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The State of the Art and the State of the Practice

A New Model for Tactical Mission Planning for the Swedish Armed Forces

Topics: Cognitive Domain Issues, C2 Architecture or maybe C2 Experimentation

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Abstract

The purpose of this paper is to present a model for mission planning at the tactical level of command. The new Planning Under Time-pressure (PUT-) model views the mental activity in the MDMP as problem-solving activity. Only one course of action (COA) is fully developed, after having the eyes open to many possibilities at the beginning of the process. The stress in the PUT-model is on planning, modifying and refining this COA, and not as in traditional models, to choose between alternative COA's. The PUT-model is based on contemporary research how experienced officers tend to make decisions and plans, and it also captures experience inherent in traditional military planning models. Results from experimental and field tests indicate that the simplifications made in the PUT-model compared to traditional models result in significantly faster planning without loss of plan quality. Usability ratings of the PUT-model are generally high. Improvements compared to traditional models refer to four different areas: a) practical working technique, b) mental technique, c) military tactics inherent or focused in the PUT model and d) shorter time needed to make a plan. The PUT-model is currently being adopted as a unified, tactical level, planning model for the Swedish Armed Forces.

Introduction

Making decisions and plans are core activity for military commanders and staff. This activity is normally guided by formal models such as the Military Decision Making Process (U.S. Army, 1997). Substantial amounts of time and effort are put into training of officers at all different hierarchical levels in the ability how to make timely and accurate decisions and plans. However, during the last twenty years, a growing body of descriptive field research indicates that the traditional prescriptive military planning models are often violated in realistic planning situations; many experienced planners use other strategies (e.g. Fallesen, 2000; Kaempf, Klein, Thordsen & Wolf, 1996; Klein 1989; 1993; Pascual & Henderson, 1997; Schmitt & Klein, 1999). One important reason for this, often mentioned by the decision makers and planners who participated in these studies, is that time-pressure, normally inherent in military decision-making situations, makes it difficult or impossible to apply the formal military models.

If an important tool provided by an organization to its members in order to improve the effect of the organization is not utilized, in spite of comprehensive training on that tool that is a serious problem. This seems actually to be the case in at least some modern armies and it indicates a lack of a useful model for military mission planning under realistic field conditions, at least in those armies that have been studied in earlier research. Thus, the problem with the current decision-making models of western armies is not that they produce decisions of low quality. We do not know anything about relative decision quality between decisions made according to different kinds of military decision models. That question has not yet been addressed. The main problem with the military decision-making models is that they seldom seem to be followed in the field. This is true not only for contingency planning or rapid replanning, but also for initial mission planning as indicated by Schmitt and Klein, (1999). There is a saying in the military that "we should train the way we fight". In the case of military mission planning in the battle space, this does not seem to be followed.

There are two alternative ways to handle this problem. One is to try to convince military officers in the field to follow the current model, the other is to assume that the deviancies from the prescriptive models, observed in the field, actually represent adaptive behavior. If it could be showed that the decision quality in military decision making would be as high, or even higher with a simplified model, better adapted to time-pressure and more in line with behavior often observed in the field, this would be valuable information.

This paper presents the Planning Under Time-pressure (PUT-) Model. It is a new simplified model for military mission planning developed by Thunholm (2003a). The PUT model is currently being adopted by the Swedish Armed Forces (SwAF) to be their unified tactical level decision-making model.

First, this paper will give a brief overview of some of the results from naturalistic studies of military planning. Next, the PUT-model will be described in detail and its main differences from traditional western army decision making models will be highlighted. Next, a brief overview of the results from scientific testing and field- testing of the PUT-model will be provided and finally, the procedures used by the Swedish AF to adapt the basic PUT-model to different services and branches and the procedure to field test and use the model in a networked application for integrated planning (I-PUT) will be described.

Modeling the military planning process

Findings from empirical studies explicitly aimed at exploring the decision-making process in military units have been reported by Klein and Miller (1999), Klein, Schmitt, McCloskey, Heaton, Klinger and Wolf (1996), and Klein, Schmitt, McCloskey and Phillips (2000). Based on the findings from these studies Schmitt and Klein (1999) concluded that there was a need for a military decision-making model that (compared to the traditional models): a) was faster,

b) involved the commander more into the process, since the commander typically could come up with a better solution than his/her staff and in a fraction of the time they needed, c) involved a small group of experienced planners to develop the initial concept of operations together with the commander, d) allowed for a more natural initial problem solving strategy (cf. Klein 1996; Lipshitz & Pras, 2005), allowing for iterations between the sub-steps of the planning process, e) used wargaming (simulation) as a means for learning more about the battle and communicate intent, and f) reduced the need for transitions between different teams of planners and executors, since those transitions often resulted in the loss of meaning of the intent of the plan.

Schmitt and Klein (1999) presented a Recognitional Planning Model (RPM) of the military decision-making process that was meant to be both descriptive and prescriptive. Descriptive since it describes how military battle planning is actually done by skilled military commanders and staffs, prescriptive since it provides a strategy that will increase the speed of planning compared to the traditional approach prescribed (e.g. US Army, 1997; US Marine Corps, 1996). The basic (prescriptive) RPM is shown in Figure 1.

The RPM model consists of five separate phases that should occur in order, but will normally also take place with some kind of parallelism in that the planners will frequently loop back to earlier phases as well as forwards to later phases.

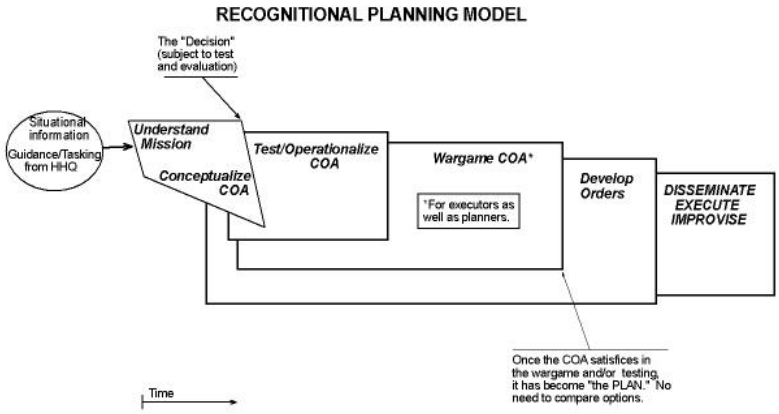

Figure 1. *The Basic Recognitional Planning Model (RPM), adopted from Schmitt, Klein, Thunholm, Baxter, Ross and Bean (2003).*

The first phase is Identify Mission and Conceptualize a Course of Action (COA). In this phase the decision maker tries to understand the mission in terms of a rough solution. The result of this phase is a decision formulated as a tentative concept of operations. This phase is similar to the recognition phase of the RPD model (Klein 1989) that ends with the generation of a single course of action (COA). The following phase in the RPM is Test/Operationalize COA. This is where the staff experts details and refines the rough concept COA into a rather detailed plan. The next phase in the RPM is Wargame COA. In this step the plan is validated with respect to probable or possible enemy COAs and when the COA is validated it becomes "the Plan". These two phases of the RPM corresponds to the Mental-Simulation and Will-it-

work and Modify-phases of the RPD model. The last phase of the RPM model is Develop Operational Orders. This phase has no direct correspondence in the RPD model, but could be viewed as the implementation phase.

