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Information

Analytická podpora dlouhodobého obranného plánování v Norsku

Analytical Support to Norwegian Long-Term Defence Planning

Sigurd Glærum, Alf Christian Hennum

Abstrakt: Hlavní výzvou v obranném plánování je vytvoření transparentního propojení mezi bezpečnostními výzvami, politickými ambicemi a strukturou ozbrojených sil. Tento článek popisuje metodiku plánování založeného na schopnostech a scénářích s využitím softwarového nástroje s názvem JDARTS, který umožní systémově řešit propojení bezpečnostních výzev a odpovídající struktury ozbrojených sil. Bezpečnostní problémy jsou výzvy, které představují úkoly, vyplývající ze scénářů, které jsou porovnány s možnostmi sil a strukturou jednotlivých prvků. Takové porovnání slouží k výběru nejvhodnější a nejméně nákladné varianty. JDARTS tuto metodu podporuje. Přestože budoucí vývoj je nejistý, úkolem plánovačů je příprava podkladů pro strategická rozhodnutí a pro stanovení priorit, které vychází z ekonomických omezení, připravenosti k obraně země a plnění mezinárodních závazků.

Abstract: A major challenge in defence planning is to establish a clear audit trail between security challenges, political ambitions and the recommended force structure. This paper describes a capability- and scenario-based methodology combined with a software toolset called JDARTS that gives long term defence planners a systematic approach to create links from high level security challenges to force structure recommendations. The security challenges are represented by mission types exemplified by scenarios which give concrete requirements. These requirements are represented by capabilities which are matched against the capabilities of force structure elements. The matching is a selection process where the outcome is the cheapest set of the force structure elements that fulfil the requirements. The JDARTS-software supports this method. Even though the future is uncertain, the defence planner's job is to help decision makers prioritize between economic constraints, national preparedness and international commitment.

Klíčová slova: obranné plánování; dlouhodobé plánování; schopnosti; scénáře; výstavba ozbrojených sil.

Keywords: Defence Planning; Long Term Planning; Capabilities; Scenario; Force Development.

INTRODUCTION

One of the main problems in long-term defence planning after the end of the Cold War has been to establish a clear link between security challenges and political ambitions on the one hand and the recommended force structures on the other. What - specifically - should our forces be able to do and which platforms and units are needed to do it?

Due to a lack of clear methodological foundations, defence planning has in many nations centred on financial challenges and the urge to maintain as many of today's capabilities as possible under tight budget constraints. In this paper we will present an approach that gives decision makers explicit choices in the trade-offs between economic concerns, force structure capabilities and level of ambition. The method will throw light on the consequences of these choices. It is systematic, provides an audit trail, is repeatable and - perhaps most importantly - is feasible from a practical point of view.

BACKGROUND

A main element of Norwegian defence planning has been the so-called Defence Studies, initiated by the Chief of Defence. The methodological approach applied by these studies has not been completely consistent, but the studies have nonetheless been the main driver for a hard, but necessary, transformation of the Norwegian Defence.

The nineties were characterised by a completely new security environment. The Cold War was over and the one scenario that had dominated the Norwegian defence planning - invasion from the East - was less relevant. It was therefore necessary to reconsider the tools and methods that had been employed up until then. Although collective defence is still a central mission (and more so than it was just a few years ago) the threats and challenges today are complex and multifaceted.

Especially in times when defence budgets were declining (at least in terms of purchasing power), the focus will often shift to the preservation of current capabilities as far as budgets allow. The view in the long-term, the identification of future challenges and the (new) capabilities needed to handle them will often suffer as a consequence.

There is, in other words, a tendency to concentrate on today's solution to today's problems, with the economic constraints as the main parameter for the planning process. Since today's problems are radically different from those prevalent during the Cold War, this has not stopped the transformation process. We will, however, maintain that it is necessary to base defence planning on an investigation of the long-term challenges in order to build defence forces that are robust with respect to an uncertain future.

GOALS

A method for long-term defence planning should in our view fulfil the following:

- It should identify and specify the challenges in the security environment the nation may face in the future, in peace, crisis and war - in our immediate neighbourhood and farther afield.
- It should give an internally consistent and traceable path from the security environment assessment and defined level of ambition to the recommended force structure.
- It should be capability based, i.e. seek to establish the required defence capabilities before explicit solutions in terms of platforms and units are specified.
- It should identify the most cost effective force structure and allow trade-offs between cost and level of ambition.
- It should identify a force structure which is robust and flexible with respect to a changing security environment, uncertain future budget levels and shifts in policy.

