



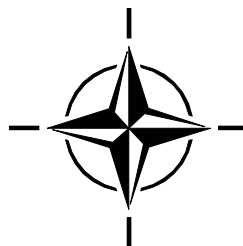
RTO TECHNICAL REPORT

TR-HFM-087

# **Military Command Team Effectiveness: Model and Instrument for Assessment and Improvement**

(L'efficacité des équipes de commandement  
militaires : un modèle et un instrument  
pour l'évaluation et l'amélioration)

This Technical Report has been prepared as a result of a project on  
"Team Effectiveness" for the RTO Human Factors and  
Medicine Panel (HFM-087/RTG-023).



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Medicine Panel (HFM-087/RTG-023).

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- SCI Systems Concepts and Integration Panel
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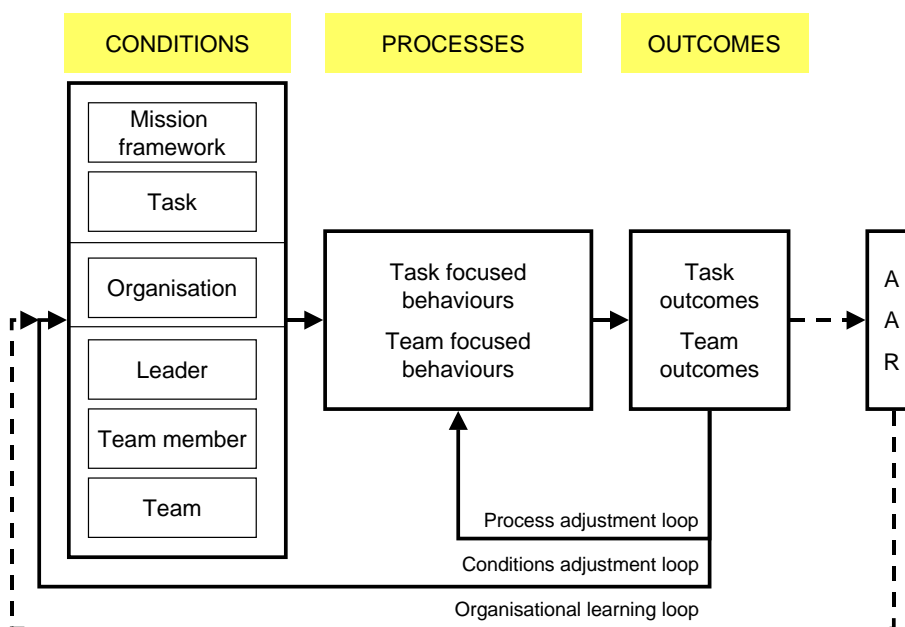
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# Military Command Team Effectiveness: Model and Instrument for Assessment and Improvement (RTO-TR-HFM-087)

## Executive Summary

Commanders need to gain and maintain better insight into the effectiveness of their command teams. The mix of military, political and societal objectives and constraints, and the increasing need for multi-national, joint military operations, with ad-hoc teams even to the lower command levels, has made effective teamwork a critical mission success factor. The objective of our study is to support commanders in guiding and controlling the team towards effective performance. The focus here is on commander-staff and commander-sub-commanders teams at operational and tactical command levels.

A model of critical factors of command team effectiveness was developed – the CTEF model. Effective teamwork is the result of a complex mix of *condition* factors (contextual, organisational, and personnel) and *process* factors (task-focused and team-focused), which develop in interaction with the dynamics of operational situations, and *outcome* criteria. Effective teamwork will more likely arise with well-understood and selected conditions, well-directed performance, and well-defined outcomes, and timely adjustment of processes and conditions if necessary.



In order to help commanders to apply the model systematically – before, during, and after their mission – an instrument was constructed, which helps to (a) assess the status of the listed conditions, processes, and (intermediate) outcomes at time of assessment; and (b) judge the impact which the status may potentially have on effectiveness. The instrument is a questionnaire comprising items with detailed model element

descriptions, which the commander and/or team members can score on a negative-positive scale. In this way an overview is obtained of items that require attention. This can be used by the commander to take actions. In the development of the CTEF model and instrument we presented draft versions to commanders. They confirmed the importance and practical value of the model overview of critical factors. In addition, they made clear that for the instrument to be applied effectively it should be short and easy to use.

The CTEF model and instrument provide a common reference to effectiveness and teamwork for the operational military and trainers. Application of model and instrument in NATO will help to further exchange of international military perceptions on effective teamwork. Operational validation of the CTEF model and instrument was outside the scope of the study, but will be the focus of a follow-up NATO/HFM study with a web-based version of instrument.

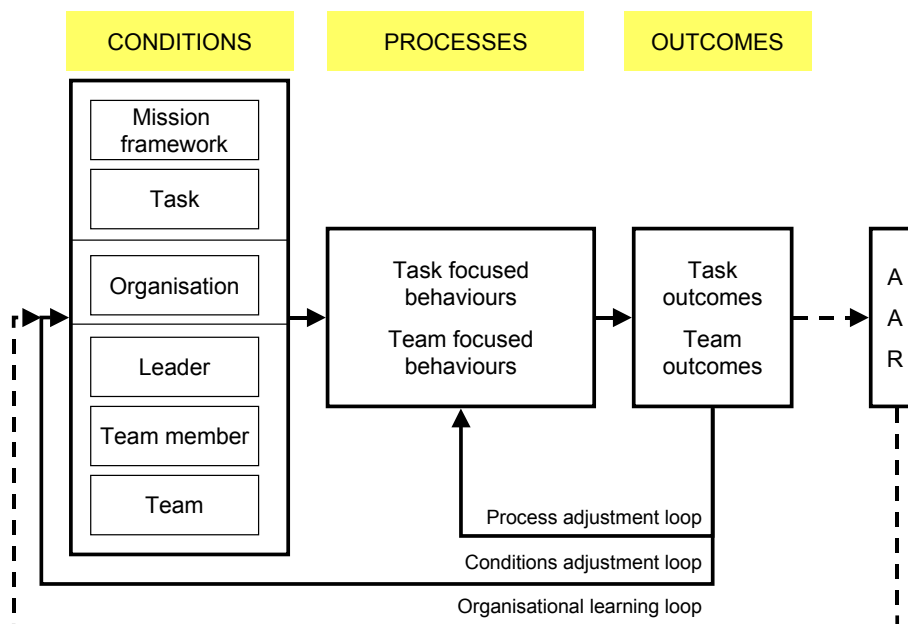
# L'efficacité des équipes de commandement militaires : un modèle et un instrument pour l'évaluation et l'amélioration

## (RTO-TR-HFM-087)

### Synthèse

Les chefs militaires ont besoin d'acquérir et d'entretenir une meilleure compréhension de l'efficacité de leurs équipes de commandement. L'ensemble de contraintes et d'objectifs militaires, politiques et sociétaux, associé à la demande croissante d'opérations multinationales, interarmées, avec la création d'équipes *ad-hoc* dans toute la chaîne de commandement jusqu'aux échelons inférieurs, a fait du travail d'équipe efficace, l'un des éléments déterminants de la réussite des missions. Notre étude a pour objectif de soutenir les chefs militaires en ce qui concerne le contrôle et l'orientation de leurs équipes vers des performances efficaces. L'accent ici est mis sur les équipes chef militaire-personnel et chefs militaires-sous-chefs aux niveaux de commandement opérationnels et tactiques.