The RPM has so far been tested in three studies in the United Kingdom (Pascual, Blendell, Molloy, Catchpole & Henderson, 2001; Blendell, Molloy, Catchpole, & Henderson, 2002; Sirret, Catchpole, Roddy, Phipps, Cremin & Thunholm, 2004). This testing was exploratory and involved small temporary planning teams, each consisting of four highly experienced military officers simulating a planning team of a Joint Forces Head Quarters (the third study concerned battlegroup mission planning). Advantages of adopting the RPM (as opposed to the traditional Military Decision-making Process, MDMP), noted by all participants included a higher overall planning speed, space for lateral thinking, and increased freedom to address the phases of the planning process in a parallel rather than linear fashion. The initial RPM has subsequently been developed into a field manual (Schmitt, Klein, Thunholm, Baxter, Ross & Bean, 2003). Based on this manual initial testing of the RPM was conducted with a staff of experienced officers in the US Army. The evaluation of the RPM process suggests that it worked well in a staff working under realistic conditions of time pressure and uncertainty (Ross, Thunholm, Uehara, McHugh, Crandall, Battaglia, Klein, & Harder, 2003). Also none of the participants expressed a need to develop and compare several decision options in the decision-making process (Ross, Klein, Thunholm, Schmitt, & Baxter 2003).

The Planning Under Time-pressure (PUT) Model

The PUT model is based both on the traditional Swedish army (SAR) model and on descriptive military decision-making research reviewed above. As will be obvious from the following description it also integrates findings from other related areas of psychology. The rationale of the PUT model has been described in detail elsewhere (Thunholm, 2005a). Here I will only describe the model itself with references to the research on which the different sub-processes were based. The PUT model is intended to be used both as a tool for training of officers and for use in real settings where the decision situation is dynamic and typically contains uncertainty, time-pressure, and complexity. The impact of those factors on the details of the PUT model design will be further discussed when the details of the model are described.

The PUT model can be conceptually related to a generic model of Command and Control (C2). This generic model is Brehmers Dynamic OODA-loop (DOODA; Brehmer 2005), which is an extension of Boyds original OODA-loop. The DOODA-processes covered or inherent in the PUT are shown in Figure 2.

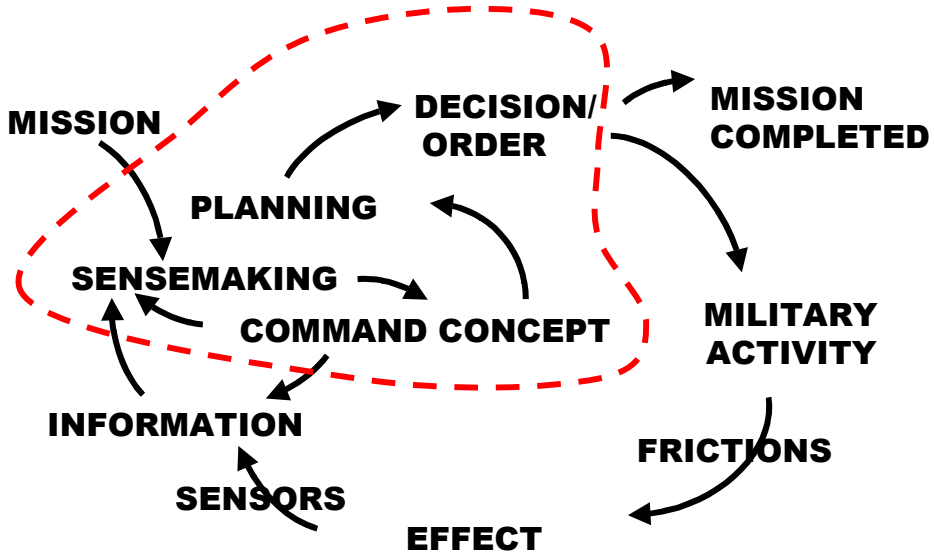

Figure 2. *The generic C2 processes according to Brehmers' (2005) Dynamic OODA-loop (DOODA) and covered by the PUT-model as indicated by the dashed line.*

The PUT model (Figure 3) contains three separate main steps. Each step aims at answering one main question: What must be achieved? (Step 1); How can this be achieved? (Step 2); and how should this be achieved? (Step 3). Each main step contains sub-processes. The steps should be followed in the designated order, as this is considered to increase the likelihood of original solutions, but iterations between the events (and sub-processes) will have to occur. The PUT model allows for the natural iterations that exist in a complex problem solving process and that have been shown in studies of military decision making (e. g. Schmitt & Klein 1999, p. 513). As can be seen in the figure one of the sub-processes in Step 3 is open-ended. The evolving battle calls for dynamic decision making, which means that adjustments and further progressing of the plan must go on as the battle evolves, until the whole mission is accomplished.

The PUT model is not a static model. It could be changed according to the needs of the situation and the planners' individual preferences. If the situation is very well known, Situation assessment could be reduced to a minimum. Also, an effect of recognizing a situation as well known could be that a solution suggests itself in mind very early in the process. If that happens sub-steps of the Situation assessment could be used as a checklist against an early solution instead of as a vehicle to produce a solution. If early recognition occurs and there is substantial time-pressure the whole of Step 2 could be excluded from the process, then the model will be very similar to the RPM (se also Fig 6). Severe time-pressure could also reduce the simulation in Step 3 to a mental simulation conducted in the head of a planner when developing a Credible Plan.