In this paper we will outline a method that seeks to satisfy these criteria. The method has been used at FFI in support of the long term planning process in the MoD and a number of Defence Studies carried out by the Chief of Defence over the last ten years. The main inputs to the studies have been gap analysis of the current and planned force structures and the development of a number of alternative force structures with a long term view.

THE FRAMEWORK

The method we present in this paper is what could be loosely called ”capability based planning”. It has certain similarities to what NATO employs in its Capability Requirements Review (CRR) and also to the framework defined by SAS-025 “Handbook on Long Term Defence Planning”, but with some national adaptations. This paper does not, therefore, present fundamentally new research, but rather the implementation of an established approach in a national context.[1]

The term capability is in this context synonymous with the operational ability to perform a certain task. In a capability based approach a number defined capability categories (collection or package of capabilities) is used both to express requirements derived from scenarios and the abilities of units and platforms. This gives us flexibility in matching units and platforms to requirements and avoids zeroing in on specific solutions too early in the process.

Figure 1 illustrates the process flow and basic components of the method. There are two main lines of analysis. The bottom one, the force structure analysis, is a bottom-up process that aims to identify the capabilities and costs of the current and future force structure. The upper one, the scenario analysis, is a top-down process where we

[1] Although one of the authors took part in the development of the CRR while employed by the NATO C3 Agency. He was also in charge of the development of the JDARTS toolset described below.[1]

develop capability requirements from the national security situation, future challenges and strategic aims.

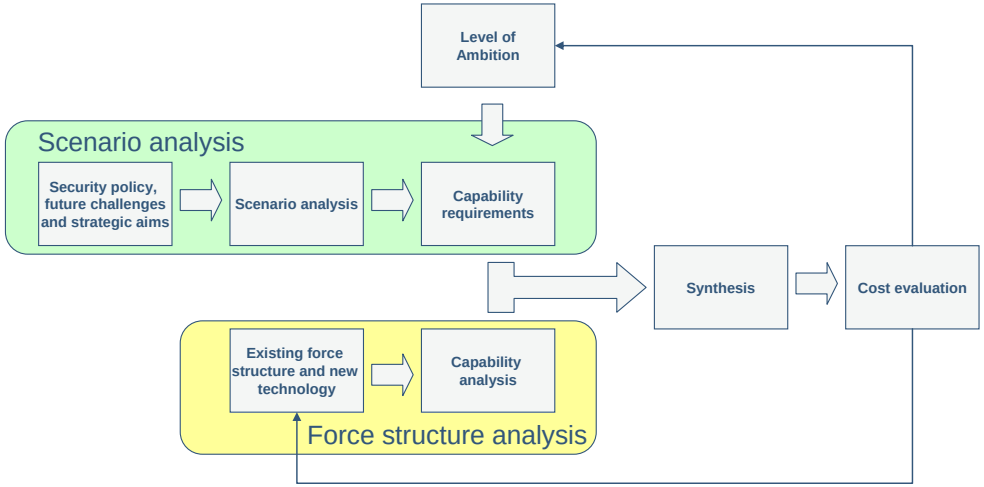

Figure 1: The scenario- and capability-based analysis process

MISSION TYPES, SCENARIOS AND CAPABILITY REQUIREMENTS

The derivation of capability requirements is based on an analysis of the national security situation, future challenges and national strategy. The critical factor of the derivation is to be as open-minded as possible. It is a classical mistake to depend too much on projections of trends or probabilities - such prophecies usually end up being wrong. What we aim for instead is a set of mission types which spans - to the greatest extent possible - the space of potential future challenges to national security. The mission types are generic scenarios, which mean that they do not contain specifics with regard to parameters such as time, place or opponent. Examples on mission types could be “Collective Defence” or “Crisis Containment”. To develop a complete set of mission types we have to take into account both national and international challenges.

The mission types are not specific enough to be used for the derivation of meaningful capability requirements. It is therefore necessary to develop concrete situations where geography, actors and time lines are defined. These are called scenarios and are detailed examples of the mission types described above. To represent the different aspects of each mission type, at least three scenarios should be developed and analysed. Figure 2 gives an example of a specific scenario.

The scenario analysis consists mainly of a decomposition of each mission type into objectives, tasks and subtasks. The subtasks are then analysed to determine the capability requirements for each of them. This can be accomplished through war-gaming, simulation models, the application of doctrine, etc. It is important to note that this is not a troop-to-task analysis, as we at this stage are only interested in capabilities. The mapping of forces against requirements is done later in the analysis.