Un modèle des facteurs critiques pour l'efficacité d'une équipe de commandement a été développé – il s'agit du modèle CTEF. Le travail en équipe efficace est le résultat d'une combinaison complexe de facteurs de *situation* (contextuels, organisationnels et personnels) et de *processus* (orientés tâche et orientés équipe), qui évoluent en interaction avec la dynamique de situations opérationnelles et de critères de *résultat*. L'efficacité du travail en équipe passe par la mise en place de conditions bien choisies et bien comprises, de performances bien contrôlées, de résultats bien définis, et de la modification judicieuse des processus et des conditions, le cas échéant.



Afin de permettre aux chefs militaires d'appliquer le modèle de façon systématique – avant, pendant et après la mission – un instrument a été élaboré qui permet (a) d'évaluer l'état actuel des conditions, des

processus, et des résultats (intermédiaires) au moment de l'évaluation; et (b) de juger de l'impact possible de cet état sur l'efficacité. L'instrument prend la forme d'un questionnaire composé de descriptions détaillées d'éléments de modèle, que le chef militaire et/ou les membres de l'équipe doivent noter sur une échelle du type négatif/positif. Ainsi, est obtenu un aperçu des postes devant être examinés. Le chef militaire peut s'en servir pour la prise de décisions. Nous avons présenté des projets aux chefs militaires dans le cadre du développement d'un modèle et d'un instrument CTEF. Ils ont confirmé l'importance et l'intérêt pratique de l'aperçu des facteurs critiques donné par le modèle. En outre, ils ont clairement indiqué que pour être efficace, le modèle devrait être concis et facile à mettre en œuvre.

Le modèle CTEF et l'instrument serviront de référence commune d'efficacité et de travail en équipe pour les chefs militaires et les responsables de l'entraînement. La mise en œuvre du modèle et de l'instrument au sein de l'OTAN fera progresser l'échange d'expérience militaire internationale en matière d'efficacité du travail en équipe. Le groupe a considéré que la validation opérationnelle du modèle et de l'instrument CTEF ne faisait pas partie de son mandat. Elle fera l'objet d'une étude complémentaire HFM/OTAN à l'aide d'une version Web de l'instrument.



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Task Group 023 on Team Effectiveness operated in the context of the Human Factors and Medical Panel of the NATO Research and Technology Organisation. We would like to acknowledge the support of the RTO Executive and Secretary. Our group consisted of representatives from Canada (DRDC), Belgium (RMA), USA (ARI, NAVAIR), United Kingdom (QinetiQ), and The Netherlands (RMA, TNO). We visited establishments in Paris FR (NATO RTA), Toronto (DRDC), Brussels (RMA), Sevenoaks, UK (DSTL), Ft. Leavenworth USA (ARI), Linköping SW. (FOI), Orlando USA (NAVAIR), Naples IT (NATO HQ). The directors of these establishments are gratefully thanked for the hospitality and logistic support provided. In particular we would like to thank Dr. Arne Worm (FOI) and Major-General Rick Lynch (NATO HQ) for supporting our meeting at their establishment.

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## **Chapter 1 – INTRODUCTION**

### **1.1 BACKGROUND**

The variety and scope of world-wide operations to promote peace and security place high demands on military organisations, their commanders, and soldiers. Crisis response operations, anti-terrorism operations, peace support operations, humanitarian aid operations, and warfare are so diverse in nature that they require a range of qualities and skills of the military involved (Essens, Vogelaar, Tanercan, & Winslow, 2001; Vogelaar & Essens, 2001). Missions have become complex, as a standard, with a shift from clear military objectives to political and societal objectives and constraints. Accordingly, mission effectiveness has become multi-faceted and may be defined differently by various stakeholders. The increasing need for multi-national, joint military operations, with ad-hoc teams even to the lower command levels (such as NATO Reaction Force NRF-04) has brought forward issues such as critical team size, distribution of specialties, leadership, communication, cultural diversity and their impact on robustness, flexibility, and effectiveness. In addition, the increased availability of information and diversity of sources raises issues such as common situation awareness and understanding. Increasingly mission success will rely heavily on bringing skills, knowledge, experience, and intelligence together in effective teamwork.

We identified the need of commanders to gain and maintain better insight into the effectiveness of their teams. Knowledge of factors that affect the success of command teams will help to build effective (multi-national) military command teams of the future, select the best personnel, improve organisational structures, develop rapid team arrangements, and optimise processes to operational conditions, all in the context of mission goals and stakeholders expectations. Building and maintaining effective teamwork is a continuous process. Commanders need to assess, control, and adjust the qualities and maturity of the team before and during the mission, in order to achieve intermediate and end goals, and learn from the experience after the mission for future missions.

### **1.2 GOALS OF THE STUDY**

Effective teamwork is the result of a complex mix of structural factors (contextual, organisational, and personnel) and process factors (task-related and team-related) that develop in interaction with the dynamics of operational situations. The primary goal of our study is to develop a model of critical factors of team effectiveness of command teams, the ‘command team effectiveness model’ – the CTEF model.

Additionally, commanders need a practical instrument to measure the status of the critical factors, in order for a commander (and the team members) to apply the model and repeatedly assess the effectiveness of the team – the CTEF instrument.

### **1.3 TARGET AUDIENCE**

The focus of the Command Team Effectiveness (CTEF) model and instrument is on military command teams. Such a team comprises a commander and staff officers, or a commander with sub-commanders. Typically, these team’s main activities are information processing, creative problem solving, and decision-making in complex, ambiguous, and stressful situations. The levels of command that the model addresses are mainly tactical and operational. The CTEF model and instrument are intended to be generically applicable to command teams independent of configuration, including multi-service and international teams. The team can be co-located or distributed, but interaction between team members is an essential element of the team process. The teams may be formed on an ad-hoc basis or may be standing teams, but usually they are intended to operate for a longer period (e.g., the duration of a deployment).

Our intention is to have the commander use the CTEF model and the instrument to gain insight and control of team effectiveness, but also the team members play an important role in the review of the team's processes and they provide feedback to each other and to the commander. The instrument is best used at milestone points during the mission (using intermediate outcome measures), which will provide a track record of how the team's effectiveness develops during the mission. The CTEF instrument is intended to be used before and during the mission in the operational context, and for after action reviews, but also for instructional and training purposes.

Researchers and scientists may study the model and the instrument to compare these to their own concepts and experiences, and potentially apply these in their own (military) research. However, the main target audience and users are the commanders and the command teams. This means that the model and instrument should be compact and easy to apply.

### 1.4 METHOD OF WORK

The approach in the study was first to review existing models of team effectiveness and the existing literature on effectiveness in the areas of command and control, decision-making, human resource management, organisational design, and team factors. We scanned hundreds of books, articles, and reports, some of which are specifically referenced in the text or are listed in the bibliography. Second, from these studies, and our experience with military command teams, we identified the factors that are critical for team effectiveness in a military context. Third, we developed a model that captures the critical factors and feedback loops for command team effectiveness – the CTEF model. We operationalised the model into a measurement instrument that can be used by commanders and their teams to assess the team factors and provide feedback for improving the teamwork – the CTEF instrument.

