NORTH ATLANTIC TREATY ORGANISATION

RESEARCH AND TECHNOLOGY ORGANISATION

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RTO TECHNICAL REPORT **TR-SAS-066-Phase-I**

Joint Operations 2030 – Phase I Report: June 2007

(Opérations interarmées 2030 – Rapport Phase I : Juin 2007)

This Report documents the findings and results of Phase I of the SAS-066, Joint Operations 2030 Long-Term Scientific Study.

Published April 2011

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The Research and Technology Organisation (RTO) of NATO

RTO is the single focus in NATO for Defence Research and Technology activities. Its mission is to conduct and promote co-operative research and information exchange. The objective is to support the development and effective use of national defence research and technology and to meet the military needs of the Alliance, to maintain a technological lead, and to provide advice to NATO and national decision makers. The RTO performs its mission with the support of an extensive network of national experts. It also ensures effective co-ordination with other NATO bodies involved in R&T activities.

RTO reports both to the Military Committee of NATO and to the Conference of National Armament Directors. It comprises a Research and Technology Board (RTB) as the highest level of national representation and the Research and Technology Agency (RTA), a dedicated staff with its headquarters in Neuilly, near Paris, France. In order to facilitate contacts with the military users and other NATO activities, a small part of the RTA staff is located in NATO Headquarters in Brussels. The Brussels staff also co-ordinates RTO's co-operation with nations in Middle and Eastern Europe, to which RTO attaches particular importance especially as working together in the field of research is one of the more promising areas of co-operation.

The total spectrum of R&T activities is covered by the following 7 bodies:

- AVT Applied Vehicle Technology Panel
- HFM Human Factors and Medicine Panel
- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS System Analysis and Studies Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

These bodies are made up of national representatives as well as generally recognised 'world class' scientists. They also provide a communication link to military users and other NATO bodies. RTO's scientific and technological work is carried out by Technical Teams, created for specific activities and with a specific duration. Such Technical Teams can organise workshops, symposia, field trials, lecture series and training courses. An important function of these Technical Teams is to ensure the continuity of the expert networks.

RTO builds upon earlier co-operation in defence research and technology as set-up under the Advisory Group for Aerospace Research and Development (AGARD) and the Defence Research Group (DRG). AGARD and the DRG share common roots in that they were both established at the initiative of Dr Theodore von Kármán, a leading aerospace scientist, who early on recognised the importance of scientific support for the Allied Armed Forces. RTO is capitalising on these common roots in order to provide the Alliance and the NATO nations with a strong scientific and technological basis that will guarantee a solid base for the future.

Published April 2011

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Table of Contents

List of Abbreviations

ACT	Allied Command Transformation
CAN	Canada
CONOPS	Concept of Operations
JO 2030	Joint Operations 2030
LTRS	Long-Term Requirements Study
LTSS	Long-Term Scientific Study
NATO	North Atlantic Treaty Organisation
NC3A	NATO Consultation, Command and Control Agency
NLD	Netherlands
OPP	Operational Planning Process
SAS	System Analysis and Studies Panel

Joint Operations 2030 – Phase I Report: June 2007

(RTO-TR-SAS-066-Phase-I)

Executive Summary

This report provides an overview of the work done during the Phase I of the SAS Long-Term Scientific Study "Joint Operations 2030" (SAS-066). The overall objective of this study is to identify research and technology opportunities that will enable the capabilities that will be required for NATO to the horizon 2030.

A great deal of the effort during Phase I was dedicated towards developing a common understanding of the project, and to agree upon key methodologies. It was agreed that the methodology known as "future worlds" was better than using trends to extrapolate what the future will look like in 2030. The "future worlds" methodology will be used to test various scenarios in 3 or 4 substantially different worlds from a geo-political standpoint. It was also agreed that the study will try to use as much as possible existing scenarios, particularly the ones developed by ACT as part of their work on the NATO-mandated Long-Term Requirement Study. The Operational Planning Process (OPP) was also retained to develop concepts of operations in scenarios to test various capabilities and identify capability gaps. However, given that the world of 2030 is likely to be quite different from the present, it was also agreed that the OPP will be used only as a general guideline rather than as a strict process to follow.