The capability requirements derived for each subtask is mission type specific and applied to each scenario of that mission type. The details associated with each scenario will influence the size of the capability requirements (some of which may be zero), but not the type of capabilities required. Another way of putting this is that the concept of operations is determined at the mission type - not the scenario - level.

LEVEL OF AMBITION

One of the more important benefits of a structured defence analysis is that it entails a concrete formulation of the level of ambition with respect to a national defence policy. In a perfect world this level of ambition should be defined by high level political decision makers. This is, however, very rarely the case. The alternative is to demonstrate and clarify the level of ambition that is actually achieved with respect to any given force structure. This is the approach taken in FFI's support to the Defence Study, initiated by the Chief of Defence, and also in the MoD's long term planning process.

There are several aspects of the ambition level that must be defined:

- A level of ambition with respect to a given scenario, i.e. a course of action, degree of dependence on allied forces, etc.
- A level of ambition with respect to what specific scenarios and/or mission types the force structure must be able to handle.
- A level of ambition with respect to what scenarios and mission types that the force structure must be able to handle simultaneously.

The level of ambition, as defined above, will, together with a force structure cost analysis, give a precise description of the consequences of the strategic choices and trade-offs. The level of ambition, together with the capability requirements from the scenarios, gives the total capability requirements the force structure must fulfil. These requirements can be used to either develop a cost-effective force structure from given building blocks or to test an existing one for shortfalls and excesses.

FORCE STRUCTURE REPRESENTATION

In order to establish how well a force structure matches the requirements it is necessary to express these entities using the same units of measurement, or capability categories.

A force structure consists of elements that are qualitatively different. Some of these can have the same or similar capabilities. A Coast Guard ship and a P-3C Orion can, for instance, both do maritime surveillance. To be able to compare the surveillance capability of these two platforms we need a yardstick to measure it with. This yardstick is called a reference unit which then defines a unit of performance (or capacity) for that particular capability category. The reference unit for the capability category maritime surveillance could either be defined as a certain performance level (the ability to survey a certain area with a certain resolution within a defined period of time) or it could be defined to be equal to the surveillance performance of a known platform, such as the P-3C. All platforms and units having a given capability must then be evaluated in terms of performance relative to the reference unit of the capability category, as illustrated in Figure 3.

The performance evaluation aims to identify the 'replacement value' of a certain platform/unit relative to the reference unit. A value of e.g. 2 means that one platform can do the same job as two reference units. It is difficult to be exact in such measures since relative performance will vary with the type of scenario, geography, weather, threat, and other external factors and so a good measure of judgement must be

allowed. Since the purpose of the analysis is an analysis at the level of national force structures, however, the required resolution and accuracy is limited. Techniques that can be used include military judgement, lessons-learned, doctrine, simulation models and more.

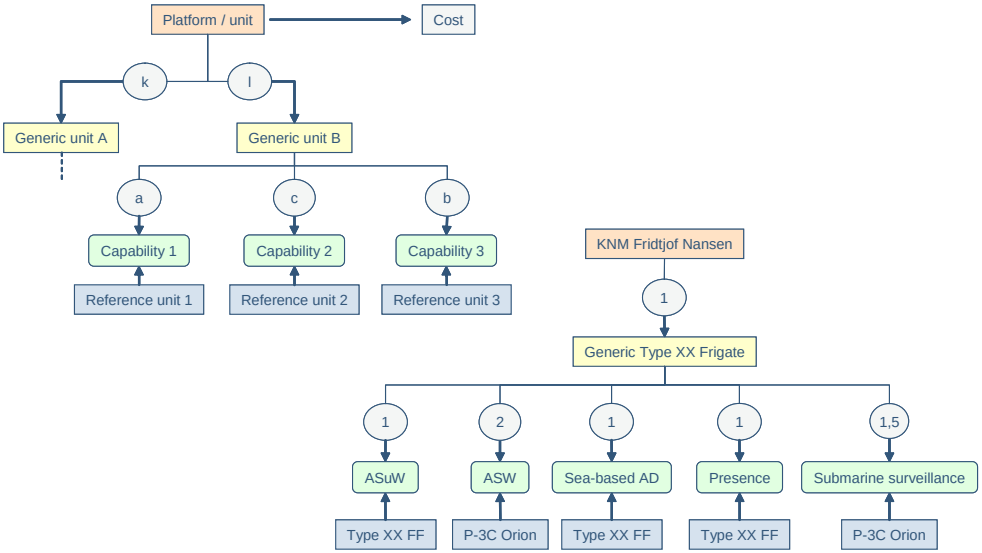

Figure 2: The capabilities and capacities of a unit are given as the sum of multiples of a number of generic units, each with a given set of capabilities and capacities measured against reference units - here illustrated with the Norwegian frigate KNM Fridtjof Nansen.