During this process of development, we interviewed fifteen commanders from different nations on an intermediate version of the model and the instrument. Our aim was to receive feedback on what was represented in the model, on what might be missing, on the usefulness of the model and the instrument, and its potential application. Finally, we compiled a technical report aimed at our target audience, the command team, including the empirical evidence we found in the literature. Additionally, the results will be discussed at an international expert meeting. A broader and more systematic validation of model and instrument was outside the scope of the study, but this will comprise the focus of a follow-up study (HFM-127/RTG Operational Validation of Command Team Effectiveness Instrument).

We operated as Task Group 023 on Team Effectiveness in the context of the Human Factors and Medical Panel of the NATO Research and Technology Organisation (NATO/RTO/HFM/TG023). The group consisted of representatives from Canada, USA, Belgium, United Kingdom, and The Netherlands, all with a strong background in military-related research in command and control, team performance, leadership, and decision-making. The Task Group worked from June 2001 to September 2004, during which we met eight times and discussed our findings and results. In Spring 2005 the group will have an extended meeting with an international expert workshop.

### 1.5 STRUCTURE OF THE REPORT

In Chapter 2 we give a complete, concise overview of the work, including the CTEF model and instrument. This should provide the reader with direct insight into the model and the instrument. In Chapter 3 we describe the military context of our study, with a focus on the command team, command structures, and the command processes. This chapter will provide readers with less knowledge on command structures with sufficient contextual information. In Chapter 4 we describe the conceptual background of our model by providing a comprehensive review of alternative models of team effectiveness, focussing on the strengths and weaknesses of each model as they pertain to military

command teams. In Chapter 5 we give a detailed description of the CTEF model, including definitions of the components, aspects and features of the model. In Chapter 6 we review the empirical evidence concerning the relationships between the model components and how these affect the task and team processes, and the outcomes. The CTEF instrument, its structure, its working, and how to apply it are described in Chapter 7. In Chapter 8 we draw some conclusions concerning our work, and we provide recommendations and directions for further research. The references in the text are at end of report (Chapter 9). Annex A shows a protocol for after-action reviews. Annex B contains the complete version of the instrument.



## Chapter 2 – MILITARY COMMAND TEAM EFFECTIVENESS: OVERVIEW

### 2.1 THE COMMAND TEAM EFFECTIVENESS MODEL

A team is said to be effective if it achieves its goals. But what are the factors that enable and facilitate the achievement of those goals? Our premise is that to be potentially effective, commanders must understand (a) what they start with (conditions), (b) what they can direct and control (processes), (c) against which criteria results will be measured (outcomes), and (d) which processes and conditions to adjust. Effective commanders regularly review the task and team processes against intermediate outcomes, and adjust these, or even seek to adjust condition factors if possible. The CTEF model helps the commander to address the relevant factors in the control of effectiveness. The model will stimulate awareness of critical variables that may affect the team’s effectiveness. It can be used before the team engages in an assignment to assess the conditions of the mission in terms of tasking, organisation, and people qualities; prepare for the requirements required to optimise the processes; identify the stakeholders involved and their expectations, and specify the end goals and intermediate goals.

Figure 1 shows the CTEF model with the components of team effectiveness, their relationships, and feedback loops. Each component has several aspects and features that in more detail specify the potential effects on overall effectiveness (see Chapter 5 for a complete overview of components and aspects of the CTEF model).

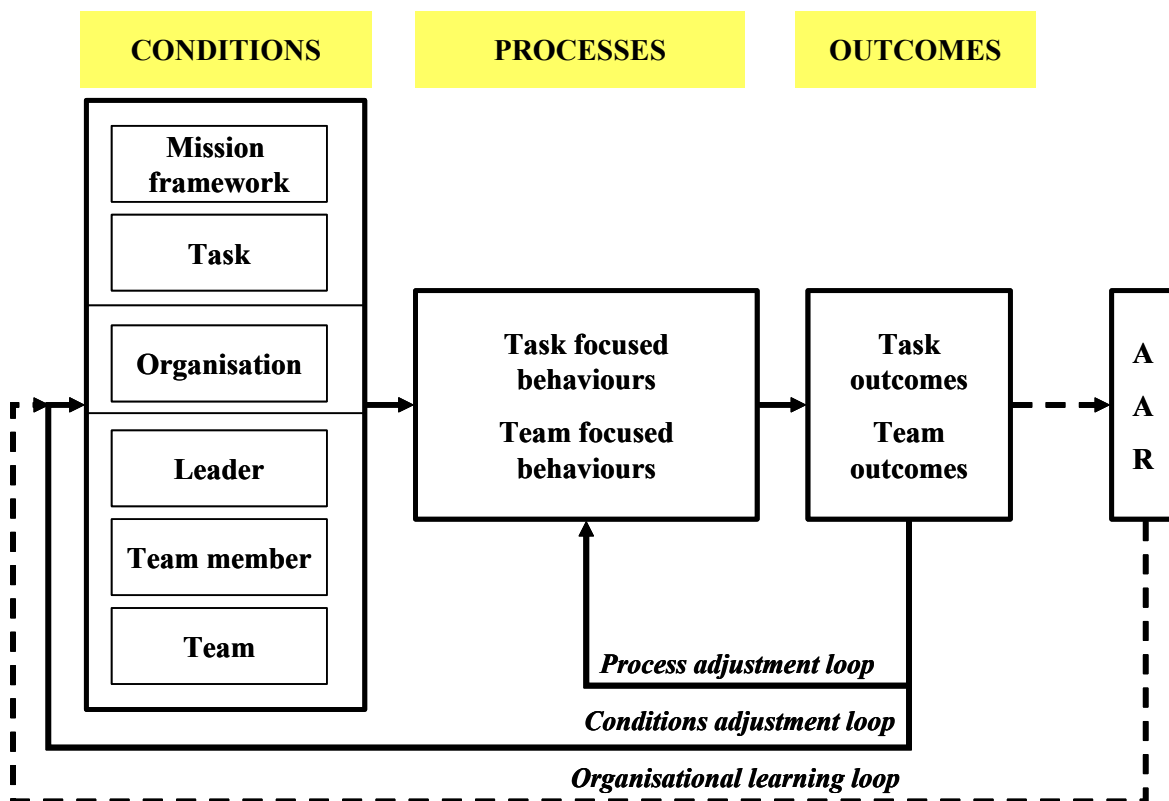


Figure 1: The CTEF Model with Basic Components and Feedback Loops.

## MILITARY COMMAND TEAM EFFECTIVENESS: OVERVIEW

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One set of conditions addresses the context the team is working in and captures the demands and constraints of the mission and tasking:

- *Mission Framework*, which captures the conditions of the mission of the team (situational uncertainty, stress potential, limiting constraints, and stakes);
- *Task*, which captures the goals the team has to accomplish, and the characteristics of the work that will be involved (task complexity, workload, goal clarity, and goal stability);

A second set of conditions addresses:

- *Organisation*, which captures issues related to the fact that the team is embedded within the context of a broader organisation (goal congruity, clarity of command structure, autonomy, organisational support).

A third set of conditions addresses the people that form the team:

- *Leader and Team Members*, which capture critical characteristics that potentially affect the functioning and effectiveness of the team (skills and knowledge, and congruity of personal goals and organisational goals);
- *Team*, which captures critical characteristics of the team as a unit (composition, size, architecture, maturity, and team goals).