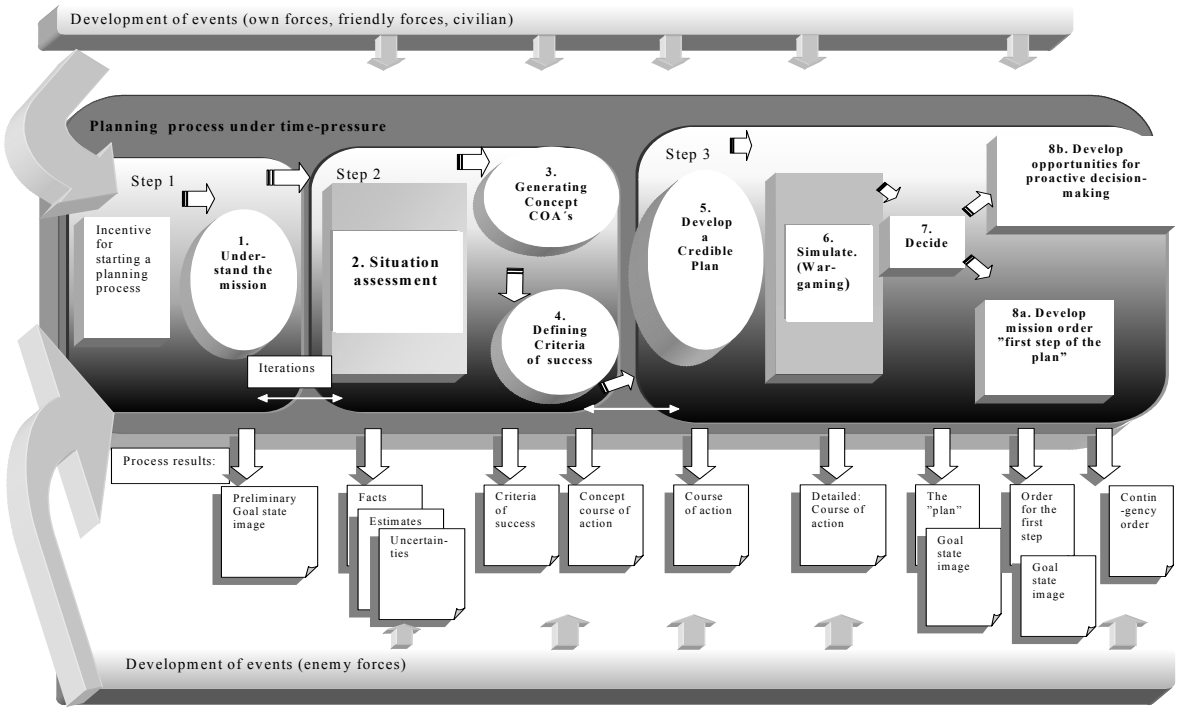

Figure 3. *The Basic PUT-model*

Incentive for starting the planning process. Incentives to initiate a new planning and decision-making process could be a new mission from a superior commander or result from an ongoing analysis within the staff itself. In the present study the incentive to start the planning process was an operational order from a superior HQ.

1. Understand the mission. This process aims at clarifying what *must* (minimum) be achieved in light of a given order or situation that has arisen. Under time pressure there is a tendency to focus on the most critical and to optimize the solution against this instead of trying to think in a more integral way (Edland & Svenson, 1993; Zakay, 1993; Thunholm, 1997). There is also a tendency to prematurely lock into habits instead of keeping an open mind towards the true demands of the situation (Luchins, 1942). In order to try to reduce these effects of time-pressure and avoid narrow thinking the PUT model advocates that the decision maker tries to think in terms of *capabilities* that the enemy must be denied and capabilities that friendly forces must posses, rather than to think in terms of military units although this may be difficult. Freeman and Cohen (1996) showed that better tactical solutions could be reached if the decision-maker avoids adopting a potential interpretation of the situation early on in the decision process. By advocating that the situation is interpreted in terms of capabilities instead of in military units on the battlefield, a premature interpretation of the situation might be avoided. In line with the findings from Serfaty, McMillan, Entin, & Entin. (1997) about greater use of visualization among skilled decision makers the PUT model advocates that the outcome of the process is depicted on a map overlay or on a sketch with an explanatory text. As such the overlay constitutes a *preliminary vision of goal state overlay*. This work can of course also be done in a computer supported environment.

It is important to note the *preliminary* state of the vision of goal state. In this early stage of the planning process it is sufficient to establish a fragmentary view of the goal. The complete view will evolve during the solution process. Some of the early problem solving

literature (e.g., Dunker, 1945; Wertheimer, 1959) describes the iterative way in which people often try to solve difficult problems. There is an ongoing elaboration between the evolving goal and an evolving tentative solution throughout the whole solution process. The goal cannot be fully established before the solution is produced. This view differs from most prescriptive problem solving models but has gained support by later findings (e.g., Klein, 1996: Lipshitz & Pras, 2005). Still the importance of establishing the goal early in the planning process gets support from the judgment and decision-making literature. Plous, (1993) and Russo and Schoemaker, (1989) point at the importance of establishing the goal before trying to make a solution, but also indicate that this is often overlooked in problem solving situations. Both civilian and military management philosophies stress the importance of the manager or commander clearly communicating his or her intent to subordinates (e.g., Bruzelius & Skärvad 1995; Swedish Army, 1995). This could probably be explained by the fact that a common goal of the members of an organization is a necessary preconditions for co-ordinating the efforts. A common vision also empowers subordinate commanders to take initiatives and act in the spirit of the commander even in unexpected circumstances and communication breakdowns.

Another outcome of the understand-the-mission-process is the initial evolvement of some planning documents. The first document is about *perceived important uncertainties* that must be acknowledged by the planners. Some of them will be passed on to the rest of the staff in the form of requests for information to be carried out immediately, and some will be handled later. The second planning document that is beginning to evolve in this stage of the planning process is about *perceived restrictions in the freedom to accomplish the mission* that will probably have an impact on the plan. The third planning document concerns *immediate actions* that will have to be ordered already in this early stage of the planning process. The fourth planning document is about perceived *criteria of success* to consider in the plan. The planner is advised to start evolving these four documents if he already in this stage of the process gets a notion about some important aspects when he is trying to understand the mission received. These documents will evolve during the whole of the planning process and further conclusions will be added as they come to mind of the planner. The possibility of continuous refinement of these documents advocated in the PUT model should make it easier to iterate between stages.