In a defence analysis looking twenty years ahead it will also be necessary to assess the impact of new technologies. Some of today's solutions may become irrelevant and it may also be possible to develop entirely new capabilities. Long-term planning must therefore integrate a technological view in order to analyse alternatives to the traditional force elements.

COST ANALYSIS

Cost estimates are part of the overall analysis at two different stages. One is the total force structure cost analysis, which we will return to below, the other is the life cycle cost analysis with regard to individual force elements. In order to evaluate the cost effectiveness of a particular unit or platform compared with any other then both its capabilities and its costs must be estimated. This can be a very challenging task, since costs associated with, for instance, future technologies are uncertain and because it is not trivial to decide which parts of the support structure should be assigned to and costed as part of a given operational unit before the total force structure is defined. Our experience is, however, that this is not a critical problem since it is not necessary to have very precise cost estimates at this stage of the analysis. The main focus here is at the relative differences between units and platforms - it is only at the total force structure level that absolute costs become important. At that stage the overall support structure will also have been defined and the assignment problem goes away.

SYNTHESIS

After the capability requirements have been analysed and the cost and capabilities of the potential structural elements have been satisfactorily represented, we need to match the two strands of the process depicted in Figure 1. In practice this is done as a Mixed Integer Programme (MIP). This is a mathematical and deterministic algorithm which - given the inputs like costs, capabilities, level of ambition and capability requirements - finds the force structure that fulfils all requirements at the lowest possible cost. The result therefore represents the most cost effective answer to the challenges posed by the level of ambition, under the constraints implied by what is identified as potential structural elements.

The results of the structural analysis cannot be of better quality than the quality of the inputs it is based on. The scenario analysis and the capability and cost evaluations are both, at least at some level, based on judgement and uncertainties and inaccuracies will play a part. The answers can therefore not be represented as any kind of objective, scientific 'truth'. The strength of the analysis is, on the other hand, that the audit trail is very clear and that the effect of all assumptions can be quantified and tested.

GAP ANALYSIS

A main application of the process described in this paper is to evaluate the capabilities of an already existing or proposed force structure. By matching the capabilities of the force structure to the capability requirements derived from the scenarios and level of ambition, the method gives an explicit quantification of what the structure is lacking with regard to capabilities, capacities and readiness. Gaps identified can then either be rectified or a choice can be made to accept the - again explicit and quantifiable - risks associated with leaving gaps unfulfilled.

If, on the other hand, there are elements in the force structure that are not matched against any requirement then the necessity of those elements should be investigated. The reason why they were not selected could either be that its capabilities are not required in any of the scenarios or that there are other elements with sufficient, overlapping capabilities that represent more cost effective solutions. It is of course premature to draw hard conclusions with respect to force elements identified as surplus to requirements. There may be other reasons to include them that cannot be extracted from a scenario analysis, such as overriding political priorities or requirements stemming from the Defence Forces' wider societal responsibilities.

FORCE STRUCTURING

Another and in many ways more powerful application of the method is to use it in a constructive manner. If we take as a starting point a great number of potential structural elements - representing both legacy units, potential acquisitions and radical new technologies - the method will construct a force structure which represents the most cost effective fulfilment of the capability requirements posed by the scenario

analysis and the selected level of ambition.

A total force structure will not be fully defined after the first run-through of the process described here. The path from the current structure to the target structure must be defined, total cost for both the force and support structure must be analysed, the risk of incorporating new untested technologies evaluated, and specific constraints and guidelines may need to be incorporated. A number of iterations will need to take place where it may well turn out that the level of ambition must be adjusted, if for instance the total cost of realising the original ambition level turns out to be unrealistically high.

In this way, we may converge towards a defence structure which is acceptable with policy makers, but which is also in a certain sense internally consistent and for which a clear audit trail from the level of policy and security environment assessment down to the specific force structure elements is available.

IMPLEMENTATION – J-DARTS

The method as it is described above is rather similar to the method that is used within the NATO's cyclic Capability Requirement Review (CRR)-process. To support this process a tool set called J-DARTS (Joint Defence Analysis and Requirements Tool Set) was developed by the NATO C3 Agency (now NCIA). A big advantage with J-DARTS is that it is generic in the sense that it supports the method only. It can therefore be used to support national defence planning processes as well as the CRR-process.

To be able to use J-DARTS for national purposes, it was necessary to remove most of the NATO data and develop national capabilities, mission types and planning situations. It was of course also necessary to analyse the Norwegian forces with respect to capabilities and costs.