The Processes are focused on the behaviours that emerge during the operation. We use the term processes, because these are on-going activities. The relevant components address:

- *Task-Focused Behaviours*, which address the activities directed at the operational tasks (managing information, assessing the situation, making decisions, planning, directing and controlling, and liaising with other teams);
- *Team-Focused Behaviours*, which address the interactions between the team members (providing and maintaining vision, maintaining common intent, interacting within the team, motivating, adapting to changes, and providing team maintenance).

The Outcomes address the standards, goals, criteria, intentions, expectations, and products that are explicitly or implicitly intended results of the mission. Mission success is not only specified in military terms. Current operations usually have multiple stakeholders, which should be considered in evaluating the effectiveness of the team. For the team, Outcomes focus on those measures of a team that reflect mature and potentially well-performing teams. Missions are usually not a simple 'one-shot' effort, but develop with successive rotations and last for longer periods. Therefore, it is important for commanders and teams to specify and assess intermediate results. These can be used for more or less formal iterations in the mission or development of the team.

The relevant Outcome components and aspects are:

- *Task Outcomes*, which address the intermediate or final results of the mission [achievement of the (intermediate) goals or achievement of the mission, meeting criteria set by stakeholders, other stakeholders' satisfaction];
- *Team Outcomes*, which address the maturity of the team [mutual trust, morale, cohesion, collective confidence in achieving the goals, shared vision, mutual respect].

The model shows arrows between the components, which indicates that the components affect each other: conditions affect processes and processes affect outcomes. The feedback loops represent iterative development, adjustment, and learning processes, which follow (more or less) formal reviews of the progress of the team against the outcomes. Note that intrinsic feedback processes may be present within

the team- and task-processes as a natural element in performing tasks and providing feedback when working together. The feedback loops specify more explicitly the reviewing activity. The specified feedback loops are:

- *Process Adjustment Loop*, which addresses the required interventions in the management or performance in the task and team processes;
- *Conditions Adjustment Loop*, which addresses the changes needed in the structural basis of the processes, either in personnel, organisation, or mission and task factors;
- *Organisational Learning Loop*, which addresses the evaluation of all components of the effectiveness in the light of the success and failures in the mission; for the commander and team's own learning cycle, and the advice to the organisation and follow up commanders.

## **2.2 THE COMMAND TEAM EFFECTIVENESS INSTRUMENT**

The CTEF model provides the basis for the assessment instrument, which is organised along the same structure as the model. With the CTEF instrument, the model is applied to assess, control, and improve the effectiveness of the team. The commander can apply the CTEF instrument at various stages of a team's mission to capture the status of the team at a given time. It can even be used before the mission to assess the current status of the conditions, in term of tasking, organisation, and personnel qualities. It can be used during the mission to measure how well the team is doing in task and teamwork, and whether it is achieving its intermediate goals or outcomes. The results of the instrument can be used to diagnose the team's performance and identify which elements require improvement in order to achieve effectiveness (feedback loop). Each time, the results provide a benchmark against which the impact of an intervention of the commander can be evaluated. After the team's mission, the results can be used as a basis for an after-action review, to learn and to understand how and why things happened as they did, and how things can be improved. The instrument is suitable to apply repeatedly to reveal how the team is evolving and performing over time.

In Figure 2 a snapshot from the instrument is shown. The sample shows the factor 'task-focused behaviours', with a set of aspects of the factor, such as managing information. We distinguish between actual status and potential impact of that status on the eventual effectiveness and ask the commander to assess the factors in two steps:

- *First*, an objective judgement is required concerning the status of a particular aspect of a component. For instance: What is the current status of managing information (i.e., obtaining, processing and exchanging information)? The commander scores this item on a scale from negative (very low) to positive (very high). This is the commander's assessment on how well the process is currently being performed (i.e., the estimated factual state).
- *Then*, a judgement is required to assess the potential impact of that status on team effectiveness. The commander expresses an estimate of the direction and seriousness of the impact on the achievement of the intended outcomes, on a scale from very negative to very positive.

Thus, if at a particular evaluation moment, managing information is low, the commander may still estimate that its impact is not negative but neutral (obviously not positive). However, if the impact is judged to be negative, an intervention may be needed. By going over the scores the commander is provided with an overview of components and aspects that may need adjustment or intervention. In fact, the instrument provides the management data for a commander to lead the team.

## MILITARY COMMAND TEAM EFFECTIVENESS: OVERVIEW

### TASK-FOCUSED BEHAVIOURS

Task-related processes include both productive and corrective behaviours:  
*managing information, assessing the situation, making decisions, planning, directing and controlling, monitoring progress, and liaising with other command teams.*

Item	Assessment of Current Status in Team						Impact on Team Effectiveness				
	NA	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Managing information</b> (e.g., obtaining, processing and exchanging information)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Assessing the situation</b> (e.g. perceiving, recognising, anticipating events)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Making decisions</b> (e.g., defining the problem space, managing time available to make decisions, evaluating options and results)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Planning</b> Formulating actions necessary to achieve a goal (e.g., anticipating future tasks and events, scheduling actions, specifying resources needed, and defining strategies)		1	2	3	4	5	-2	-1	0	+1	+2
.....											
Count of scores											

**Figure 2: Sample Snapshot of the Instrument.**

There is a dependency between the status scale and the impact scale, but not completely. As said before a negative status does not have to result in a negative impact score. Along the same line a positive status score need not have to result in a positive impact. Obviously, a positive status will not result in a negative impact score.

After the instrument, or a section of it, is applied, negative impact scores may be summed up to give an overall score on how effective the team is at a given moment. These scores should be reviewed and a decision should be made on what corrective action(s) should be taken.



## **Chapter 3 – MILITARY COMMAND TEAMS**

### **3.1 INTRODUCTION**

In this chapter we describe the focus of our model and instrument: military command teams. Although such teams share many commonalities with conventional teams, they differ in critically important way, such as the life-and-death nature of their work, the stakes and constraints they operate under, and the far-reaching consequences of their actions. We begin with a review of important concepts in command and control. This will be followed by a discussion on the essence of effective military command (i.e., decision-making, execution of plans, and leadership). We then explain the concept of command team and we conclude with a description of the various teams that can be addressed by our model and instrument.

### **3.2 COMMAND AND CONTROL**

Command and control can be defined as the exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission (Harrison, 1994, p. 9). Command implies authority and responsibility. Authority derives from two sources: official authority, which is related to one's position in the organisation, and personal authority, which is based upon personal attributes. Authority gives the commander the power to enforce his will. Responsibility, or accountability for results, is a natural corollary of authority (Schmidt, 1994; Pigeau & McCann, 2001). Commanders should use the authority assigned to them in a responsible way. Control is the way in which commanders track the execution of their decisions.

An important function of command and control is to get the right information to the right person at the right time to do the right thing in the right manner. Command and control has to deal with uncertainty. Commanders usually have incomplete knowledge about a number of aspects that are important for their operations. According to Schmidt (1994), effective command and control should result in a number of desired outcomes:

- provide insight into the nature and requirements of the problem facing the unit;
- provide vision, that is foresee suitable and meaningful goals and devise appropriate plans;
- provide direction and focus of efforts;
- generate tempo;
- provide adaptability to adjust actions to ever-changing situations;
- provide security to deny the enemy knowledge of own true plans and actions.