Finally, beyond using geo-political and technological axes to identify future capability needs, it emerged that there was interest in exploring a third axis along the lines of those barely understood conditions that could influence future outcomes. This exploration has subsequently been called a Thematic Analysis and refers to those horizontal issues, whose impact is often underestimated. The work of defining these Themes and then, in turn, using the geo-political, technological and thematic trends to determine future capability requirements will be the focus of the next 1 – 3 meetings of the JO 2030 Study Group.

Opérations interarmées 2030 – Rapport Phase I : Juin 2007

(RTO-TR-SAS-066-Phase-I)

Synthèse

Ce rapport donne une vue d'ensemble du travail qui a été effectué pendant la phase I de l'étude scientifique à long terme SAS « JO 2030 » (SAS-066). L'objectif global de cette étude est d'identifier les opportunités de recherche et de technologie permettant d'atteindre les besoins capacitaires de l'OTAN à l'horizon 2030.

Une grande partie des travaux de la phase I a été consacrée au développement d'une compréhension commune du projet, et à se mettre d'accord sur les méthodologies clés. Il a été admis que la méthodologie connue sous le nom de « Mondes futurs » était meilleure que celle consistant à utiliser les tendances, pour en extrapoler ce à quoi ressemblera le futur en 2030. La méthodologie « Mondes futurs » sera utilisée pour tester divers scénarios dans 3 ou 4 mondes notablement différents d'un point de vue géopolitique. Il a été également convenu que l'étude devrait autant que possible essayer d'utiliser les scénarios existants, en particulier ceux qui avaient été développés par ACT dans le cadre de l'étude des exigences à long terme mandatée par l'OTAN. Le processus opérationnel de planification (OPP) a également été retenu pour développer des concepts d'opérations selon des scénarios destinés à tester différentes capacités, et identifier les lacunes capacitaires. Quoi qu'il en soit, compte tenu du fait que le monde de 2030 sera probablement très différent du monde actuel, il a également été convenu que l'OPP serait utilisé seulement comme un guide plutôt que comme un processus rigide à suivre.

Finalement, au delà de l'utilisation des axes géopolitique et technologique pour identifier les futurs besoins capacitaires, il est apparu qu'il serait intéressant d'explorer un troisième axe à côté de ceux qui ne sont pas reconnus comme pouvant influencer les résultats futurs. Cette exploration a, par la suite, été appelée Analyse Thématique et renvoie à ces questions horizontales dont l'impact est souvent sous-estimé. Le travail de définition de ces thèmes, puis en retour l'utilisation des tendances géopolitiques technologiques et thématiques pour déterminer les futures exigences en matière de capacités seront le point central des prochaines rencontres 1 – 3 du groupe d'études JO 2030.

JOINT OPERATIONS 2030 – PHASE I REPORT

1.0 INTRODUCTION

1.1 SAS-066 JO 2030 Background

Several single-service focussed Long-Term Scientific Studies (LTSSs) were conducted by NATO in the mid 1990s, but the missions and role of the Alliance have changed significantly since then. Recent military operations highlight the transformation of modern warfare in the following critical respects:

- Globalization of asymmetric threats to the security of Alliance Nations;
- Increased need for joint multi-national expeditionary operations outside NATO's historic area of responsibility;
- Drive towards further integration of single service capabilities into fully joint force capabilities;
- Need for information superiority, flexibility, and rapid employment of forces;
- Increased concern for protection and counteraction against weapons of mass destruction; and
- Need for improved networking of military C2 systems with civil authorities and other multi-national bodies.

In November 2005 at the SAS Business Panel Meeting, Canada agreed to lead a LTSS that would:

- Consider the changed security environment;
- Identify capability shortfalls;
- Consider how a joint multi-national approach could be advantageously exploited; and
- Address the impact of emerging technologies.

This was followed by an Exploratory Team meeting that was held at NATO Headquarters, the development of a study Terms of Reference and Work Plan which were approved by the SAS Panel in April 2006 and given the name SAS-066 Joint Operations 2030. Approval by the member Nations was received in July 2006 and the Study began in the fall of 2006.