2. Situation assessment. The process aims at integrating new information into a holistic mental picture of the situation that has arisen. The situation must always be understood in light of the given inputs, e.g., a new task. In real situations, the decision maker is likely to have a good understanding of the present situation when the planning process begins. However, the information contained by a new or modified task must be integrated into the current understanding. This is likely to mean that the previously known situation is looked upon with “fresh eyes”, as goals and expectations affect what is being paid attention to in the amount of information that constantly floods a contemporary military staff (cf. Endsley, 1997). Klein (1989) concludes that experienced decision makers (experts), more than novices, place a strong emphasis on a thorough understanding of the situation. A part of the difference between experts and novices is that the experts have a substantially higher ability to discern type situations within their area of expertise (Shanteau, Weiss, Thomas & Pounds, 2001). It is therefore important to make an effort to understand the current situation and its inherent possibilities and threats. The factors to consider in the process are: (1) Civilian situation, (2) Own forces, (3) Enemy forces, (4) Third party forces, (5) Terrain, weather and visibility, (6) Force comparison and (7) Possible enemy actions and the critical vulnerabilities of the enemy force. These factors are derived from the SAR model with two extensions, the first is the possible enemy actions (which appears later in the SAR-process) and the other is the establishment of a clear statement about the critical vulnerabilities of the enemy force (which

is not a part of the SAR-process at all). The main result of the situation assessment-process is a holistic mental representation of the current situation and what could be evolved. In line with Serfaty et al. (1997), visualization on situation maps is advocated in the PUT model. In line with Freeman and Cohen (1996), the decision-maker is encouraged to try to use metacognitive processes to critique his/her own understanding of the emerging situation assessment.

Further conclusions that could be noted on some of the aforementioned planning documents could also be drawn. The vision of goal state could also be refined.

In accordance with Janis (1989) the situation assessment-process prescribes that uncertainties are identified and transformed into prioritized needs for information. However, no technique to quantify it is prescribed. The technique to quantify uncertainty by assigning subjective probabilities (e.g., as in multi-attribute utility theory) is not considered a viable path as officers generally lack sufficient experience and knowledge to make such valuations. Obviously, the decision maker must deal with the uncertainty in the final plan, e.g., by detailing reserves, avoiding irreversible actions, or collecting additional information (Lipshitz & Strauss, 1997). However, a generic technique for handling uncertainty that can be built into a military tactical decision model for field use is not assumed.

3. Finding concept of courses of action (COA). This process aims at generating possible concepts of own COA's. All the concepts that come to mind are visualized, only by pen and paper (the concepts could be sketched with a few pen strokes). It is important that the decision maker tries to keep an open mind and allows all ideas to emerge without making reality assessments. Since time-pressure could have a devastating effect on this kind of creative process, the planner is not "forced" by the PUT model to produce a certain number of possibilities. One possibility could be enough if that is what comes to mind of the planner. However, support for the prescription of multiple-alternatives *generation* as a way of increasing the likelihood to find good solutions can be found in research on problem solving (e.g., Dunker, 1945; Wertheimer, 1959) and creativity (e.g., Claxton, 1999: Sternberg & Davidson, 1995). These findings indicate that the first alternative is not always the best. The insightful alternatives tend to be produced only by a few individuals and to arrive late in the option generation process.

4. Define criteria of success. This process aims at capturing previous war experience in the planning process. This is done by listing general and specific criteria of success. The foundation for these criteria is partly earlier war experience that has been condensed in concepts such as *surprise*, *concentration of forces*, *freedom of action*, and *local superiority*. (For a discussion and reevaluation of such criteria see Leonhard, 1998). Another part of the foundation is the conclusions that have been made earlier or that can be drawn from the analyses that have been made up to this point. The first event of the process of defining criteria of success is to establish an integrated, holistic picture (a mental representation) of the situation. This holistic mental representation should be a good base for the definition of criteria of success, which is the second event. The last event in this sub-process is to define own force critical vulnerability. The psychological base for the prescription to define criteria for success stem from the findings from Klein, (1989;1993), Freeman and Cohen (1996), that skilled decision makers spend relatively much time to try to understand the important factors of the situation and to ask the most critical questions (Serfaty, MacMillan, Entin, & Entin, 1997). By advocating that the decision maker focus his /her attention on the most critical questions (i.e. what will lead to success in the particular situation) the natural behavior of skilled decision makers is replicated in the PUT model.

5. Develop a Credible Plan. The process aims at developing a tentative combat plan. By this point in the process there is a good base for the decision maker to sense what the solution should look like. Claxton (1999) concluded that there are reasons to believe that also a short

period of incubation (5-15 minutes) before attempting to solve a problem can enhance the possibilities of creative problem solving considerably. If the planner has been able to follow the basic PUT model as intended he now has a fair view of the goal state in terms of capabilities. He also has a clear understanding of the evolving situation and what the main uncertainties are. This whole process so far could be seen as incubation, before trying to develop a solution, a plan. When the criteria for success are defined in the end of the situation assessment an experienced decision maker is likely to envision at least one viable course of action.

The term "credible" refers to the feeling of the decision maker. The PUT model stresses a notion that the plan or decision must feel "right" both by the decision maker and those who are carrying out the decision (staff and subordinate commanders). When the decision feels right, that feeling is likely to inspire (Hitchins, 1998). If the plan/decision has high credibility, can be executed and feels necessary for those who will carry out the decision it is likely to facilitate the execution, especially when it requires sacrifices. This is particularly true for military decisions on the battlefield.

There is usually no need to compare the plan with another plan (or course of action) before a final decision is made. Drillings & Serfaty (1997) refer to a series of studies concerned with generating alternatives in connection with decision making in the field. They state that there is no support for the notion that it is good to develop several different courses of actions prior to making the decision. In the vast majority of cases, the decision maker chooses the alternative that was first generated anyway, (se also Klein, Wolf, Militello & Zsambok, 1995). The suggestion that comparison of several possible courses of action is not likely to result in finding of a better solution than evaluation of one option at a time is also supported by the findings of Thunholm (2003b). As the PUT model primarily is built for use on the battlefield, a cost-benefit perspective has been applied to the planning activities on which time is spent. Only events that add something crucial to the quality of the decision up-front should be a part of the decision process; this will always be a matter of offsetting time loss against the need for analysis. A good reason to develop more than one plan, however, is if there exists some fundamental uncertainty. In that case different plans could be adapted to different outcomes of the uncertainty.