In order to be successful, commanders need the following information (Nelson, 1994):

- stimuli that shape their courses of action, such as: guidance from above and requirements of others; command arrangements; Rules of Engagement;
- means to get their plans out to the players;
- ability to influence and control the plan during execution;
- feedback on how well they did.

### **3.3 PROCESSES AND STEPS IN MILITARY COMMAND**

Command and control can be described by three processes: decision-making, execution of plans, and leadership. These processes are closely related. The commander has to make decisions about the

operation, after which the plans have to be communicated to the sub-commanders, and, finally, they have to execute these plans. Both the commander and the sub-commanders have to lead their subordinates in the processes of decision-making and execution of the plans. In this section these elements are elaborated.

### **Decision-Making**

The NATO standardised decision-making process usually contains a number of steps (e.g., U.S. Army Command and General Staff College, 1996). Mission analysis constitutes the first step, in which the situation is assessed with respect to the goals that need to be achieved. When a mission is in progress, then the situation needs to be monitored in order to assess new developments that would require an updating of previous plans or decisions. Effective commanders are continuously monitoring the situation and comparing it with their plans and goals. If the situation requires a decision about a change in focus of the mission, the commander should consult his superiors or, if that is not possible, formulate a new mission for his unit. In this step the role of the unit in the total operation should be considered. Taking into account the intent of his immediate superior commander, and his or her commander, should guarantee that the commander does not step out of line in his decisions. In addition, the constraints for the mission should be assessed (e.g., timeframe; legal aspects; Rules of Engagement). Finally, facts and assumptions should be made explicit.

A commander is free to decide with whom he analyses the mission and to what depth. Accordingly, a commander could use his staff (or a few staff members) in the assessment of the situation and the orientation of the mission. After this step there is usually a directing staff meeting. This meeting should create a common basis for the further decision process that has to be conducted. This meeting should create some common idea of what is to be done. In this way the efforts of staff members can be focused on the necessary work, but without stifling their creativity.

In the second step the relevant factors for the making of the decision should be assessed [e.g., the terrain in which the operation takes place, the weather, the opponents, and other parties involved (such as population, media, etc.)]. In contemporary operations, many other aspects should also be assessed (e.g., support for the operation by different parties, the position of governmental and non-governmental organisations, and Rules of Engagement). In addition to the environment, it is important to also assess the state of one's own forces should be assessed (e.g., the presence and effectiveness of materiel and equipment, the adequacy of the organisation, the logistics, the morale of troops, security, joint and international co-operation, etc...). The assessment of all factors is a continuous process in which staff officers attend to their area of attention. However, in a specific mission, each staff officer should focus his or her efforts on the mission requirements.

The third step captures the consideration and development of possible courses of action for the operation. This step is partly a creative exercise in which the commander is looking for opportunities in order to reach the objectives as successfully as possible. This step should take into account the information that has been gathered in earlier steps (i.e., an analysis of the mission, tasks, constraints and relevant parts of the intelligence of the operation). The courses of action may be weighed against a number of criteria, such as realism, feasibility, acceptability, and suitability. In this analysis process, staff officers consider the courses of action from their perspectives and consider eventualities. Also, an operational analysis is worked out, where it is visualised how the operation may evolve if the plan was to be implemented. Furthermore, undesirable effects and risks are assessed in order to permit contingency planning.

In the fourth step, the commander makes a decision, which contains the commander's intent, the operational concept (who is doing what, when, and why), and the assumptions on which the chosen course of action is based.

## **Execution of the Plans**

After a decision has been made, the commander has to organise, direct and co-ordinate the activities of the troops that are assigned to him (Doctrine RNLA, 2000, p. 101). In this process the commander's staff supports him. This process contains the following aspects:

- writing orders based on the decision;
- the communication of the plans and orders to all the people involved in the execution;
- supervising the execution of the plans;
- checking and evaluating the results of the execution of the plans;
- (if needed) redirecting the execution with partial orders.

Decision-making and the execution of the plans cannot be separated, because during the execution of the operation the situation has to be evaluated continuously against the expected outcomes. The development of the situation may lead to a reconsideration of the decision and then the decision-making process starts again.

## **Leadership**

The commander leads both the staff officers, that execute most steps in the assessment of the situation and in the decision process, and his sub-commanders that bring the plan into operation. Although the commander is ultimately responsible for the decision-making and the execution of plans, it is important to conceptualise both parts of the operation as teamwork. Both the commander and his staff and the commander and his sub-commanders have to work together towards a common goal and are for their success dependent upon each other. In the following section, we describe military command teams.

### **3.4 TYPES OF MILITARY COMMAND TEAMS**

In the previous section, we described the concept of command and control that a commander exercises. However, commanders do not perform command and control on their own. At battalion level, or equal levels in the other services, the commander works with a command staff, which supports the commander in preparing and developing operational plans, processing operational information, and performing control over the execution of the plans. A lot of discussion and fine-tuning between commander and staff needs to take place. Furthermore, at many levels in the armed forces, commanders and sub-commanders have to go over the plans in order to create the conditions for a successful operation. Therefore, we can state that successful command and control depends on teamwork.

We distinguish two kinds of teams: First, we consider 'horizontal teams', i.e., the commander, the chief of staff, and the staff officers. We use the term horizontal, because the staff members are considered to be advisors to the commander. Although the commander is responsible for command and control, it is very important that the commander, the deputy commander, and the staff work closely together as a team towards a common goal. If the staff does not work in a common direction, command and control will fail. The search for intelligence, the way the courses of action are developed, the way personnel aspects are handled, the way logistics is organised should be coordinated. This requires that the intent of the commander is fully developed, understood, and accepted by all staff members.

Second, we consider the 'vertical team': the commander, the deputy commander, and their sub-commanders (e.g., the battalion commander, deputy battalion commander, and the company commanders). We use the term vertical, because the team is comprised of two hierarchical layers. The commander and the staff prepare their plans, which are communicated and fine-tuned with the sub-commanders.

## MILITARY COMMAND TEAMS

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The commander has to convey his intent to the sub-commanders in a comprehensive way because, eventually, the plan has to be executed in the absence of the higher commander.

The command teams we described play different roles. The horizontal command-staff team is involved in the decision-making stage. The staff is involved in several steps of this process. They acquire, process, and communicate the required information. Furthermore, they help to develop possible courses of action, think through the strengths and weaknesses of those courses of action, and develop contingency plans. Also, they help the commander make good decisions and create the plans that have to be executed. When the decision has been made and the operation plans have been worked out, the commander and his staff will communicate the plans to the sub-commanders who execute the plans in line with the commander's intent. This step is also critical in vertical commander-sub-commander teams.

In the preceding section we introduced two types of teams: horizontal commander-staff teams and vertical commander-sub-commander teams. The model and the instrument we developed are applicable to both kinds of teams. However, both kinds of teams are found at many places and at many hierarchical levels in the armed forces. The focus of this report is primarily on teams that are characterised by the following aspects:

- team members are working towards a common goal;
- tasks of the team members are interdependent, which means that the work of one team member influences the work or the products of other team members;
- the team has a complex and dynamic task and the team should make many decisions;
- the team is confronted with ambiguous information from multiple sources;
- the team has a relatively long life span, which implies that improvement of the team would be a desirable goal.

