty and complexity, the use of data analysis to improve situational awareness, the inclusion of human factors in modeling and simulation, robust design of (communication) networks, development of strategies and tactics to cope with an asymmetric enemy at the homeland, strategies for cyber warfare and providing analytical and conceptual support for implementation and evaluation of doctrines and tactics related to NEC.

On the other hand, the largely varying and unpredictable operational usage of the systems places high demands on the maintenance concepts and logistic support that will have to ensure the actual deployability of the systems. Traditional static maintenance concepts with fixed intervals will have to be replaced by more complex dynamic maintenance concepts, enabled by techniques like (remote) condition or health monitoring and prognostics. Also, the continuous pressure on budgets demands a considerable efficiency gain for those processes, focusing on a reduction of the life cycle costs of the systems. And finally, the interaction between deployment and deployability must not be neglected, to avoid suboptimal and unrealistic solutions.

The present research covers this multidisciplinary field of deployment and deployability of military systems. The deployment challenges are mainly covered by the Operations Research discipline. Examples of these challenges are the design of optimal and robust search patterns for the deployment of unmanned vehicles, taking into account uncertainty and risk, optimal convoying against piracy, the evaluation and assessment of new technologies, protection of critical infrastructure and SCM and the quantification of the (supposed) advantages of NEC using agent-based modeling. The Maintenance Technology discipline mainly focuses on the deployability aspects, where understanding and modeling of the physical failure mechanisms are the basis for the development of new dynamic maintenance concepts and associated efficient logistic support strategies. The Logistics discipline is involved in both deployment and deployability aspects.

Moreover regular knowledge dissemination and discussion on practical application of scientific work is effectuated through the Knowledge Network Life Cycle Management, in which all relevant Defence departments participate. Cooperation within the Ministry of Defence is further enhanced through a Research and Expertise Centre (REC) in Maintenance and Life Cycle Management and a Research and Expertise Centre in Military Operations Research.

A challenge and distinguishing perspective of the present program, both scientifically and in terms of practical yields, is the integral quantitative approach of deployment and deployability. Where traditionally these two fields are optimised separately, incorporation of the interactions between deployment and deployability provides a more realistic and better solution. For example, the optimal planning of UAV missions will be more realistic and more reliable when also the failure rates, reliability, maintainability and logistic support of the vehicles are taken into account. And the other way around, optimisation of the maintenance process of navy frigates yields better solutions when information on the actual deployment of the platforms is incorporated.

This SRO is a collaboration between various sections: the Military Operations Research group and the Maintenance Technology group from the Military Technical Sciences cluster and the Logistics Group in the Military Business Sciences cluster. Research performed in other groups in the two clusters (aircraft/ship/vehicle performance, energy management, emissions, military engineering, C4I, system performance and UAVs) provides valuable input for our research.

The two main research themes of this SRO are (1) Optimal Deployment of Military Systems and (2) Optimising Military System Deployability. In both research themes, the activities are organised along two to three research lines (topics). The two main themes contain activities focusing on the single fields, but also an (increasing) number of activities aims at integrating both fields. The latter activities will yield the true benefit of the multidisciplinary approach followed in this SRO.

In the present complex military context, taking decisions on the optimal deployment of military systems and on the optimal strategy to guarantee the demanded deployability requires decision-support based on quantitative methods. For the deployment this is confirmed by the Ministry of Defence (MoD), requesting assistance in this area and by the operational analysts that are active during operations. For the deployability, this is proven by the redesign of the weapon system management process at the MoD, aiming at an increase of the control on the process by incorporating quantitative methods. The scientific work in this SRO provides the knowledge and tools to both increase the effectiveness and efficiency of deployment and deployability.

Within the MoD and also NATO, Operational Analysis has been applied to various scientific and operational problems, often using multidisciplinary teams. These problems range from

logistic optimisation to strategic evaluation of cooperation in a certain conflict. This multidisciplinary approach is shown in the fact that all Bachelor programs of the NLDA pay attention to Operations Research. Contacts between de Operations Research group of the NLDA and the MoD, Warfare Centers, universities and NATO research agencies are intensified through the Research and Expertise Centre (REC) in Military Operations Research.

Collaboration with: TNO, NLR, NATO SAS task teams, Erasmus University, Vrije Universiteit Amsterdam, TU Delft, Naval Postgraduate School, Universität der Bundeswehr, Nederlands Genootschap voor Besliskunde. Collaboration within the MoD: operational commands, Reservekorps OA, MIVD, Onderzeedienst, MDTC, Vliegbasis Woensdrecht, Marinebedrijf, DMO, C2CoE, Virtuele Veiligheids Academie.

Research in the field of maintenance and logistics requires a multidisciplinary approach, combining physics of failure, reliability engineering and maintenance management. Although a lot of research has been performed worldwide in the separate fields, the integrated approach of this program is scientifically quite unique, at least in the Netherlands, but even worldwide. The incorporation of logistics and deployment/OR aspects in the present SRO enhances this position even further.

Collaboration with the following institutes and industries exists: University of Twente, TU Delft, TU Eindhoven, Groningen University, ESReDA, NLR, TNO, World Class Maintenance, Dutch Institute for Advanced Logistics, Maritime Campus Netherlands. Collaboration within the MoD: operational commands, maintenance establishments (MB, LCW, MatLogCo) and the Defence Materiel Organisation (DMO).

Research Themes

DDMS-1 Optimal Deployment of Military Systems

The objective is to provide optimal solutions to military, operational problems, also taking into account issues like deployability and logistics. To this end, various modeling, simulation and optimisation techniques (like meta-heuristics, game theory, decision theory, stochastic modeling, network theories, logistics, artificial intelligence, etc.) are used. Current research is focused on modeling, simulation & analysis, where the following topics are studied:

1. Network Science and C2

The relation between networks and C2 is studied using stochastic actor-based simulations, network theories and game theory. Findings of this research can be used to provide analytic and conceptual support for implementation and evaluation of doctrines and tactics related to Network Enabled Capabilities (NEC). It also may make possible the quantification of the relation between an agents network topology, type of agents and system performance or completion of a mission. Another application of the research is cyber warfare. Our findings

of actor-based simulations on networks may be used for risk analysis of the vulnerability networks and provide insight into robust design of these C2 networks.

2. Optimal deployment and operational logistics of security forces

The efficient and effective use of scarce safety measures has been a topic for Operations Research since World War II. However, due to the rapidly changing environment, quick reaction times and an increasing uncertainty in the operating environment, traditional planning and operational logistics approaches do not always offer the required solutions. The aim is to design, test and implement robust and agile methods for operational logistics that provide good solutions for a variety of operational circumstances. Another, quite different facet of the increasing complexity is the fact that security measures taken, often are observable for an intelligent opponent. Most models do not explicitly model the possibility of adaptive behaviour by multiple adversaries given our security measures. This research aims to close this gap, thereby improving the deployment and deployability of limited security measures.