The outcome of the process is a *credible plan* depicted on a map overlay and described in such a detailed way that it together with the vision of goal state, (which has been refined during the steps of the planning process), can form the basis of a graphically represented order to the directly subordinate commanders. The criteria of success are used in the detailing work.

The Credible plan should include (1) subordinate units with attachments and detachments, (2) effects that should be accomplished by the different subordinate units, (3) area of responsibility for each subordinate unit and (4) main effort in different phases of the plan. With this credible plan as a base, the staff will proceed with detailing of the plan and development of support plans.

6. Simulate. This process aims at confronting the plan so far developed with at least one and ideally several possible enemy actions and thereby gain an understanding of required modifications of the plan and identify the need for: 1) co-ordination of units and integration of systems, 2) further information and 3) future decisions that will have to be made. Simulation could be done formally with the aid of computerized war games or on maps. It could also be done informally as a mental simulation (for a deeper discussion on the concept of mental simulation, see David & Stone, 1995) that will mainly take part when the credible plan is developed.

7. Decide. This decision should be viewed as the point of final mental commitment. This process aims at deciding how the task should be carried out and to start the execution. In the case prescribed by the model, namely that there is only one plan, the commander should

formally decide on establishing the vision of goal state and the credible plan that has passed the simulation and also decide to start the execution of the first step of the plan. In the case of two or more existing plans, the decision is made by comparing the alternatives with respect to the most important criteria of success, (which then become criteria of selection).

8. Develop mission order; "step one of the plan". This process aims at transforming the decision into an order for fulfilling the primary task, to directly subordinate units. Normally it starts paralleling already during 5. Develop a Credible Plan

8. Develop opportunities for proactive decision making. This process is initiated in parallel to the mission order work and aims at preparing as far as is possible a quick command of the unit's action once it has been initiated by the given order. The purpose of the planning is to define in advance times, places, or actions where decisions concerning the continued sequence of events can be predicted. The purpose is also to prepare these decisions as far as the time allows, so that delays in the combat caused by commanders' need for planning are avoided (to try to leapfrog the decision cycle of the opponent).

Differences between the PUT-model and traditional military decision-making models

At the national level most countries use their own national military decision-making models. In many cases there are also differences in models between different services (such as the US Army and the US Marine Corps), however, basically these models are much similar. Here the MDMP (US Army, 1997) is used for a comparison.

The Ultimate purpose of the MDMP as stated in the U.S. Army Field Manual (FM) 100-5 is to develop and compare several courses of action (COAs) in order to find the best one possible. The view of the PUT is that first, there is little support that the process of generating and detailing three different options and compare them thoroughly will result in finding a better solution than if only one solution is generated. Because objective measurements to evaluate a COA in advance is lacking, evaluation of COA's must be based on subjective criteria (emotionally based). Second, the need for timeliness often makes it better to use the available time for planning to generate one workable option and then corroborate and refine it through war-gaming instead of using available time to generate and compare different possible options.

In the MDMP the decision maker is encouraged to go through all steps carefully and not take short-cuts because that may affect decision quality negatively. The view of the PUT is that going through some model stages does not per see result in higher decision quality. The decision quality is not necessarily related to the model and the important thing is to come up with a credible COA, not to follow a sequence of stages. Thus in PUT it is ok to come up with a COA at any stage of the planning process. When that happens it is better to spend time to detail and test that COA than to proceed through a chain of steps and stages in order to follow the process.

In the MDMP the role of the commander is normally to give guidance to the staff in the beginning of the planning process and then to chose one of the options that has been evaluated (and recommended) by the staff members. The view of the PUT is that the commander should normally be the one who comes up with the COA, or at least participate actively in this work. This is important because he/she is normally the most experienced person and thus should be the most capable to produce a high quality COA. He/she will also be responsible for carrying the plan out.

Another difference concern working technique. In the MDMP the decision-maker is supposed to take one step at the time, finish it and then continue to the next step without iterations. In the PUT model the decision maker initiates the steps in a certain order but is encouraged to iterate. For example, in the first step of the PUT, the decision-maker is supposed to develop only a preliminary vision of the goal state. As he/she proceeds through

the process he/she is supposed to go back and refine the vision of the goal state. The differences in working technique is illustrated by Figure 4 (traditional models) and 5 (the PUT).

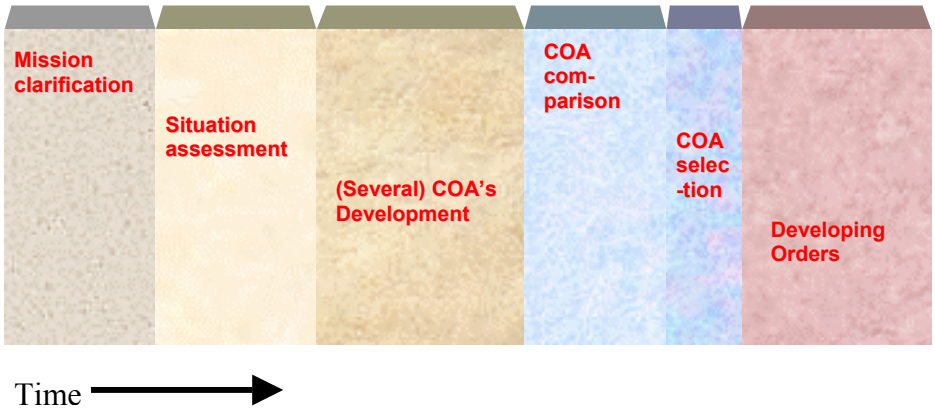

Figure 4. *Illustrating working technique in traditional military planning models, i.e. sequential, stepwise workflow, here illustrated by the Swedish Army planning model (Swedish Army, 1995).*