1.2 Study Objectives

As detailed in the study's TOR it will:

- Consider the impact that potential future global security environments could have on joint operations across a range of representative operations;
- Determine the types of capabilities and identify capability gaps that may exist in this future environment; and
- Consider how applied technologies will impact upon future capabilities and identify system concepts that could either close capability gaps or significantly enhance capabilities.

The JO 2030 study proposes to meet these objectives by dealing with the following issues and areas of interest:

- The strategic environment, scenarios and CONOPS;

- The projected baseline capabilities for NATO key force structures in 2018;
- By identifying capabilities for 2030 and assessing capability gaps; and
- By conducting a technology assessment and identifying system concepts to close capability gaps or enhance capabilities.

1.3 Report on the Phase I Meeting

The JO 2030 Study program of work has been divided into five phases and is scheduled to complete its work by December 2009. The study held its first Phase I meeting over the course of five days in Paris from 6-9 November 2006 and it was attended by 20 participants representing 10 Nations and 3 different NATO organizations. The overall objective of this initial meeting was to serve as an introduction to the study and to begin to build a common understanding of the study's methods and concepts. Areas of specific discussion included security threats and trends, the future security environment, the future worlds approach to Long-Term planning, ACT's Long-Term Capability Requirements Study, the use of scenarios in long-term planning, and the role of a military estimate and development of a concept of operations in operational planning.

This report serves as a record of this meeting.

2.0 STRATEGIC ENVIRONMENT

2.1 Study Context

The initial challenge for the Joint Operations 2030 was to assess the type of capabilities NATO will require in the horizon 2030. This represents a 25-year leap into the future. Given that the future is, by definition, unknowable, this study is presented with a significant challenge in order to anticipate the Alliance's long-term future capability needs. In this fluid and uncertain strategic environment a number of avenues of exploration and insight were reviewed.

2.2 Problems with "Trends" Only Approach

To find ways to deal with this challenge, the Study Group looked into the "Global Trends", presented by the ACT members. After some discussions, the Group concluded that using a "trends approach" was not the best option to anticipate future capability needs. The "trends approach", although providing useful information, tends to be too linear in its construct and too much based on what we know now. Any deviations of the trends would lead to a substantially, if not radically, different future, which would make our assessment of future capabilities erroneous.

2.3 Alternate Worlds Approach

The approach of "alternate worlds" was proposed as an alternative for the Study Group. Alternate worlds looks at various macroscopic parameters deemed having structural impacts. These parameters are themselves constituted into binary axes of metrics (e.g., international system stability – high or low; peer competitor to the Alliance – yes or no; transatlantic link – weak or strong). Finally, logically consistent clusters of metrics are combined together establish a possible alternate world. Based on ACT's use of the alternate worlds methodology, four future worlds were proposed to the Study Group. They were given the following descriptive names:

a) Return to the World Order;

b) Middle East Resurgence;

c) China Resurgence; and

d) Globalization of Terror.

The Study Group would work to propose capability needs for NATO that meet the challenges found in each world, and ideally find capabilities that can be applicable to more than one possible future world. It is important to note, however, that the Study Group will try to use as much as possible the work done by ACT members, but upon evaluation of the detailed future worlds proposed by ACT may decide to add, remove or modify future worlds to meet the needs of the study.

2.4 Scenario Methodology

The Study Group has selected the scenario methodology to explore how various future capabilities perform in each of the future worlds. ACT will develop one scenario for each future world that encompasses as many elements as possible of each future world. The study agreed that more than one scenario per future world would be probably better, but given the limited resources and time available the ACT scenarios constitute an acceptable compromise. However, for the scenarios too, the Study Group remains open to the possibility of adding, removing or modifying scenarios upon detailed evaluation of the scenarios proposed by ACT.

2.5 Thematic Analysis

Finally, beyond using scenario-based geo-political and technological axes to identify future capability needs, towards the end of the meeting it emerged that there was interest in developing a third axis of exploration along the lines of deep trends or as yet barely understood conditions that could influence future outcomes. This exploration has subsequently been called a “Thematic Analysis” and refers to those horizontal issues, whose impact is often hard to discern or is underestimated.