Activities planned

1. Network Science and C2

Evolution of networks: modern organisations and units have to be adaptive and flexible. We evaluate (by means of simulations) guiding principles for change for networked forces, where we focus on coordination, synchronisation, robustness and desired operational effectiveness of a network as a whole.

2. Optimal deployment and operational logistics of security forces

Project in cooperation with TNO/UTwente. This project addresses the efficient and effective deployment of security measures, for example multiple layers of barriers, fire walls and patrols in an environment where possible threats move through a given area attempting to take over or destroy a high value asset, or to disrupt the transportation and networks of goods and services that are critical to our economic well-being.

Optimal convoying against piracy: design and experiments. Focus on the design (using modeling, simulation and optimisation) of optimal convoying against piracy: what is the optimal position of a frigate in a convoy so that the convoy is optimally protected against piracy? A second project is on the integration of (timely) information (for example, provided by a submarine) into the model.

Project C-base explores game-theoretic models for defending a bastion. Currently, we are working on a game-theoretic attacker defender ASW model.

Results expected

Evers, L. Glorie, K. Ster, S. van der, Barros, A. & Monsuur H. : *A Two-Stage Approach to the Orienteering Problem with Stochastic Weights* (article).

Evers, L., Barros, A., Monsuur, H. & Wagelmans, A. : *Online Stochastic UAV Mission Planning with Time Windows and Time-Sensitive Targets* (article).

Grant, T., Janssen, R. & Monsuur, H. (eds.), *Network Topology and Military C2 Systems: Design, Operation, and Evolution* (Hershey, PA: IGI Global). The overall objective of the book is to connect the fields of C2 and network science; both fields share the need to face adversaries, but until now have been studied separately. Book chapters by A. van der Wal, H. Monsuur & L. Rothkrantz.

Mijden, T. van der, Boucherie, R. & Monsuur, H. : *Deploying Security Forces to Intercept Threats* (article).

Schuitmaker, A. & Janssen, R. : *Spare Parts Management* (article).

Jutte, R. , Janssen, R. & Monsuur, H. : *C-Base: a game-theoretic approach* (article)

Ven, M. van de & Vermeulen, J. : *Counter Piracy* (article).

DDMS-2 Optimising Military System Deployability

In the present research theme concepts, methods and tools are developed aiming at realisation of the required system availability at minimal life cycle costs. This is achieved by research on three topics:

1. Improving the predictability of failures and the required maintenance

By understanding the physical failure mechanisms and the associated loads, monitoring of the usage and/or condition of the systems enables the prediction of component failures. In that way, maintenance can be made predictable, which makes it possible that components are replaced preventively just before they would fail. The research on this topic focuses on the understanding and modeling of failure mechanisms and usage/condition/health monitoring and prognostics concepts. This topic also includes the development of new sensors and sensing concepts for health and condition monitoring.

Activities planned

This PhD project of M. Woldman focuses on the prediction of wear rates of military systems at different operating conditions. It will be finalised early 2014. The insights obtained from experiments and modeling will be integrated into a predictive maintenance method.

2. Performing intelligent data analysis and Life Cycle Management

Large amounts of data on the system usage, failures, parts supply and maintenance costs are collected within the MoD (and industries). Research focuses on the development of innovative data analysis methods that translate the collected raw data into useful

maintenance information. This enables to improve the Life Cycle Management process, since decisions can be based on objective and quantitative performance indicators.

Activities planned

The PhD project of B. de Jonge researches the development of methods to incorporate the uncertainty in failure distributions into decisions on maintenance activities. Moreover, methods and simulations are developed to optimise the execution of maintenance, e.g. by clustering activities. This project will be finalised in 2014.

The National Technology Project *Tools4LCM* (together with NLR and MoD) is about quantitative methods for Weapon System Management: identifying which data are available within the MoD and how they can be applied to assess and improve the maintenance performance (research by T. Tinga). In addition, a PhD student will start in 2014 on the same project to continue and extend the initial work in Tools4LCM project and to develop quantitative decision support tools for Life Cycle Management (2014 – 2017).

Support of Program Management at Logistics Center Woensdrecht (Airforce): supporting and coaching LCW employees in executing RAM analysis to optimise LCM.

A World Class Maintenance project on reliability, availability, maintainability and supportability (RAMS) analyses. The aim is to identify best practices in the industry and to develop a standard methodology. This project will be finalised in 2014.

A pilot study with CLAS/DMO Policy Department on CBM and UBM on Army vehicles (CV-90/Fennek) This project will be finalised in 2014.

3. Optimising maintenance and logistic processes

The concept of dynamic maintenance, where intervals are not fixed, but depend on the actual usage of the system, is developed here. Moreover, maintenance modeling and optimisation techniques are applied to improve maintenance and logistic processes. The work is strongly related to, and also interacts with, topic 2 of DDMS-1, as well as with the work of the Military Logistics group.

PhD research of LTZ2OC A. Homborg (Marinebedrijf): methods to analyse electrochemical noise signals generated by corrosion are developed to monitor system condition. Due for completion in 2014.

PhD-project within MaSeLMA project (Dinalog funded, cooperation with Marinebedrijf, TUE, UT, Gordian, Thales, Damen and Imtech): the development of a predictive maintenance concept and maintenance process optimisation (clustering, planning) for maritime maintenance. Another PhD student in this project is working on supply chain cooperation within the SRO “Managing Military Coalitions” (2013 -2016.).

Application of a dynamic maintenance concept to military systems, either based on detailed monitoring or based on usage profiles (F. Wubben, T. Tinga and BSc/Msc thesis projects).

Optimising maintenance processes based on representative modeling of usage profiles. A case study on a LC frigate has been used as start-up of this activity (2012 – 2016).

Results expected

Homborg, A., Tinga, T. (et al): *ENM on microbiologically induced corrosion* (article).

Homborg, A., Tinga, T. (et al): *Application of an ENM corrosion sensor for condition based maintenance* (article).

Jonge, B. de & Tinga, T. : *The optimal preventive maintenance age under certainty in the parameters of the lifetime distribution* (article).

Jonge, B. de & Tinga, T. : *The optimal maintenance strategy based on a small dataset with failure data* (article).

Stuivenberg, T. & Tinga, T. : *Development of a usage-driven maintenance framework for the Chinook T-55 engine* (article).

Woldman, A. & Tinga, T. : *Modelling of single intender scratch tests* (article).

Woldman, A. : *An experimental and theoretical investigation into three-body abrasive wear* (PhD thesis).

Wubben, J. & Tinga, T. : *Dynamic maintenance based on system usage profiles* (article).