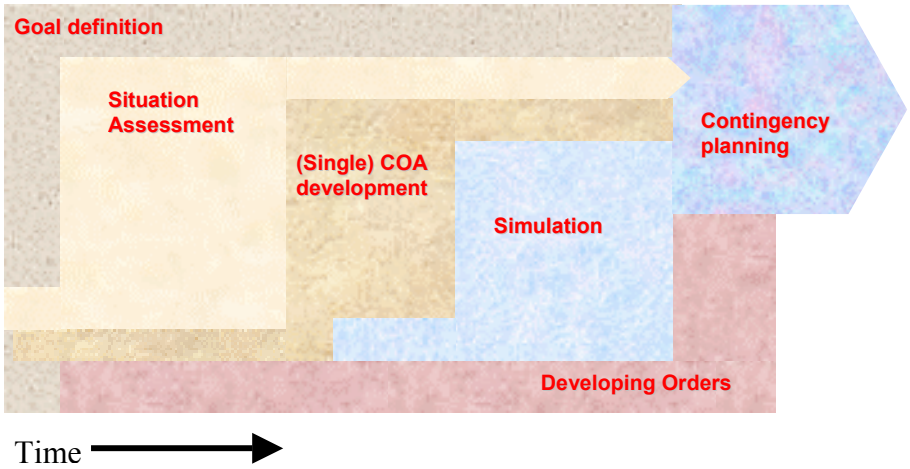

Figure 5. *Illustrating the parallel workflow in the PUT-Model.*

Differences between the PUT-model and the RPM

The PUT-model was inspired by the RPM presented by Schmitt and Klein, (1999). There are however some significant differences. First, the RPM is developed to suit experienced commanders and staff on the battlefield and mainly in situations where the commander can identify a COA early in the process. The PUT model also allows for that to happen and gives guidance how then to proceed, but the PUT also gives guidance how to proceed when early recognition does not occur. This is the Basic PUT model described earlier and this makes the PUT-model suitable for use during training of junior officers, like the traditional decision-making models are. The short early-recognition based Quick PUT is described in Figure 6.

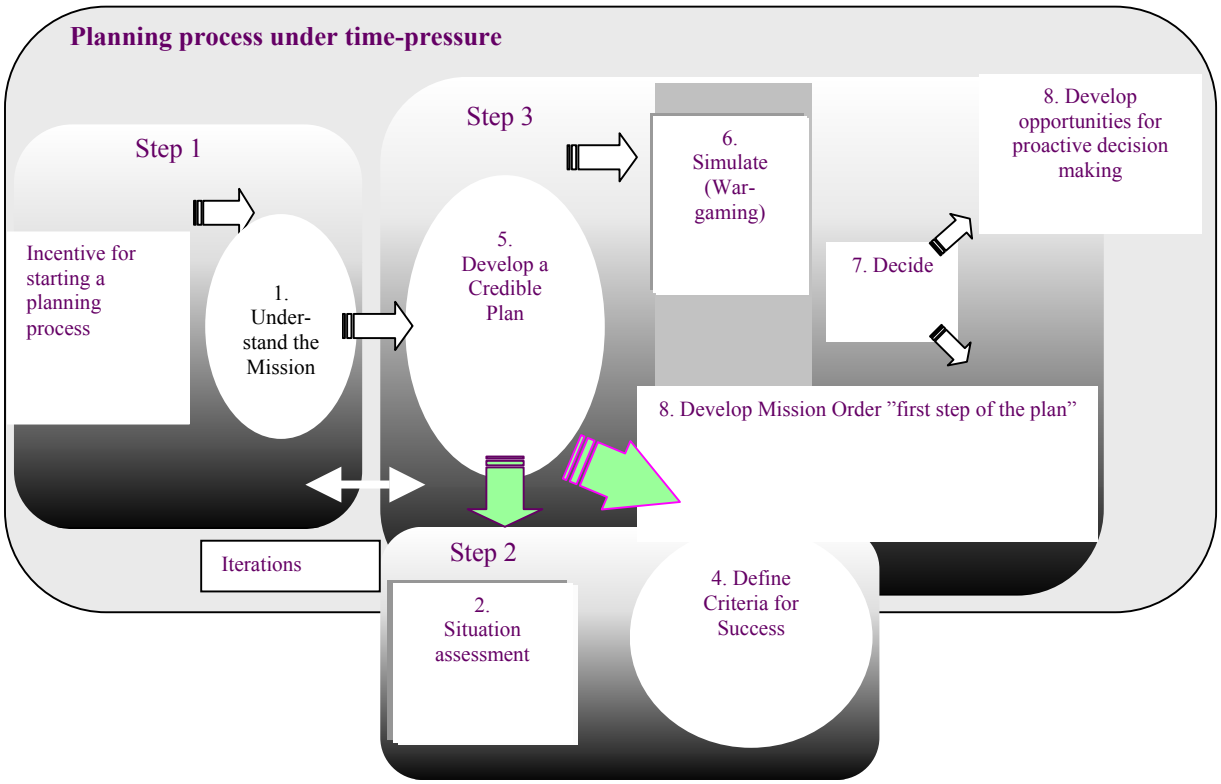

Figure 6. *Illustrating the Quick PUT. Here the decision maker realizes a COA already in the first moment of the planning process and then proceeds directly from understanding the mission (Moment 1) to developing a Credible Plan (COA). The Situation Assessment is now used only as a checklist in order to find out if the initial COA will match the situation. This version of the PUT model has great similarity to the RPM.*

Another difference is that the RPM model is based primarily on what planners actually do when they engage in military planning. Schmitt and Klein obviously see no need to specify activities that will enhance the possibilities of innovative thinking. Therefore the RPM model lacks a step similar to Step 2 in the PUT model. The RPM model prescribes that the decision or the conceptualization of a COA should emerge already in the first step of the process, when the commander identifies the mission. Such emergence could of course take place in some situations but real combat, fortunately, is relatively rare, which means that even experienced officers seldom have expert knowledge when it comes to leading the combat in the field. Their ability to intuitively recognize a real combat situation and instantly be able to generate a good course of action should not be exaggerated.

A third difference is that Schmitt and Klein argues that situation assessment is a necessary base for planning but that it is not a part of the planning process. I argue that the situation must always be understood in light of the given inputs, for instance a new task. In real situations, the decision-maker is likely to have a good understanding of the situation once the planning process begins. However, the information contained by a new or modified task must be integrated into the current understanding. This is likely to mean that the previous known situation is looked upon with "new eyes", as goals and expectations affect what is being paid attention to in the amount of information that constantly floods a contemporary military staff (see, for instance, Endsley, 1997).

Results from testing the PUT model

The PUT model was introduced at the Swedish National Defence College (NDC) in 2000. Since then four scientifically controlled studies in order to evaluate the PUT model have been conducted. In addition to that, a number of user evaluations have been done.