3.0 USE OF SCENARIOS

3.1 Introduction

In order to inform the capability analysis and capability projection efforts that this study will undertake in Phases III and IV, effort was spent during Phase I to consider the utility and availability of different scenarios that could be used to provide context and meaning to the JO 2030 study. Briefings from ACT on various scenario options were given and a discussion period on the use of scenarios in this study was also conducted. The highlights of these discussions concerned four issues: classification; credibility; resolution; and applicability. Each of these is discussed below.

3.2 Classification

It was generally agreed that it would be preferred, where possible, to work with a scenario at the unclassified level. Where possible the study’s objectives are to work in an open and accessible forum and avoiding classified scenarios helps meet this objective.

3.3 Credibility

Credibility or realism refers to a measure of how realistic or conceivable the scenario is. Scenarios can be well informed from previous historical events but are not always great predictors of future conflicts – nor are they meant to be. However, given that JO 2030 must work in a far future time frame, this can be a challenge. The potential scenario space is very large. Thus, finding a working balance with an agreed scenario that situates one or more of the potential JO 2030 operations, without confining the study's focus too narrowly on that one situation, will be an ongoing effort.

3.4 Resolution

In general, it was recognized that a scenario needs to have good to high resolution. This aids the contextual impact of the scenario. Nonetheless, given the future dimension of this study, the study does not intend to expend great effort on getting the resolution right. The scenario or scenarios chosen will best serve the study as test beds for novel technologies, new systems, and novel approaches to conflict resolution challenges.

3.5 Applicability

While the title JO 2030 might lead one to see this as a study of NATO expeditionary operations in the far future, it was the general agreement of the Study Group that other operations closer to home such as WMD threats or internal security challenges within NATO Nations should also be considered.

3.6 Choosing One or More Scenarios

Some discussion was also held as to if only one scenario or a set of scenarios should be considered. Discussion ranged across a number of possible options. It clearly was beyond this study's scope to enter into a scenario building process of its own. Other alternatives settled upon either working with four planning scenarios that are based upon the Zoran Sea Scenario developed at NC3A or to work with the outcome of ACT's scenario work that is being used to inform their Long-Term Requirements Study effort. Both options were left to be further considered in later phases.

4.0 MILITARY CONCEPTS OF OPERATIONS

4.1 Operational Planning Process (OPP)

In order to build scenarios and test various capabilities combinations, the Group agreed that the Operational Planning Process (OPP) should be used. It is a comprehensive planning tool, but should not be used as a checklist for the purpose of this study. Instead, the Group prefers to identify what are the main principles of the OPP process and how it could be exploited for the purpose of the study. In other words, it was viewed as a good tool that could guide the study's analysis but it should not drive it.

The OPP was also found useful to interact with other partners and organizations, as it is a standard and well-known process. We have to maximize the possibilities of collaboration with other countries and agencies, as we do not have assigned resources for this study.

4.2 Limitations of the OPP

The OPP, however, has some drawbacks. The OPP is built on the achievement of one end-state, derived from the analysis. In the context of 2030, it would be wise to assume a much greater complexity in deriving end-states,

particularly having in mind that a number of end-states might be sought by each major stakeholder. In this regard, the Diplomatic Information Military and Economic (DIME) paradigm is somewhat illustrative and helpful.

Instead of using only the OPP, we need to think more creatively and look at effects we want to obtain, beyond the ones developed for the scenarios. The effects have to be thought in much wider, longer-term and holistic perspective.

4.3 Some Directions in Using the OPP

One required activity before developing or using existing scenarios will be the selection of those elements in the OPP that we think will be useful for this study. The Group agreed that from a military perspective we cannot rid ourselves of the need to construct relevant end-states, because the aim of any military operation is more easily explained in end-state terms. Without such an important step our work becomes more difficult. We need to define an end-state, we need to identify an aim, and we need to identify centres-of-gravity. These are the most important activities that must be respected.