Manpower Resources Allocated

Participants	Section	Hours	Remarks
Dr. A. Baros	TNO	340	DDMS-1, senior research fellow
Prof. dr. P. van Fenema	MBS	50	DDMS-2
LTZ2OC ir. A. Homborg	CZSK	1530	DDMS-2, OPCO PhD research
Dr. ir. R. Janssen	MTS	420	DDMS-1 and 2
B. de Jonge, MSc	MTS	1530	DDMS-2, PhD research*
Military assistant prof (tba)	MTS	420	DDMS-2
Dr. H. Monsuur	MTS	420	DDMS-1 and 2
LTZ2OC D. Oorburg	MTS	100	DDMS-1
Ir. C. Rijsdijk	MoD	600	DDMS-2, PhD research*
ELT A. Schuitmaker	CLSK	765	DDMS-1 and 2 (temporary staff)
PhD (tba)	MoD	1530	DDMS-2, PhD research*
PhD (tba)	MTS	1530	DDMS-2, PhD research*
Prof. dr. ir. T. Tinga	MTS	420	DDMS-1 and 2
TNO PhD (tba)	MTS	1530	DDMS-1
Drs. M. van de Ven	MTS	420	DDMS-1 and 2
Dr. A. van der Wal	MTS	210	DDMS-1
Ir. J. Wubben	MTS	250	DDMS-2
			* = externally funded
		12065 h.	= 8.5 vte

SRO-5: The Human(e) Factor in Present-day Military Practices

Military practice takes shape in the preparation, facilitation, execution and enforcement of the tasks appointed to the Armed Forces. In its function as an instrument of force in the hands of the state, militaries in democratic societies are entrusted with the defence, protection and advancement of the values that are seen as indicative of these tasks, notably, peace, security and humanity.

This specific nature of present-day military practice is the reason why it is a unique object of study. The military are involved in complex interactions in which legitimacy, responsibility and accountability are cornerstones of their actions. The specific tasks and goals of the defence organisation and thus of its personnel with regard to peace, security and humanity, are at the beginning of the 21st century brought under the flag of 'responsibility to protect' and 'protection of civilians' (UN) in the international political context. In this context 'human(e) security' means that the focus on traditional war is broadened to peace-building and even state-building. This implies a shift of focus from the state and state sovereignty to the (threatened) individual(s). At the same time, international security is increasingly influenced by non-state actors such as global institutions and flexible (terrorist) structures. Also, society puts demands on national tasks and the protection of national and economic activities, as in the case of anti-piracy. More and more collaboration is sought with other (non)governmental resources to achieve this. Goals and values have to be balanced, sometimes even at the level of the individual soldier.

The human(e) factor

Within this context in which ethics and the use of violence are uniquely interrelated, this research program focuses on the crucial role of the human(e) factor. The cluster of values, both voiced within and with regard to military practice, not only implies that there is a unique and complex connection between ethics and violence in this practice (the humane factor), but it also points to the crucial role of the human factor. In other words, it also emphasises the importance of the focus on the soldier as an individual agent, as a member and leader of a team or ad hoc structures, and as a member, leader and manager in and of a governmental organisation that is entrusted with the monopoly of violence. Emphasised as well is that the actions of this human(e) factor are inherently enabled and constrained by the broader context of the socio-technological system in which he or she operates.

The complex combination of tasks and goals of the military generates many ethical, political, personnel, organisational and cultural questions and dilemmas. It has become painfully clear that these questions and dilemmas may have unwanted and tragic consequences for protégées as well as protectors of human(e) security, on an individual level as well as on an organisational and political level. Military personnel have to execute their monopoly of violence within the small margins of legitimate mandates and Rules of Engagement, yet, are often confronted with the asymmetry of these mandates and rules, and thus with

illegitimate violence and often gross violations of human rights. This not only leads to the abovementioned questions, dilemmas and uncertainties but also, as a result thereof, to stress and pressure, which may form a slippery slope to moral disengagement, PTSD and moral injury. The humane side of this research theme therefore includes the employer's responsibility in this sense.

Focus of the research program

In this research program both the actual behaviour and professionalism of military personnel, teams and organisations are studied as well as their underlying mechanisms and contextual sources. The philosophical and ethical fundamentals of the various aspects of military practice are another important focus. All these topics are studied before, during and after military missions and in the context of present-day military practice specifically. In order to ensure actuality, potential future developments in military practice will be taken up as well.

Scientific perspectives

The strength of the program lies in the unique interdisciplinary and transdisciplinary approach of its object: the human(e) factor in present-day military practices. The subjects in this program are studied from five different disciplines: psychology, philosophy/ethics, organisation sciences, sociology and political sciences. It is in their interconnectedness that these disciplines can generate new and fundamental insights that are not only of scientific importance but also of utmost importance to the defence organisation because it is in their mutuality that a broader understanding can be gained on the objects of research. Organisation sciences offers insights into the context in which the human(e) factor is active and into the particular dynamics that are active in this context. Psychology provides insights into the specific psychological dynamics of the human(e) factor in military contexts. Sociology puts all this in a framework of human social behaviour, including thereby potential organisational and institutional influences. This, in turn, connects with the political sciences. Philosophy and ethics, finally, provide insights into the ethical challenges that relate to military contexts as well as the analytical depth to the four other disciplines. In each project the interplay between the disciplines works out in a different way.

Three Research Themes

The interdisciplinary focus on military practice takes its relevance from both the academic literature and policy documents that are relevant for the defence organisation such as SKIA, and 'Toekomstverkenningen'. On the basis of this dual focus, three themes have been identified that each generate a variety of research projects that all reflect different, yet related, aspects of the human(e) factor in present-day military practices. Notably, these themes also form the basis of the education program of the FMS/NLDA. These three themes and their respective research projects are:

Collaboration and position within the scientific community

At several (inter)national universities extensive research is done in the domains of philosophy/ethics, psychology and organisation sciences. However, it is the focus on military operations, organisations, groups and individuals and the strong focus on the special circumstances within which the military has to operate, that makes this research program unique. The researchers are embedded in a number of (inter)national networks and cooperate with researchers of several scientific institutions:

TU Eindhoven, VU Amsterdam (Department of Law), Centre for International Conflict Analysis and Management (Radboud University), University of Amsterdam (Faculty of Humanities and of Social and Behavioral Sciences), University of Humanistics, Utrecht (researchprogram: 'burgerschap in een interculturele samenleving'), Instituto Technológico y de Estudios Superiores de Monterrey (Mexico), TNO, TU Delft, 3TU, Police Academy, Ruhr University (Bochum, Germany), Institute for International Law and Peace & Armed Conflict, Universita degli studi di Torino (Italy), Clingendael, Central Military Hospital (CMH), NATO/ RTO Human Factors and Medicine Panel, Military Ethics Education Network, International Society for Military Ethics (ISME), VIEW group (nternational & nterdisciplinary research group on Security, International Politics and Law), American Educational Research Association (AERA), Special Interest Group 'Moral Education', European Association for Research on learning and Instruction (EARLI), Special Interest Group 'learning and teaching in Culturally Diverse Settings', European Defence Agency (EDA): working group: Demographic change, Recruitment and Retention, Netherlands Veteran Institute

Research Theme 1: Military Ethics and Leadership

Given the complexity and the moral/ethical challenges of present-day military practice, reflection on the values, norms and related interests of this practice, is highly relevant. In providing and stimulating this reflection military ethics established itself as a form of applied ethics with a focus on the individual, organisational and political level. The connection between ethics and leadership, which is underlined in both academic and business contexts, is especially relevant in a military context.