The first study (Thunholm 2003c) with the PUT was a comparison between the PUT and the traditional Swedish Army planning model (SAR; Swedish Army, 1995). Participants were 28 male army majors attending Higher Command Program at NDC. The design of the study was an experimental, repeated measures design. Independent variable was planning model, the PUT and the SAR, given in a random order in two subsequent, equally difficult, division level planning tasks. The task was for the participants to use maximum three hours to transform an operation order from a higher Head Quarters (HQ) into a battle plan for a mechanized division. The scenario was a traditional mechanized battle scenario, including time-pressure, high complexity and uncertainty. The results showed that there was no difference in decision quality between plans produced in the two different conditions. The quality ratings were made by teachers at the NDC. This result indicates that the prescription inherent in traditional military planning models to develop and compare several (normally three) different COA's does not result in higher decision quality. This result was replicated in a subsequent study, designed to compare plans produced based on evaluation of one vs. three different COA's in the planning process (Thunholm 2003b).

Another result in the PUT vs. SAR comparison study was that decision confidence felt by the participants was significantly higher ($p < .05$) among participants after planning according to the PUT. This is important because battle activity is about "forcing your will upon your opponent" (Swedish Army, 1995), and confidence in your plan should be related to the force invested in carrying out the plan.

A third result was that when the participants planned according to the PUT, they used significantly less time to come up with a COA than they did when they planned according to the SAR ($p < .001$). This is important because once a COA has been decided subordinate commanders can initiate their planning process and this can result in an overall quicker decision-loop. Participants also reported significantly lower levels of perceived time-pressure ($p < .05$) after planning according to PUT. This is important because time-pressure might induce stress and reduce cognitive capacity available for planning (Zakay, 1993).

One of the most important questions in this study was if the PUT model would be perceived as suitable for planning under realistic field conditions. This was evaluated for both models on a six-step Likert scale where 1 represented "very unsuitable" and 6 represented "very suitable". The PUT received an average rating of 5.1 and the SAR received an average rating of 2.7. The difference was statistically significant ($p < .0001$). This indicates that the PUT was considered to be a useful model for military planning under realistic field conditions but the SAR model was not. The high rating for the PUT model has been consistent in every subsequent user evaluation of the model, with values between 4.6 and 5.3 on the six-step Likert scale (Thunholm 2004).

The item concerning the participant's evaluation of the suitability of the planning model was followed up by an open question asking for motives for the rating. Analysis of the motives given showed that motives could be referred to four different categories: a) mental technique (MT) prescribed by the model in the planning process, b) practical working technique (WT) prescribed, c) military tactics (Ta) inherent or focused in the model, and d) the need for time (NT) to make a plan in accordance with the planning model. The six-step rating scale has its natural mean value at 3.3. Out of the 28 participants, 26 rated the PUT model as 4-6. Motives were categorized as follows: WT = 16 participants (e.g., "The PUT model is not a strict model, iterations and successive completion are allowed"); MT = 15

participants, (e.g., “PUT promotes creativity and liberates the thought process”); Ta = 3 (e.g., “The PUT model is built to fit with the maneuver concept”); NT = 3 (e.g., “PUT is fast”). Out of the 28 participants 10 rated the SAR model as > 3. Motives were categorized as follows: WT = 7 (e.g., “The SAR model is well known – you know where the bottle-necks are”); NT = 3 (e.g., “The SAR model is time-consuming but adjustable”); MT = 2 (e.g., “The SAR model is a bit too formal and detailed”). Motives from 18 participants, rating the SAR model as 1-3, were as follows: NT = 8 (e.g., “The SAR model is too time-consuming”); WT = 8 (e.g., “The SAR model is far too rigid and undynamic”); MT = 2 (e.g., “In the SAR model it is easy to prematurely restrict your thought process”).

Altogether these results indicated that planning according to the PUT model resulted in higher decision speed, higher decision confidence, and lower perception of time-pressure, without losing anything in objective decision quality.

The other three scientifically controlled experimental studies of the PUT have not been formal comparisons between PUT and another model. The purpose with those studies have been to try to establish how the PUT model would be applied under different circumstances. The first of these studies varied the amount of time available for planning (Thunholm, 2004). The second varied amount of available information (Thunholm, 2004) and the third study (Thunholm, 2005b) varied the ability to communicate verbally between the participating planning staffs (brigade and battalion). All the data from the third study are not yet analyzed.

The main result from these two studies is that the participants on average agree that the PUT model works well. Jensen (2005) in two studies on the sensemaking process of military planning teams at the brigade level concluded that plan quality, as measured by two independent raters, was strongly correlated to how well the teams managed to make sense of the mission given to them. This in turned seamed to be depending on how well they were able to structure the planning process. Following the steps of the PUT-process was strongly correlated to plan quality. However, it cannot be concluded that the PUT process is better than another formal process because this was not tested in these studies. These studies were based on data collected at the same time as the second and third studies mentioned previously.

The result from the study varying available planning time (Thunholm, 2004) showed that when time for planning was severely limited (three hours to produce parts of a Navy Task Group order) it affected the way the PUT was applied. In the condition with high time-pressure 70 % of the participants reported that they made adaptations to the basic PUT while 30 % reported that they used the basic PUT unmodified. In the team with low time-pressure the proportions were 35 % (made adaptations) vs. 65 % (did not). This difference was statistically significant at the 5 % level. The adaptations included concentration to only some of the steps in the situation assessment (enemy and own forces situation, and possible enemy COA’s). Also most of the stages were minimized regarding process documentation. Only the most important facts and evaluations were attended to, and the resulting process documentation was meager. The stage most often left out completely from the planning process was the formal simulation (wargaming). However, these adaptations did not affect decision quality or decision confidence in a negative way, nor did it affect the usability ratings of the PUT model. They were equally high (4.6 on the 6-step Likert scale) in both conditions (Thunholm 2004).

In the study evaluating how different amounts of information available to the planners would affect the planning process the results indicated that the PUT was applied in the same way independent of how much situation information that was available. One condition (including eight brigade level planning teams) had detailed and accurate situation information on the enemy situation and did also receive updates in real time. The other condition (eight teams) had a more “normal” level of situation information available. It was no difference in the way the PUT was applied between participants in the two conditions. Overall, 68 % of the

participants reported that they used the basic PUT unmodified and 32 % reported that they made adaptations. One common adaptation was to skip the formal wargaming. Another adaptation was to start situation assessment before, or in parallel with starting to understand the mission. Another common modification was to do some kind of evaluation of more than one COA. In the PUT manual the planner is encouraged to use the criteria for success as evaluation criteria in case that more than one COA emerges during the planning process.