These characteristics apply to many teams in the different services of the armed forces. Although different services have different structures and different kinds of staffs, the model and the instrument that are developed are generic enough to cover the different services, organisations and agencies. In our study we focus mainly on the tactical and operational levels where the military actually direct and perform military operations. We think our model is less applicable for the political-strategic levels, where the conflicting interests may be much larger than the common goals, or for the technical levels, where the focus is more on procedural execution than on planning or decision-making. The model is also suited for military teams that include 'augmentees', people that are added to the team (e.g., liaison officers, military police officers, etc.). The model is also applicable to inter-service or international teams.

Examples of teams that may be the 'object' of the model and the instrument:

- the task force commander and his staff officers in a peace support operation or a task force commander and his sub-commanding officers;
- the battalion commander and his staff officers or a battalion commander and his company commanders;
- high level staff sections;
- the command centre of a (battle) ship;
- the detachment commander of an air force operation and his co-workers;
- joint, inter-service, coalition or multinational teams that work together in a mission.

The report is based on the assumptions that effectiveness of the teams is influenced by:

- the conditions in which the team operates;
- the composition of the team;
- the task-focused and team-focused processes;
- the way the team monitors its progress towards the (intermediate) goals and adapts its processes or improves its composition as a consequence of this monitoring process.

In the following chapters these effectiveness assumptions and concepts are further elaborated.



## Chapter 4 – REVIEW OF TEAM EFFECTIVENESS MODELS

### 4.1 INTRODUCTION

For over 50 years, behavioural scientists, engineers, human factors specialists and individuals from a host of other disciplines, have attempted to understand and measure command team effectiveness. Yet today, there exists no single, universally accepted model of team effectiveness (Henderson & Walkinshaw, 2002). Whilst no attempt is made to develop a universal model of team effectiveness, in this chapter, we provide the conceptual and theoretical background for the development of the model of military command team effectiveness – the CTEF model. We begin with a discussion of what specifically is meant by command team effectiveness, and in doing so we illustrate how this concept is prone to misunderstanding. We then provide a comprehensive review of alternative models of team effectiveness, focusing on the strengths and weaknesses of each model as they pertain to military command teams. We conclude by extracting key structural and process factors identified in the various models, and which collectively provide the point of departure for the development of the CTEF model.

#### Varieties of Effectiveness

Definitions of team effectiveness abound and have been the subject of much debate. For example, teams are often evaluated in terms of their performance or effectiveness – but with little explanation as to what is meant by either of these terms. Performance is a useful term to denote the capability of a team (for either a comparative or isolated assessment) and the processes that the team undertake. However, the notion of performance can be unrepresentative of how effective the team actually is (in terms of its contribution to the mission). To explain further, a study may reveal that a team is effective in a particular circumstance or situation. However, this does not mean that the team will always be effective under the various conditions in which it may be required to operate. Therefore, a team must be considered in terms of both performance and effectiveness. Figure 3 illustrates the difference between the two concepts – performance and effectiveness.

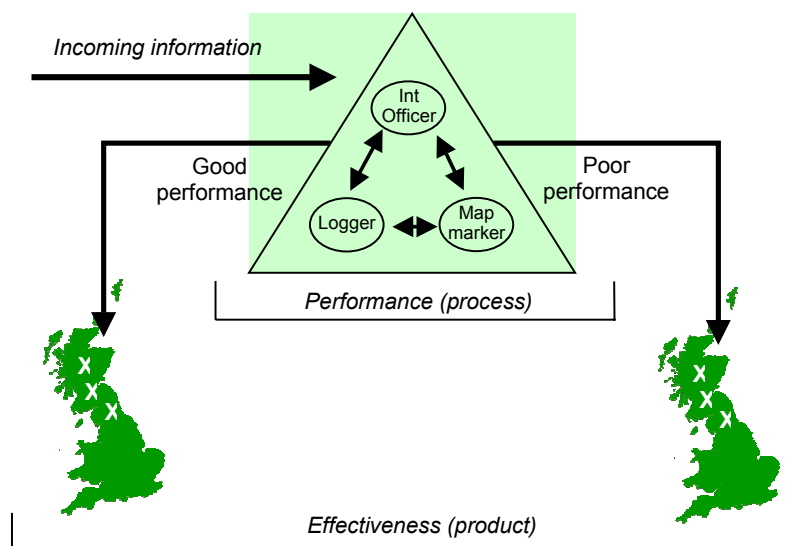


Figure 3: Performance and Effectiveness of an Intelligence Team.

## REVIEW OF TEAM EFFECTIVENESS MODELS

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Imagine two intelligence teams. Their task or goal is to accurately mark a map. Team A spends much time thinking about their incoming information, and displays good teamwork and taskwork skills. The performance of Team A would be seen as good, and, because the team achieved the goal they were given (to accurately mark the map), they would also be seen as effective.

Team B have been given the same task. However, rather than taking the map marking seriously, the team performs other tasks, and at the last minute marks the map randomly. By chance, Team B marks the map accurately. As they achieved their goal, Team B is considered to have been effective, although its performance was much poorer than that of Team A.

As the preceding discussion has shown, the concepts of performance and effectiveness are distinct and important in their own right. Hence, any model that focuses on one aspect at the exclusion of the other is likely to fail or to be incomplete.

According to Henderson and Walkinshaw (2002), the performance and effectiveness of a team is defined as follows:

- performance – the execution of an action; something accomplished; what is going on inside the team;
- measure of performance – the extent to which a team executes the actions required in order to be effective;
- effectiveness – the accomplishment of a desired result, especially as viewed after the fact;
- measure of effectiveness – the extent to which a team meets the demands which are placed upon it.

From the research of Henderson and Walkinshaw, it is evident that *effectiveness* pertains specifically to the accomplishment of the goals, milestones, and objectives as defined by the requirements of the context or the stakeholders. By contrast, *performance* pertains more closely to how well the taskwork and teamwork is carried out.

Throughout this work, our objective will be to understand and model the situational, contextual, and process factors that impact on these two aspects of effective team functioning and, to the extent possible, their many complex interrelationships. An important benefit of considering both the task processes and outcomes, as well as the team processes and outcomes, is that it permits the adoption of a simple, elegant, and generally acknowledged definition of an effective team: “A team is effective if it meets (or even exceeds) the standards for the products and processes of interested stakeholders” (Hackman, 1987).

## 4.2 REVIEW OF TEAM EFFECTIVENESS MODELS

We conducted an extensive review of all known models of team effectiveness for their applicability to military command teams. However, in this chapter we review only those believed to have most relevance and application to command team effectiveness. Throughout the review an evaluation has been made as to the various strengths and weaknesses of the models. Importantly, some of the models focus on aspects or variables that are internal to the team, whereas others focus more on external factors (e.g., contextual and situational factors) that impact on the achievement of the goals. In addition, two general approaches to modelling team effectiveness have been studied. Structural models attempt to conceptualise the relationships among factors and how they impact on effectiveness, whereas process models are typically dynamic in nature and thus attempt to capture the temporal relations among factors as well as the roles of learning and feedback. Our review is presented chronologically, beginning with a meta-theoretic model of the determinants of team effectiveness developed by Driskell et al. (1987).