1a. Moral professionalism and moral injury in military practices

The focus on moral professionalism implies the focus on the meaning and development – both on a scientific and a practical level – of the core aspects of moral professionalism, i.e. awareness, judgment, value communication, responsible action, responsibility and accountability, buoyancy and resilience. The first five aspects refer to the ability and willingness to act in a morally responsible way. However, this does not imply that there will be no tragic dilemmas and violent confrontations and as a possible consequence thereof moral injury and PTSD for the servicemen/women involved. Thus, with regard to the sixth

aspect of moral professionalism (buoyancy and resilience) the effects of moral questions and dilemmas that military personnel are confronted with and the mental health problems that can result from these confrontations are studied. The goal of this study is to develop tools and training to contribute to the prevention or decrease of these problems. With regard to this aspect there is a connection with the Dutch Veteran Institute, the Dutch Police Academy and the TNO research on mental defensibility.
In addition to the focus on moral professionalism as such, the project also focuses on the perception of military identity and its behavioural consequences (PhD research) and infrastructural conditions to support morally responsible military actions and interventions (PhD research).

1b. Moral education and moral formation in (the preparation for) violent contexts

One of the major objectives of ethics education is to strengthen moral competence (or moral professionalism). Little has been published in this area until now. This research project focuses specifically on the preconditions for ethics education and on the role that virtue ethics, the Socratic dialogue and the process of 'living learning' can play in this context. In order to realise this objective a 'train the trainer' course in military ethics, will play a crucial role. The focus will be on the discrepancy between strengthening moral competence (which is about constructive doubt and asking questions) and the work context of the participants. Thinking within a framework of legality, standards, regulations and obligations often implies thinking in black and white or right and wrong and leaves little room for acknowledging the grey areas. This poses a problem, given the complexity of military practice. Thus ways to overcome this discrepancy is also one of the objectives.

1c. Military Virtues

Most of today's militaries put their money on character building in trying to make their soldiers virtuous; developing virtues is seen by many authors as the best way to prevent misconduct by military personnel. Although there is a great deal to say in favour of virtue ethics, there are a few practical concerns. For instance, it appears that the traditional military virtues, such as honor, loyalty, courage and obedience are mainly beneficial to colleagues and the organisation, not so much to the local population of the countries military personnel are deployed to. Especially in today's missions it can be expected that the proper virtues are not necessarily solely the more martial ones. Finally, it should be noted that virtue ethics in the military is more about the soldiers themselves, the maintaining of their morals, their self-image and their ability to 'look at themselves in the mirror' than about those who suffer the consequences. The aim of the program is not only to shed some light on different aspects of some of the more prominent military virtues and the role they can have in

today's missions, but also to delve somewhat deeper into some of the abovementioned concerns.

1d. Building leaders; leadership and moral formation in Military Education

Military missions are becoming increasingly complex, not only from an organisational point of view, but also from a technological, cultural and ethical point of view. As a result of these developments, leadership in the military has never been more important. The traditional model of a single leader with a fixed group seems not exclusively relevant anymore. Future leaders need to be able to fulfill different kinds of roles in evolving networks and need to be able to cooperate with a variety of people and (international) organisations. Given their future challenges, leadership education and training exceeds preparation of leaders at a mere cognitive level. Leaders also need to have social, moral and mental competencies to adaptively handle the challenges they are confronted with. The broader educational philosophy connected to these competencies can be called 'Bildung'. The German concept 'Bildung' affects not only the cognitive, but also the emotional, moral and volitional development of an individual. This research project is oriented on the education of military leaders in contemporary western armies; on the educational philosophy behind the education of military leaders and specifically on the way 'Bildung' can be applied.
A second focus in this project lies on military socialisation effects on leadership and moral behaviour. This research explores the effects of specific military socialisation events. Longitudinal survey measures combined with cross-sectional deep interviews with officer(-cadet)s in national and international contexts allow a broad analysis of socialisation effects on the development of leadership and moral behaviour.

1e. Mass violence, military ethics and the politics of law

This new interdisciplinary research project will be set up in 2014. It will explore how soldiers deal with present-day demands of politics, ethics and law in violent conflicts and peace enforcement. For this project collaboration will be sought with researchers in the area of International Criminology and International Politics and Law.

Research Theme 2: Psychosocial dynamics of expeditionary organising

The ways in which the military operates and is perceived in the 21st century profoundly differs from the centuries before. Missions today can range from small-scaled events in the context of national tasks towards large-scale combat missions conducted globally – and everything in between, including distant warfare. To deal with this diversity, teams or even whole units are often constituted in an ad hoc manner with the expertise that is depicted by the 'expedition' to be accomplished. A result of all this is that up to the individual soldier the military is confronted with a diversity of tasks, environments, rules and regulations, political landscapes, units to work with, etc. Such flexible or expeditionary organising can pose a

burden of psychosocial dynamics on the organisation and on the individual. It is the responsibility of the armed forces to investigate these dynamics and their consequences, and to investigate how to prevent and/or to respond to them adequately.

2a. Military Intervention and Reconstruction: new dilemma's in a new millennium

In present-day military practice the combination of combat tasks and tasks with regard to political, social and economic reconstruction is not easy and often creates questions and dilemmas that cannot be countered with simple and short-term solutions. Notably, conflict resolution and political, social and economic reconstruction, and thus the road to 'human security', can only be realised by a comprehensive strategy. In one trajectory of this research project (developed in cooperation with the Centre of International Conflict Analysis and Management (CICAM) of the RU Nijmegen) the focus lies on an evaluative analysis of the concepts of comprehensive approach, human security, Just War and more specifically *ius post bellum* and their contribution to the questions and dilemmas that are generated in attempts to restore conflict and reconstruct political, social and economic infrastructures.

In a second trajectory the focus lies on the importance of civil-military relations (CMR) in humanitarian crises. In this context a profound analysis and understanding of the roles and perceptions of the military, humanitarian organisations and local population is needed, given the widely acknowledged tensions between all different actors in CMR. A third trajectory reflects on inherent dilemmas of state building in reconstruction activities.

2b. Gender, Integrity and the moral dimension of Leadership

Military organisations are characterised by hierarchy, uniformity, masculinity and an emphasis on group cohesion, leadership, structure and planning. This research project focuses on the influence of these contextual characteristics on co-operation processes, group dynamics, power processes, integrity and leadership. There are three trajectories. One focuses on the critical analysis of the gendered character of the military organisation, the so-called masculine orientation, and examines the implications of this orientation for military women during Peace Support Operations. The focus lies on the relationship between gender and implicit en explicit power processes, gender and group dynamics and gender and sexuality (PhD research of J. Bosch). The second trajectory focuses on integrity. The term 'violations of integrity' includes a range of meanings like misconduct, sexual harassment, bullying and physical violence. The best way to define this concept needs to be examined as well as which qualitative research methods could be used with regard to research on this topic. In a pilot study the experiences of recently appointed confidential supporters in the Corps of Cadets of the Royal Netherlands Military Academy (NLDA) will be monitored. At the same time the experiences of the first-year cadets with being or not being bullied during hazing rituals will be surveyed for a second time. A third trajectory focuses on the moral dimension of leadership. The Staal (2006) and Blauw (2010) studies have made clear that

there is a relatively high amount of misconduct in the defence organisation. These studies also stated that social leadership is lacking. On this precise point (military) leaders are supposed to play a key role in countering violations of integrity. What are the (im)possibilities with regard to these demands on the Dutch military?