5.0 THE WAY AHEAD

Towards the end of the meeting a number of things were left to be progressed between the end of this meeting and the Phase II meeting set for Brno, the Czech Republic 25-29 June 2007. The key ones are as follows while a table of the end of Phase I "To Do List" is included at Annex D:

- Write the Phase I Report – a task taken on by the Lead Nation;
- Draft a list of common terms that would be agreed to and used by the Study – a task taken on by the CAN;
- Obtain and distribute for review the 4 Zoran Sea Scenarios – a task taken on by ACT and NOR;
- Track LTRS work on Scenarios – a task taken on by ACT;
- Examine the mission types with an aim to select the representative list for the purpose of the study – a task taken on by NLD;
- Develop a 2018 asset list and from this develop a NATO 2018 Capability List – a task taken on by ACT; and
- Organise and administer the work between and for the Phase II meeting – a task assumed by the Lead and Host Nation (the Czech Republic).

Recalling that the Core Study Team currently consisted of representation from CAN, NLD and ACT, and remained open to representation from other participating Nations, it was also understood that the Core Study Team would meet occasionally between the end of the Phase I and start of the Phase II meetings in an effort to progress work on some of the above items.

With the next Study Group, Phase II meeting set for Brno, in the Czech Republic, the participating Nations were also encouraged to consider the possibility of hosting a meeting during the remaining course of this study.

6.0 CONCLUSION

The JO 2030 Study is a three year multi-phased study. The first, Phase I meeting of the Study Group for this study was successfully held in Paris, 5-9 November 2006. It served as a good introduction to the study's objectives and was a good platform for understanding and exploring the study's methods and assumptions amongst the representatives from 10 Nations and 3 NATO agencies.

Annex A – PHASE I AGENDA

SAS-066 Joint Operations 2030 – Phase I Meeting
6-10 November 2006
RTA Offices Paris, France

MONDAY, 6 NOVEMBER 2006

TIME	ACTIVITY	PRESENTER
1:30 pm	Registration	
2:00 pm	General Introductions and the RTO & LTSSs	Study Leader / LtCol. Cliatt
3:00 pm	Break	
3:30 pm	Study Introduction and Study Objectives	Study Leader
4:30 pm	Phase I Agenda and Objectives	Study Leader
5:00 pm	Adjourn	
7:00 pm	No host Ice Breaker – TBD	

TUESDAY, 7 NOVEMBER 2006

TIME	ACTIVITY	PRESENTER
9:00 am	Phase I Opening Remarks – THEME OF THE DAY: The Strategic Environment in 2030	Study Leader
9:10 am	Global Trends	ACT
9:50 am	The Future Security Environment	ACT
10:30 am	Break	
10:50 am	Future Worlds	ACT
11:30 am	Alternate NATOs	ACT
12:00 am	General Discussion	
12:30 pm	Lunch	
2:00 pm	Break-Out Discussions	
3:30 pm	Break	
4:00 pm	Whole Group Discussion	
5:00 pm	Adjourn	
7:00 pm	No host Dinner – place TBD	

WEDNESDAY, 8 NOVEMBER 2006

TIME	ACTIVITY	PRESENTER
9:00 am	Day 3 Opening Remarks – THEME OF THE DAY: Scenarios and Starting Assumptions	Study Leader
9:15 am	Why Scenarios and Scenario Assumptions	Study Leader
9:45 am	NATO Scenarios – An overview	NC3A?
10:30 am	Break	
11:00	Zoran	ACT
11:30 am	Break-Out Discussions	
12:30 pm	Lunch	
2:00 pm	Whole Group Discussions	
3:30 pm	Break	
4:00 pm	Details of One or Two NATO Scenarios	NC3A
5:00 pm	Adjourn	
	Free evening	

THURSDAY, 9 NOVEMBER 2006

TIME	ACTIVITY	PRESENTER
9:00 am	Day 4 Opening Remarks – THEME OF THE DAY: Military CONOPS 2030	Study Leader
9:15 am	Military Concept of Operations and the Operational Planning Process in 2030	Canada / ACT
10:00 am	Break-Out Discussions	
10:30 am	Break	
11:00 am	Continue Discussion	
11:30 am	Whole Group Discussion	
12:30 pm	Lunch	
2:00 pm	Follow on Study Planning and Things To Do	Study Leader
3:30 pm	Break	
4:00 pm	Program of Work Review	Study Leader
5:00 pm	Closing Remarks	