### 4.2.1 Driskell, Salas and Hogan (1987)

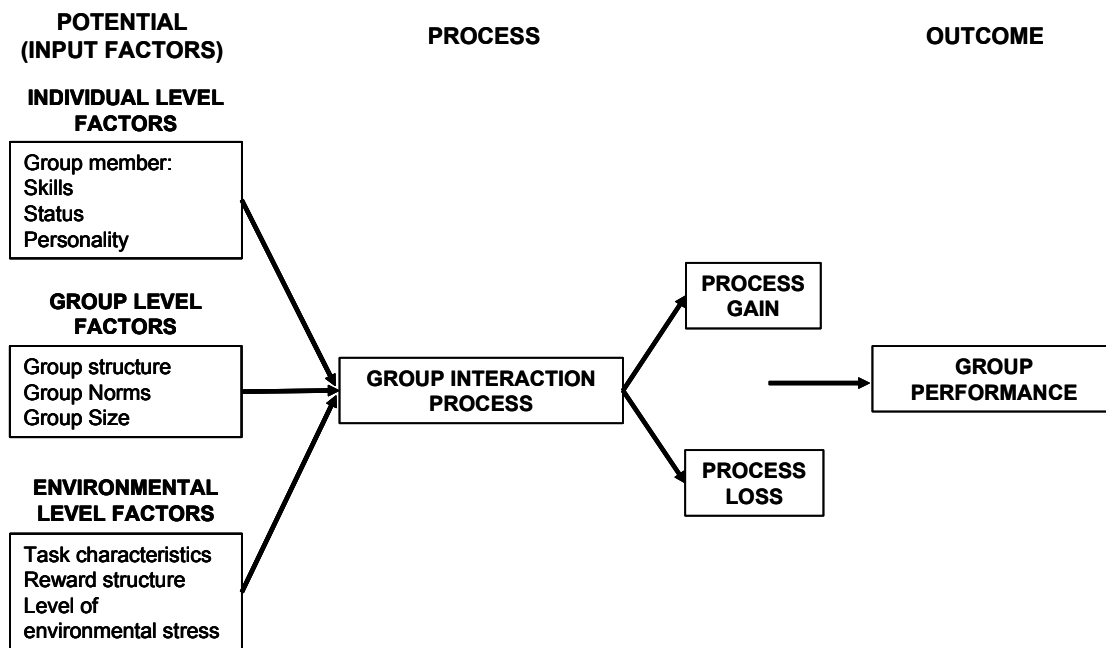


Figure 4: Model of Team Effectiveness from Driskell, Salas, and Hogan (1987).

This model is divided into three components: Input, Process and Outcome (or Output). The input factors reflect the team’s ‘potential’ for productivity. However, Driskell et al. (1987) emphasise that this potential for productivity does not equal effectiveness. Instead, the difference between potential and actual effectiveness is the function of team processes, i.e., factors that members do not bring to the group, but which emerge out of group interaction (e.g., communication structures, task performance strategies, etc.).

This model focuses on process loss and gain. One example of process loss is the reduced team performance caused by social loafing (Latane, Williams & Harkins, 1979). Driskell et al. (1987) argue that the interaction of the group input factors and group processes may lead to either process gain or process loss. Furthermore, this model suggests that some input conditions can promote process gain, referred to as ‘assembly bonus effects’ (Collins and Guetzkow, 1964). Furthermore, group interaction may produce performance beyond that expected on the basis of group input factors; as when the team capitalises on the opportunity to pool resources and correct errors, and outperforms even its cost component member (Hill, 1982).

Driskell et al. (1987) identify the salient issues to be examined when studying team performance, which our CTEF model has taken into account. These include:

- the effect of input factors;
- the interaction of input factors with team process;
- the interaction of team process variables.

The key advantage of the Driskell et al. (1987) model is that it emphasises that input factors alone do not equate to team performance/effectiveness. Instead, effectiveness is dependent on the interaction within the team. The model also recognises the influence of the context (environment) on team processes and outcomes.

4.2.2 Salas, Dickinson, Converse, and Tannenbaum (1992)

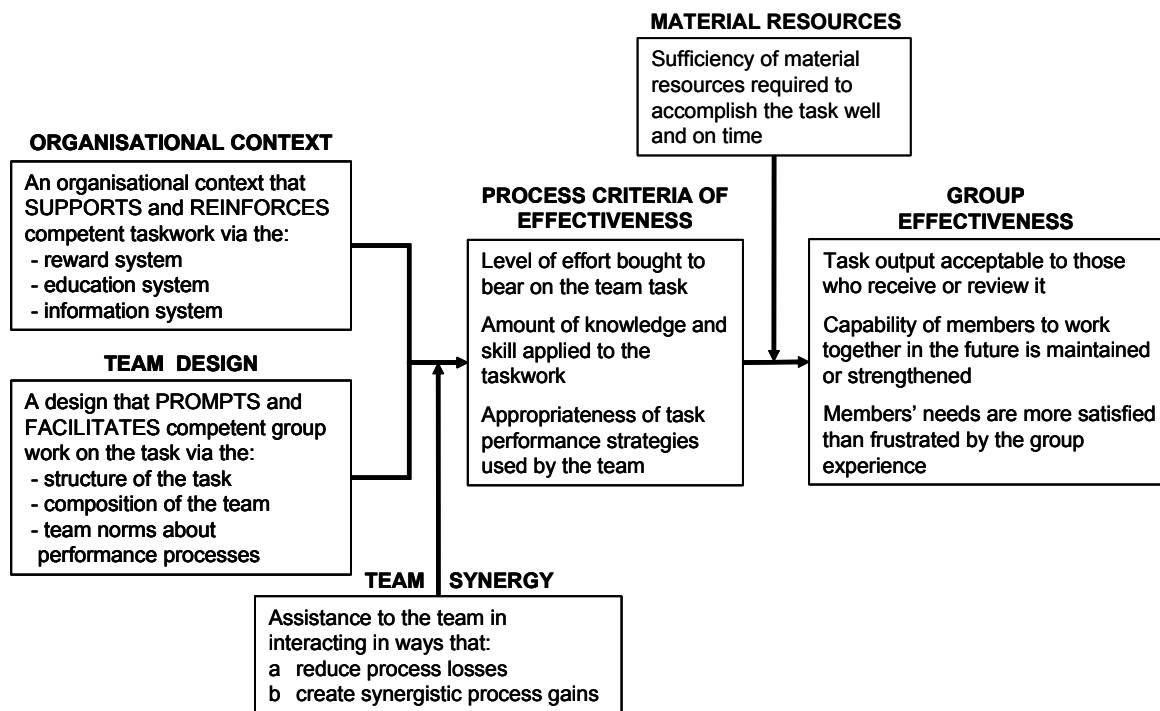


Figure 5: Model of Team Effectiveness from Salas, Dickinson, Converse, and Tannenbaum (1992).