2c. Demographic change, recruitment and retention

Demographic change but also the changes in mission types and the intensive use of ICT will change the staff composition of the Dutch defence forces. The number of recruits, the recruit's profile and possibilities to use ICT effectively in recruiting employees is affected by these changes. To keep up with these problems new recruitment (and retention) strategies must be developed, Research will be conducted to give insight in the possible impact of demographic, strategic changes and changes in ICT possibilities on recruitment and retention in the Dutch military now and in the future. Comparisons will be made with similar research projects in Europe to draw conclusions for (strategies for) recruitment and retention on the higher European level.

2d. Moral and cultural critical situations in the interaction with the local population during deployments (PhD research of M. Schut)

More than ever soldiers are interacting with the local population. Thus they are confronted with moral dilemmas, war crimes, heartbreaking human suffering and misbehaviour. They also face cultural differences (which can result in cultural clashes) and can experience a culture shock.
Situations in which perceived or experienced behaviour conflicts with personal moral values are in this context referred to as morally and culturally critical situations. This research describes how soldiers act in morally and culturally critical situations. . Furthermore, the goal is to describe which factors influence the way in which soldiers cope with these situations. At last, the local Afghan perspective on these situations and the soldier's behaviour is investigated.

2e. Psychosocial issues during and consequences of a deployment

During deployment military personnel will be exposed to ambushes and violent attacks, run a chance to be wounded or killed and witness violation of human rights of the innocent civilian population and the suffering of refugees. Service members can perceive incomprehension when sharing memories and experiences with e.g., relatives, colleagues or friends and actions during deployment can even be rejected by society after coming home. Also deployment-related experiences can cause feelings of regret, guilt and shame regarding own decisions and actions during deployment. In this project, psychosocial issues of Dutch soldiers during and after deployments will be studied and compared internationally in order to contribute to a better preparation of military officers on military deployments.

2f. The effects of stress and adaptability on (mental) health, well-being and performance of soldiers

Today's wars are inherently human endeavours. Combatants continually adapt to the intensities of war, the environmental complexities and stressors. Resilience, hardiness, leadership, coping skills and self-esteem protect the soldier against the short-term negative (mental health) consequences of these wars and provide soldiers with a proactive buffer against these stressors of the battlefield. The project will give insight in the impact of the demanding context of military missions by analysing the psychosocial aspects and their effects on the (mental) health, well-being and performance of soldiers. Examples of research questions are: How do soldiers react and adapt to these conditions and what psychological aspects are important for performing effectively under stress? Finally, the project focuses on stressful field exercises and training and selection protocols to stimulate adaptive conditions.

2g. The Warrior Peacekeeper Role Identity Project: validation of the Warrior Peacekeeper Identity Scale (WPRIS) and international comparisons of military role identity.

The Warrior Peacekeeper Role Identity Scale (WPRIS) measures warrior and peacekeeper role identities as two separate constructs. The psychometric qualities of this Dutch scale are promising. In this project we conduct research using the WPRIS for three aims: 1) comparing role identities and (background) variables between different countries (e.g. Canada, Belgium, and Estonia), 2) improving the psychometric qualities of the WPRIS and 3) developing norm scores for exploring correlations between role identities and other work-related variables. In its final validated form, the WPRIS can be used in military practice (e.g. in training) and as such it can identify deficits or biases in training programs. Finally, it can be used for preparation for deployment and identification and prevention of role strain during deployments.

In 2013 completed questionnaires were received from Estonia, Belgium and Canada and data have been prepared for analysis. Analysis will continue in 2014.

Research Theme 3: Safety in high risk socio-technological military systems and environments

Military organisations provide safety for others but do so commonly in high risk environments themselves. Its employees, mediated often by advanced and innovative technologies, have to operate in an environment that entails aspects of ambiguity and uncertainty. This raises a responsibility for the MoD, both in protecting its employees against unnecessary risks and in taking care of its personnel when things turn for the worse. Safety, therefore, is a relevant theme to investigate throughout the military socio-technological system and in the context of the complexity and dynamics of present-day military practice.

3a. Organisational fragility and the hermeneutics of safety

In this project, organisations are interpreted as social systems. Social systems are complex and are confronted with dynamics both from the inside and outside, which is the underlying source for their fragility: the challenge to maintain organised. The problem of developing an understanding for such social systems can be defined as a *hermeneutic activity*; an issue of interpreting and reinterpreting various accounts on these complex dynamics. This claim about the fundamental nature of social systems and how to access them opens up different avenues for research in safety issues. This research project focuses specifically on safety practices in the Netherlands Armed Forces and has the intention to contribute to its safety practices by means of critical analysis of safety practices, accidents and safety methodologies. Also, our goal is to theoretically and empirically develop the organisational fragility perspective.

3a1) Developing an organised theoretical perspective on safety management

This PhD project of M. Moorkamp focuses on safety management for expeditionary organisations such as the Netherlands armed forces. The assembly of constantly varying temporary organisations out of one or more parent organisations characterises these organisations. This might result in risks, as recent examples of near misses and friendly fire incidents highlight. Safety management theory seems to assume organisational and environmental stability. This study redefines safety management by developing a theory which focuses on aspects of organisational design that facilitate local adaptive processes. Applying such a theory may eventually enhance the organisation's ability to deal with variation, may diminish fragility and improve safety.

3a2) Safety in socio-technological military systems

Establishing safety of technology is often regarded as a rational process that can be modeled and controlled. In actual settings, however, this is also a social process, enabled and constrained as such. The mechanisms of these actual processes are still poorly understood. This would imply that foresight and hindsight opinion on issues of safety in military conduct, and thus for the individual soldier, can be suboptimal. This research attempts to answer from a socio-technological perspective initially, how regarding the establishment of safety as a social process can add value to foresight and hindsight safety assessments and evaluations of large-scale socio-technological military systems. The focus (specifically but not solely) will be on Unmanned Aircraft Systems (UAS).