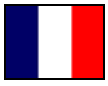
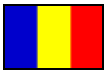
FRIDAY, 10 NOVEMBER 2006

Travel Day

Annex B – LIST OF ATTENDEES

Name	Country/Organization
Beedie, Alistair	NATO DPP
Bekkers, Frank	NLD
Black, Dean	CAN
De Spiegeleire, Stephan	NLD
Eloy, Matthieu	FRA
Glarum, Sigurd	NOR
Horvat, Bogdan	SVN
Leeman, Geert	BEL
Lemche, Viggo	DNK
Massel, Paul	CAN
Meier, Andreas	DEU
Nogrady, Nikolaus	DEU
Ouellet, Eric	CAN
Pikner, Ivo	CZE
Simpson, Richard	NATO ACT
Svejda, Miroslav	CZE
Tocher, Mark	NATO ACT
Toevank, Freek-Jan	NLD
Vermorel, Jacques	NATO RTO
Walker, Bruce “Skip”	NATO ACT
Wright, Colin	NATO ACT

Annex C – VISUAL ATTENDEES LIST BY COUNTRY/ORGANIZATION

Country	Exploratory Team Meeting 22-23 March 2006	Phase I Meeting 6-10 November 2006	Phase II Meeting 25-29 June 2007	Phase III Meeting 1 6-9 November 2007	Phase III Meeting 2 4-9 February 2008
BEL					
CAN					
CZE					
DNK					
FRA					
DEU					
HUN					
ITA					
NLD					
NOR					
ROU					
SVK					
SVN					
USA					
NATO					

Annex D – THINGS TO DO LIST

End of Phase I Meeting – Things To Do List

NOTES	ACTIVITY	Level of Effort	ACT TC720	ACT TC730	CAN	NLD	BEL	NOR	DNK	CZE	DEU	FRA	SVN	USA	UK
	Write Phase I Report	ITE / CR			L										
	Lexicon of terms	ITE			L										
Done	Obtain 4 Zoran seas PSs	ITE	L					L							
	Track LTRS work on scenarios	ITE	L												
	Take a critical look at the existing mission types, with the aim to select the representative samples for the purposes of the study	DC				L									
In progress some classified issues	Develop/obtain missions to task tables for the selected missions	DC	C/L			C/L									
Posted	Capture and hold the work on future worlds, future security environments	ITE – part of the report	A		L										
	Link mission types and future worlds	DC	L										Stanag 1059		

ANNEX D – THINGS TO DO LIST

NOTES	ACTIVITY	Level of Effort	ACT TC720	ACT TC730	CAN	NLD	BEL	NOR	DNK	CZE	DEU	FRA	SVN	USA	UK
In progress reviewed DRR	Develop 2015 asset inventory	DC		L											
In progress	From the asset list develop the capability list	DC		L											
Done	Post presentation folder on RTO Wise				L										
Done	Finalise site for meeting 25-29 June				L					A					
	Get admin details for meeting				L					A					
	Add addendum to the TOR, if need be				L										
To do	Set up bi weekly phone/VCR conference		A	A	L	A									
To do	CST meeting to push through one scenario/mission from start to finish	A	A	L	A										
	Need this set for sensitivity analysis in subsequent phases														

L – Lead A – Assist DC – Distributed Collaboration ITE – Individual Team Effort CR – Collective Review C/L – Co- Leaders

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6. Title

Joint Operations 2030 – Phase I Report: June 2007

7. Presented at/Sponsored by

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13. Keywords/Descriptors

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Thematic analysis

14. Abstract

The SAS Long-Term Scientific Study "Joint Operations 2030" (SAS-066) is a multi-year and multi-phase study with an objective of identifying opportunities for research and technology investment that could address or improve upon future NATO operational capability challenges. Phase I of this study worked towards developing a common understanding of the project, and agreed upon key methodologies. A variety of important study assumptions, methodologies and inputs were discussed and agreed to, and are the subject of this interim report.

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