In the figure below we have sketched the overall structure of the main elements in J-DARTS.

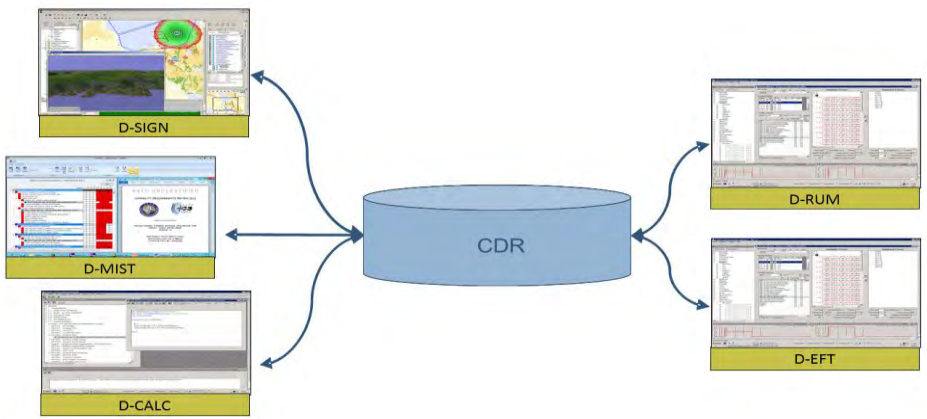

Figure 3: J-DARTS

CDR

CDR stands for "Central Data Repository" and is a set of databases. All applications can connect to and can utilize this. All mission types, scenarios, decompositions, levels of ambition, task scripts, force elements, costs, etc. are stored in the databases. It is not only a support tool, but also a complete documentation of the analytical process. J-DARTS is a distributed system where the CDR is placed on a central server. The user interface to the CDR is through the applications described below.

D-MIST

D-MIST stands for "Defence Planning MIssion Study Tool" and is used to develop and store the mission types. The hierarchical task decomposition is defined here. The lowest level of the decomposition is the basis for the next analysis in the other applications. The scenarios are also created in D-MIST, where we find a textual description of each scenario. It is also possible to link parts of the text to the decomposition to ensure consistency and increase traceability.

D-CALC

D-CALC stands for "Defence Planning Capability Assignment Logic Calculator" and is used to develop and run small scripts which generate capability requirements. The scripts can be simple rules of thumb, outputs from simulations, or static numbers depending on what task is analysed. In this tool we also aggregate the requirements over tasks, phases and geography in each scenario. The rules in D-CALC are mission type specific, but all scenarios must be run through to get the total capability requirements.

D-SIGN

D-SIGN stands for "Defence Planning Scenario Information and Geographical aNalysis" and is used to develop and document the scenario specification. D-SIGN is built upon Maria from Teleplan which is a cartographic tool. All the planning situation parameters which are needed by D-CALC must be stored in D-SIGN. This can be geography, start and end times of each phase, distance from home base, etc. The capability requirements that are generated in D-CALC can also be found here. This helps to visualize the concept of operations, threats and other aspects of each scenario.

D-RUM

D-RUM stands for "Defence Planning Requirements and Unit Matching" and has three main uses:

1. Gather capability requirements from all scenarios and combine them into the so called benchmarks in accordance with a specified level of ambition. Each benchmark represents a combination of concurrent scenarios.
2. Store all forces with the necessary capability and capacity data together with user defined rules for how a force can be used within a force structure.

3. Generate a force structure with the help from D-EFT (see below) and a user interface for parameters and rules for the optimiser, together with a set of reporting and visualisation tools for the generated force structure.

D-EFT

D-EFT stands for "Defence Planning Extended Fulfilment Tool" and is an optimisation program based on the CPLEX-algorithm. It generates a force structure by matching different benchmarks against the capacity of the potential forces. D-EFT searches for the force structure that can meet the capability requirements with the lowest possible cost, taking into account all the user defined constraints.

CONCLUSION

What the future will bring is always uncertain. It can therefore be argued that to plan a defence structure with a 20- to 30-year perspective is an exercise in futility. It is, nevertheless, the task of political and military leaders to make investment decision with impact over just such a time perspective based on the imperfect knowledge we have today.

It can be tempting, given the uncertainties of the long term, to make plans based on today's challenges and present capabilities. The role of the long term planning is, however, to take account of these uncertainties and to make clear the prioritisations that must be made between economic constraints, national preparedness and international commitments. There is certainly a lot more to be done with respect to incorporating flexibility and adaptability concerns in defence analysis, but the first priority must nevertheless be to introduce a small measure of analytical rigour in the process.

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