3b. Organisational sense making & psychological fragility

Research into the experiences of military organisations and operators in dynamically complex environments has led to insights that can contribute to organisational sense making

theory. On the one hand, sense making theory can clarify how operators develop ways to deal with dynamically complex environments by enactment and subsequent reflection. On the other hand, however, such environments can confront operators with feelings of anxiety and guilt which can eventually develop into severe psychological trauma. An "academic split" exists between the fields that study these two aspects. One consequence of this split is that the psychological fragility of operators is underestimated in the academic literature on organisational sense making. This can constrain the ability of this approach to understand the very sense making dynamics they are most interested in. This project aims to theoretically connect the two academic fields. Such a connection could develop into an academic contribution and should lead to a more balanced understanding of the psychological pressures to which operators are exposed which could be the onset for further development in military training.

3c. Innovative technology in socio-technological military systems

This project focuses on the use of military technology, its role regarding safety and its ethical and organisational consequences. Technology is omnipresent in contemporary military practice (and it is expected that this will only increase), mediating thereby its appearance, sometimes in unintended ways. Technology, after all, is not neutral; it enables and constrains, it can alter (the perception and interpretation of) information, it can obscure and it can create ambiguity, to mention only some aspects of how technology can mediate. Initially, the aim of this project was to analyse and propose morally adequate standards and principles for the use of military technology. Also, the regulation of military technology was studied as well as the manner in which public perceptions and debates can play a role in regulation and how they should be accounted for in policy. In the future focused will be on new and emerging technologies such as autonomous robots, on human enhancement, cyber and network centric warfare technology.

Future research plans for research theme 3

Organisational fragility and the underlying sources such as complexity and dynamics remain themes of interest for this line of research. The scientific literature shows huge gaps in these areas. Also, the MoD has shown great interest in these areas as the Strategic Knowledge and Innovation agenda (SKIA) has earmarked this as one of the research priorities. Projects 3a and 3b therefore will be further developed. Within the project of organisational fragility, for instance, a main focus will be the further development of a perspective on organisational safety that is grounded in organisation science. More in particular, this research will continue to build on theory that enhances organisational flexibility and reduces fragility and its associated safety issues. A specific area of interest is that of organisational design. Incorporating and refining contemporary theory on how organisations may deal with

environmental variation by rethinking and redesigning its structural composition will be a main goal in the organisational fragility project.

Another research priority mentioned in the SKIA is the topic of innovative technology. With the increased exploitation of unmanned systems (or robotics) and the exploration of cyber space, the introduction of new and emerging technology is only expected to evolve. The aims of project 3c will therefore be extended. As this has been argued there, it is the mere introduction of technology into its larger socio-technological system that creates new ways to operate and therefore new ways for failure and new ethical dilemmas. Research topics therefore include the development or introduction of new technology, the implications of its use for the human(e) factor throughout the socio-technological system, military enhancement, regulatory aspects and the way in which public perceptions and debates can influence all of these areas. Regarding unmanned cargo systems and military enhancement, links exist with the university of Twente and Delft (3TU) respectively.

Activities/Results planned

Bezooijen, B. & Kramer, F.J. : 'Mission Command, NEC and Normal Accidents Theory in *Journal of Strategic Studies* (article).

Broesder, W., Op den Buijs, T., Vogelaar, A. & Euwema, M. : 'Can soldiers combine swords and ploughshares? The Warrior-Peacekeeper Role Identity Survey (WPRIS)' in: *Conflict Management and Peace Science* (article under review).

Broesder, W. & Op den Buijs, T. : *The validation of the Warrior-Peacekeeper Role Identity Survey* (article).

Broesder, W. & Op den Buijs, T. : *An international comparison on role identity. Are there international differences?* (article)

Broesder, W. & Op den Buijs, T. : *The influcence of work variables on the role identity of soldiers. An international study into the relations between job satisfaction, commitment, role conflict, self-esteem, dedication and role identity* (article).

Kramer, F.J. & Huiberts, S. : preparing an article which evaluates IDEA for the dilemmas of state-building as formulated by Paris & Sisk (article)

Kramer, F.J. : preparing an article on the image of man in organisational sensemaking theory.

Moorkamp, M. & Kramer, E.H., Gulijk, C. van & Ale, B. : 'Safety management theory and the expeditionary organization: a critical theoretical reflection' in: *Safety Science* (article under review).

Moorkamp, M. : *Veiligheidsmanagement in een expeditionaire krijgsmacht* (thesis). Due for completion in 2014.

Moorkamp, M. : *Het managen van veiligheid van de expeditionaire organisatie: de ervaringen van 107 Aerial Systems batterij en het veilig opereren met UAV's binnen Task Force Uruzgan* (research paper, working title).

Op den Buijs, T., Berge, C. van den & Snijders, J. : The psychosocial aspects of dangerous and turbulent Dutch missions (report).

Op den Buijs, T., Berg, C. van den, Snijders, J. & Dits-Beernink, N. : *What are the effects of psychological and social support during missions? A study into the moderating effects of the professional (mental) health care and social support during Dutch missions* (article in preparation).

Oltshoorn, P. : Articles on military robots and the question of accountability, dual loyalties of military medical personnel and border security.

Rijsdijk, E.: 'Forever connected: state narratives and the memory of Srebrenica' in: Glasius, M. & Zarkov, D. (eds.), *Narratives of Law and Justice after the Yugoslavs Wars (working title)*, Springer Verlag, 2014.

Rijsdijk, E. : has submitted a proposal to publish her PhD thesis *Lost in Srebrenica: Responsibility and Subjectivity in the Reconstructions of a Failed Peacekeeping Mission* at the *Routledge Interventions* book series. If accepted, she will revise the manuscript extensively and prepare it for publication in 2014.

Rijsdijk, E. : co-editor (with M. den Boer) on a student text book on *Security and Gender* in the Green Grass book series.

Verweij, D, Ligtenbarg, H. en Homan, C. : 'Ethiek en de Nederlandse Krijgsmacht' in Muller, E. & Starink, D. (et al): *Krijgsmacht. Studies over de Organisatie en het Optreden* (Kluwer 2014) (book chapter).

Verweij, D., Schut, M. &, Graaff, M. de: 'Moral Emotions During Military Deployment. A qualitative Study on moral emotions in intercultural actions' in: *Journal of Military Psychology* (article).

Verweij, D. & Grassiani, R. : 'Conscience under a gaze' in: *Journal of Military Strategic Studies* (article).

Verweij, D. Kramer, E.H. & Delahaije, D. : 'Building leaders' in: *Journal of Military Ethics* (article).

Verweij, D. : 'Zijn 'just wars' niet uiteindelijk ook 'just wars'? De mogelijkheden en onmogelijkheden van de 'traditie van de rechtvaardige oorlog' (paper). Een artikel van dit paper verschijnt in *Filosofie en Praktijk.*

Verweij, D. : 'Zijn democratische verhoudingen onmisbaar voor vrede?'. Paper voor symposium met gelijknamige titel van Vredescentrum Eindhoven.