Evaluation, adaptation and adoption of the PUT model in the Swedish Armed Forces

Since 2000, the PUT has been learned and used by students at the Higher Command Program at Sw NDC. The Navy section at NDC started to teach it to the students of the Staff Officers Program in 2001, followed by the Army section in 2002. In 2003 it was decided that every officers' school should teach tactical planning according to the PUT model.

Some services and branches have developed their own versions of the PUT model. This includes the Air Force, Special Forces, the Ground Warfare School (PUT for mechanized units) and the Anti Aircraft Defence. Further, the PUT has been used in some of the Swedish UN mission units, for example the Multi National Brigade HQ (section J 5 Planning) in 2003-2004, when the brigade had a Swedish commander. The model was perceived as easy to apply and also, the working technique prescribed by the PUT made it easier, compared to traditional planning, to identify a viable COA early in the planning process. The prescribed techniques in the PUT to visualize the process results were also perceived as useful (interview with Norling, 2005).

Internationally the PUT model has been adopted and modified to suit the Singapore Army. This work has been done as collaboration between the Sw. NDC and Singapore Armed Forces Centre for Military Experimentation (SCME). The resulting Singapore version is called Knowledge Battle Procedure (KBP) and it was tested experimentally and reported at ICCRTS in Washington June 2005 (Cheah, Thunholm, Chew, Wikberg, Andersson, & Danielsson, 2005).

The PUT model has also been adopted by the Sw AF HQ project for NCW C2 Development (Ledsyst). Within the framework of this project the PUT has been developed into Integrated PUT (I-PUT; Josefsson, 2006). The I-PUT is similar to PUT except for some additions concerning how multi-level integrated tactical mission planning should be conducted. The I-PUT has been tested and evaluated in three large scale demonstrations in 2004 and 2005, involving staff units from Army, Navy and Air Force in multiple command levels including Joint Force HQ, Brigade, Battalion, and Company level. In June 2005 the project directors concluded that the I-PUT has proved to be working well and they recommend it to be handed over to the Sw AF as the unified tactical mission planning model for all services (Swedish Armed Forces HQ, 2005). During 2006 the HQ Project for C2 Development will continue to adapt the model in order to integrate it with the Operational (joint) planning process (OPP).

An initial attempt to synchronize the PUT model with the Operational Planning Process as described by Guidelines for Operational Planning (GOP; NATO, 2004) is shown in Figure 7.

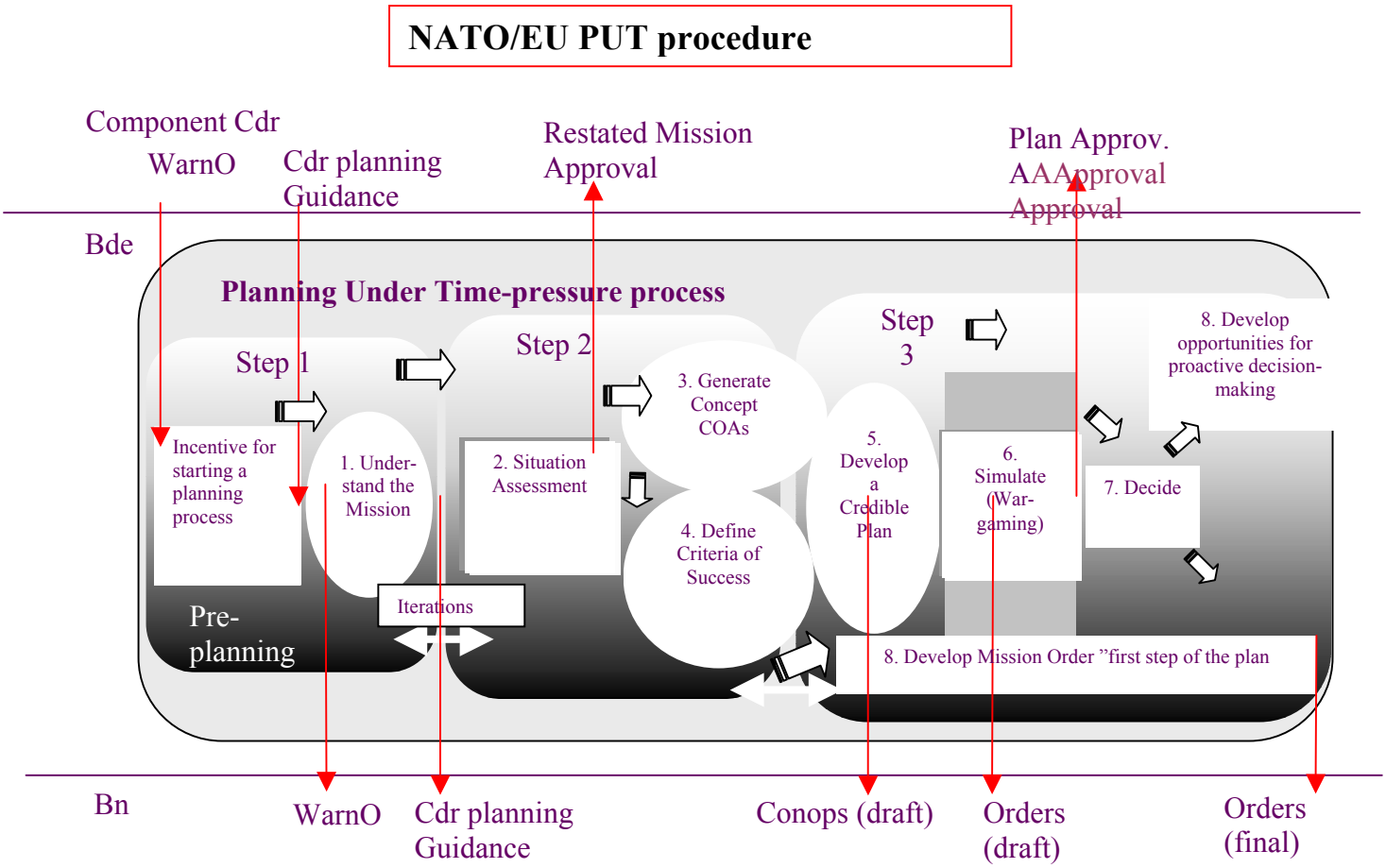

Figure 7. *Initial attempt to coordinate the PUT model (Tactical level) with the NATO Operational Planning Process.*

Finally, within the framework of Singapore – Sweden Military Exchange, another Team Collaborative Experiment is currently scheduled to take place in Sweden in March 2006. This study is on integrated planning, involving three command levels simultaneously. This study will be reported at ICCRTS 2006.

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