Verweij, D., Richardson, R. & Schut, M. : 'An Inextricable Link? Culture and Morality in Intercultural Interactions during Military Deployments' in: *Journal of Peacebuilding and Development.*

Manpower resources allocated

Participants	**Section**	**Hours**	**Remarks**
Prof. dr. D. Verweij	MBSP	600	Humefa 1abc, 2abdef, 3ab
Maj G. Bakx MSc	MBSP	500	Humefa 3ab, PhD research
Dr. R. Beeres	MODE	80	Humefa 1a
Drs. J. Bosch	MBSP	200	Humefa 1ab, 2b
Dr. T. op den Buijs	MBSP	450	Humefa 2bcfg
Lcol drs. S. Dalenberg	MBSP	400	Humefa 1abcd
Dr. F.J. Kramer	MBSP	400	Humefa 1d, 2a, 3ab
Drs. M. Moorkamp	MBSP	1530	Humefa 3a(1), PhD reserach
Dr. P. Olsthoorn	MBSP	500	Humefa 1c
Dr. R. Richardson	MBSP	250	Humafa 2cde
Drs. E. Rijsdijk	MBSP	300	Humefa 1e
M. Schut MSc	MBSP/Radboud	1530	Humefa 2d, PhD research
PhD researcher	MBSP/TNO	1530	PhD research
Prof. dr. J. Soeters	MODE	50	Humefa 2g
		6670 h.	= 4.7 vte

SRO-6 Cyber Operations & Cyber Security

The SRO on Cyber Operations & Cyber Security, hereafter 'Cyber', started as a Research Theme in 2012. For the time being, the SRO is chaired by the associate professor for Cyber Operations, col (A) dr. Paul Ducheine.

The implementation of the Netherlands Cyber Security Strategy and the subsequent Defence Cyber Strategy resulted in the establishment of a small branch within the Faculty of Military Sciences dedicated to Cyber Operations & Cyber Security. An associated professor was nominated in June 2012, a researcher allocated in 2013, the chair (and professor) will start in 2014. This cyber research group will be embedded within the Defence Cyber Expertise Centre (operational in 2014) and will have the Faculty as its base.

Mission

The mission is to extend the knowledge and skills on cyber security (in general) and cyber operations (in particular). Five themes have been identified: operational (including doctrine and legal issues), strategy, governance and organisation, social and technological. The mission implies four sets of activities:

1. contributions to enhance cyber awareness (inside and outside the MoD);
2. the development of doctrine and strategy, as well as governance and organisation;
3. contributions to non-bachelor, bachelor and master course(s) on cyber;
4. research (in order to enable the previous activities)

Research funds and resources

As of 2013 two PhD researchers were allocated in cooperation with TNO and the Task Force Cyber (MoD). In addition, one PhD researcher was allocated by the NLD Army (as of September 2013). Furthermore, one researcher (0.5 vte) will be allocated by the NLD Navy.

The Task Force Cyber also provided funds that enable contracted research (Erasmus University). It is to be expected the MoD will provide for funds enabling external research. This research will be conducted in close cooperation with the Faculty's cyber branch.

Through existing research cooperation with the University of Amsterdam (Amsterdam Centre of International Law), the other branches of the Faculty and bilateral arrangements, cyber research started as early as 2012. The branch benefitted from the Faculty's joint effort on the theme of NL ARMS 2012 'Cyber Warfare'.

Research themes

LCol B. van de Bosch: *Rules for military cyber operations below the threshold of 'attack' (art. 49 API)*. This PhD research started in 2012. Due for completion in 2016.

TLNT Mr. J. van Haaster: *Cyber Contributions to Fighting Power.* PhD research which started in September 2013. Due for completion in 2017.

PhD student of the Task Force Cyber, to be appointed in December 2012: *Cyber capabilities in MoD's cyber roles.*Due for completion in 2016.

TNO-PhD student on Cyber Technology. The exact subject of the thesis is still to be defined. Research will start in December 2013.

External and outsourced research

R. Bierens MA: *Cyber War; Risk Management in the Fifth Domain*. External PhD research. Supervisors: Prof J. van den Berg (TUD), Prof. dr. F. Osinga and Col dr. P. Ducheine (both FMS).

Maj M. Dierckx LL.M : *Cyber Activities by Intelligence Services.* External (MIVD) PhD research. Supervisors: Prof. dr. A. Lodder (VU) and Col dr. P. Ducheine.

SCADA vulnerabilities, Ir. Allard Dijk (NLD Navy). Supervisor: Prof. S. Etale.

Dr. D. Broeders (Erasmus University) is doing research on the place and role of the armed forces in Dutch Cyber security. He started in 2013. The research will result in joint papers in 2014.

Military Cyber Governance: Intervening in Ungoverned Spaces, Prof. dr. B. de Graaf, Mr. S. Boeke, Centre for Terrorism and Counterterrorism/Campus The Hague, Leiden University.

Joint research and publications in 2014

Prof. dr. I. Duyvesteyn (Leiden University), Mr. L. Boer (VU) and Col dr. P. Ducheine: *Quo vadis: the Netherlands' Strategic Position in Cyberspace.*

Col dr. P. Ducheine & TLNT Mr. J. van Haaster on the role and contribution of cyber capabilities to/in Military Doctrine and Fighting Power. To be published in a UK journal.

Col. Dr. P. Ducheine & TNLT Mr. J. van Haaster : *Active Cyber Defence Operations integrated in the Armed Forces' Doctrines*, in: Technical, Strategic and Legal Aspects of Active Cyber Defence, CCDCOE, 6th International Conference on Cyber Conflict 2014 (CyCon 2014).

Results planned

Ducheine, P. : 'The Notion of Cyber Operations (in international law and warfare)' in: Tsagourias, N. & Buchan, R. (eds.), *Research Handbook on Cyber Space and International Law*, Cheltenham: Edward Elgar Publishing Ltd (2014).

Ducheine, P. : 'The Netherlands' Cyber Security' in: Tikk, E., *Roadmap for developing the Strategic Dossier on Cyber Security (IISS)*. To be published 2014-2015.

Ducheine, P. : 'Non-kinetic targeting & cyber operations', in: Osinga, F., Ducheine, P. & Schmitt, M. (eds.), *Targeting: Multiple perspectives and challenges in modern warfare*, The Hague: Asser Press (2014).

Publications on an assessment of the ramifications of MoD's cyber operations and cyber warfare vis-a-vis the Royal Dutch Constabulary and the Dutch Public Prosecuting Authority, Coercion in cyberspace and Cyberspace, social media en strategic narratives.

Future research 2014-2018

'Soft Cyber': Effectiveness, Opportunities & Ramifications of the Use of Social Media Generating Military Effects Alongside Kinetic and Conventional Military Effects.

Responding to an Intervening Third Party: How and Why? The Non-Alligned Non-State Actor Entering Military Conflicts through Cyberspace. Cases studies based on the intervention of Anonymous as an 'activist' third party in the Second Gaza War (Israel vs. Hamas) and alike.

Dutch Emergency Legislation Filling up Governance Potholes in Cyber Security? Could emergency legislation (staatsnoodrecht) provide adequate instruments, required in situations where institutions are faced with lacunas in regular cyber security legislation.

Cyber countermeasures short of force: changing demands and codes of conduct?

Cyber Operations & Logistics in cooperation with prof. dr. P. van Fenema (FMS)

New Cyber Powers the Intelligence Services, an evaluation of the proposals of the Commission Dessens in cooperation with prof. dr. B. de Graaff.

The autonomous and non-aligned non-state actor intervening on the battlefield: what next?

Comparative research into operational capabilities & doctrines.

Digital financial operations against warring and belligerent actors.

The research output will generate fruits for exploitation in our education as well as in Defence Cyber Security Awareness Course which is developed and hosted by NLDA.

NLDA Research and Expertise Centre

Human Factors and System Safety

Military activity is increasingly situated in complex and dynamic environments. This trend can partly be related to global trends towards an increase in system integration. Safety issues emerge from this. The NLDA Centre of Excellence on Human Factors and System Safety has been active in this area, by consulting on safety management systems, developing and providing lectures and programs on Human Factors and (System) Safety, and by conducting scientifically based in-depth investigations of accidents and incidents within the armed forces. Furthermore, members of the centre participate in forums that are focused on the one hand on assuring the availability and a guaranteed quality of knowledge in this area, and on the other hand on embedding this knowledge in the different educational programs of the armed forces.

The NLDA Centre of Excellence on Human Factors and System Safety utilises scientific knowledge and expertise that is inherently available at the NLDA to contribute to issues of safe performance that military practitioners and the armed forces in general typically are confronted with. The internal need for this has been formulated in the Strategic Knowledge and Innovation Agenda 2011-2015. The aim of the centre is to strive to a win-win-win situation: the defence organisation as a whole can benefit from existing knowledge and expertise within the armed forces on Human Factors and System Safety, the NLDA research programs will benefit from opportunities for practically oriented issues and research. Also, findings and experiences will be used to flow back into the NLDA bachelor and other educational programs.

With the cancellation of the Minor Human Factors and System Safety in the bachelor curriculum after 2013-2014 it is the intention of the centre to continue a similar education program that will use existing courses from the new bachelor curriculum. These courses, it is the intention, will be offered as separate modules and a certain set of modules could then lead to a certificate in Human Factors and System Safety. To achieve this, separate courses could be developed (or copied from the old program) and added by the centre of excellence.

Activities/Results planned

- Providing lectures on Human Factors and System Safety in the Air Force course for flight safety officers (2 x 1,5 days).
- Providing lectures on Human Factors and System Safety in the Masterclass Safety. Management as part of the Dutch Defence Safety Management System (2x 1,5 days).
- Providing lectures on Human Factors and System Safety in the Safety Investigators course (2x 1,5 day).
- Providing lectures on Human Factors and System Safety in the Crew Resource Management (CRM) *Train the Trainer Course* in Den Helder (2x 2 days).

- Providing a workshop on Human Factors and System Safety as part of the yearly safety program of Flight Cabin Attendants (2x 1 day).
- Publishing a minimum of four semi-scientific papers in magazines like the Military Spectator.
- Organising a workshop on the topic of CRM with an emphasis on the exchange of knowledge and expertise between defence units internally and with external organisations in the safety and security realm such as the Police Academy and the National Institute of Physical Safety.
- Organising a seminar in the first half of 2014 on a topic in the area of Human Factors and System Safety
- Conducting regular peer reviews and adjustments of Human Factors and System Safety programs with CEAG (Center of Expertise on Labour and Health).
- Participation in Human Factors and Safety Working Group (Werkgroep Human Factors en Veiligheid Defensie, WHF&VD).
- Participation in the Working Group for (Occupational) Safety and Environmental Education (Werkgroep Veiligheid Arbo en Milieu in Opleidingen Defensie, WVAMOD), installed to synchronise and develop educational programs related to (occupational) safety and environment.
- Investigation of possibilities and opportunities for collaboration with the recently installed Knowledge Center on Risk Management and Safety of the University of Twente.
- Developing a modular educational program in Human Factors and System Safety.
- Conducting in-depth scientific research on safety management in general and on issues of human factors and system safety specifically, as triggered for instance by accidents and incidents, or by specific requests for expertise in these domains from within the defence organisation.
- Providing consultancy on request on the topic of Human Factors and System Safety.

Manpower Resources Allocated

Participants	Section	Hours	Remarks
Maj G. Bakx MSc Dr. T. Bijlsma Drs. I. van Kemenade Dr. F.J. Kramer Dr. R. Richardson Dr. W. Schmidt	MBW MBW OZB MBW MBW MBW	125 40 10 15 25 15	
		230 h.	= 0.2 vte

Military Operations Research

Recent developments such as the increase in asymmetric conflicts and increased joint and combined missions imply operations in widely diverging circumstances in unfamiliar locations. This requires solutions for the optimal deployment, coordination and operational logistics of the available military systems. It should be explored how operational capability can be enhanced through the exploitation of new technologies, new focus of organisation or new concept of operations.

Our research focuses on using analytical and quantitative methods and applying modeling and simulation techniques to solve operational, tactical and strategic problems. Methods that we use include meta-heuristics, game theory, decision-analysis, stochastic and agent-based modeling, network sciences and logistics, but also soft techniques as system dynamics and expert opinion.

Mission of the Expertise Centre

The Expertise Centre Military Operations Research contributes to credible and practical advice on and solutions to (military) operational, tactical and strategic problems. These problems are about the deployment and operational logistics of military systems and technology, and use of planning and decision tools for military missions.

The main activities of our expertise centre are:

- providing a platform for discussions and bringing together different stakeholders;
- coaching of officers in applying scientific methods to the operational problems they face; permanent education in applying military operations research methods;
- informing the military community about recent projects and scientific studies of the faculty;
- developing military relevant case studies for students of the FMS.

Activities/Research projects planned

Piracy Analysis: the development of a system dynamics model to study the implications of various strategies.

Optimal Maintenance Processes and Spare Part Management for small-fleet missions: The investigation of various policies when maintenance is performed in a more dynamic manner, instead of maintenance at fixed intervals. This project is in cooperation with the expertise centre Maintenance and Life Cycle Management at the NLDA.

A game theoretic attacker-defender ASW model: In transit to an operating area or in a sea base situation an expeditionary RNLN task group can be threatened by enemy SSKs. The task group is presumed to consist of one or more HVUs, defended by a number of assets, including an M-frigate equipped with LFAS and possibly one or more organic NH-90

helicopters. This project is in cooperation with the Maritime Warfare Centre and Naval Postgraduate School in Monterey (USA).

Planning tool for submarines in transits: Submarines need to operate undetected. However, submerged is a state that cannot be sustained over time. Therefore, in transit, the submarine will also have to sail at periscope depth (PD) at regular intervals, and fresh air is added to the boat. This project aims at developing a planning tool that also takes into account several technical characteristics of the batteries.

Nato panels/ NATO Lecture Series (LS): SAS-098: Operational Research / Operational Analysis Orientation Course Curriculum for NATO Nations.