This normative model of team effectiveness proposed by Salas, Dickinson, Converse, and Tannenbaum is based on an adaptation of Hackman's (1983) model. In that model, Hackman (1983) suggested that for a team to be successful it must have:

- A clear, engaging direction (although tasks may be clear, they must also allow room for the team to tailor the objectives to fit with members' own inclinations).
- An enabling performance situation – this requires ample effort to accomplish the task at hand, sufficient knowledge and skills, and the use of task appropriate performance strategies.
- Good team design – the task structure must be clear and motivating, the composition of the team must be correct (correct size, contain correct talents, and have members heterogeneous enough to learn from one another), core team norms should also exist that regulate team member's behaviour. This allows activities among members to be co-ordinated, behaviour to be regulated, and planning of strategies to be active (Hackman, 1986).
- Supportive organisational context – this entails a reward system (provides team recognition for excelling without giving individuals incentives to 'break apart' from the team. The organisation should also include providing the team with an educational system, so members can expand their knowledge, skills and abilities. Finally, an information system will provide the group with the data it needs to set goals.
- Expert coaching and process assistance – should be made available to direct team members how to operate interdependently with others in the team, as this is a very crucial, yet difficult skill to attain. Specific areas that should be focused on include: 1) promoting individual effort through motivation and appropriate assessment of individuals and ideas and, 2) creating and implementing ideas appropriately.

Salas et al. (1992) suggested that organisational context and group design affect the member interaction process, which in turn affects the quality of team performance. Team effectiveness is facilitated by the capability of team members to work together over time, the satisfaction of member needs, and the acceptability of task outcomes by those individuals who demand or receive them. Team effectiveness is dependent on the level of effort exerted by the team members, the amount of knowledge and skills they can apply to the task, and the appropriateness of task performance strategies. In addition, Salas et al. (1992) argue that the resources allocated to the team also influence effectiveness; appropriate tools, equipment, etc. are all factors that enhance a team's performance.

This normative model argues that the organisational context or environment surrounding a team cannot be ignored – the environment may facilitate or hinder the team processes and performance. Furthermore, this model suggests that understanding is required of the effort, knowledge, skill and performance strategies that enhance team performance. These factors will then show what motivates team members to work together, and highlight whether members have the skill and knowledge of the procedures that must be used to accomplish the team task (and therefore be a more effective team).

The obvious advantages of the normative model of team effectiveness proposed by Salas et al. (1992) include that it emphasises organisational context; highlights the importance of material resources; and distinguishes between team outcomes and task outcomes in terms of group effectiveness. A potential disadvantage of this model is that it does not sufficiently emphasise the role of leadership in team effectiveness; it also does not address the impact of team member characteristics.

### 4.2.3 Tannenbaum, Beard, and Salas (1992)

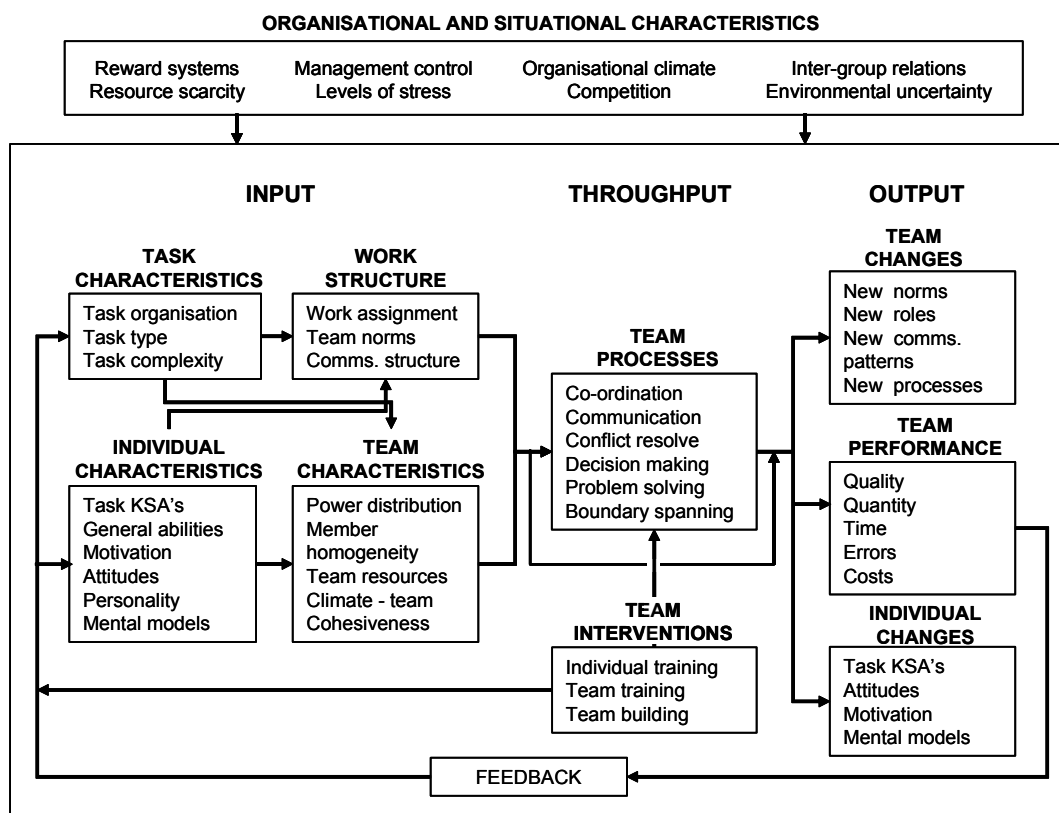


Figure 6: Model of Team Effectiveness from Tannenbaum, Beard, and Salas (1992).

## REVIEW OF TEAM EFFECTIVENESS MODELS

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This model, based on team research and theory, is a variant of the Tannenbaum, Dickinson, Salas and Converse (1990) model, and has been modified to include variables relevant to team building. The variables presented are representative of the broader characteristics, and as Tannenbaum et al. (1992) emphasise, do not provide an exhaustive list. This model adopts the Input, Throughput and Output structure, whilst acknowledging the importance of the situational context throughout the process, and incorporating feedback loops.

Tannenbaum et al. (1992) suggest that all variables occurring within the team effectiveness model should be considered in context. For example, an organisation's reward structure may influence team's behaviour. The reward may be individual or team based, and therefore, may incite competition or co-operation, which may influence team effectiveness (Hackman, 1983; Steiner, 1972).

Tannenbaum et al. (1992) identify four high-level input variables (Task, Individual and Team Characteristics, and Work Structure) that influence the output of the team – either directly, or via the team processes. Within task characteristics, complexity is related to task performance, and can account for variance (i.e., change) in team performance (Goodman, 1986; McGrath, 1984). Likewise within the teams work structure, differences in the way work is assigned to the team; formal communication structure of the group (e.g., who is allowed to speak with whom) (Naylor and Dickinson, 1969); and team norms, can influence the team processes and subsequent performance (Hackman, 1987).

Tannenbaum et al. (1992) identify individual characteristics as a cluster of input variables that have a significant bearing on the team processes. Teams with better individual task proficiency, abilities and skills will perform better (Gladstein, 1984; Tannenbaum et al., 1992; Tannenbaum et al., 1990). Personality variables (sociability, adjustment and likeability) were also identified as potentially being related to team performance (Driskell, Hogan and Salas, 1987). Finally, Tannenbaum et al. (1992) highlight the importance of how team members' mental models of both their team tasks and operations could determine individual behaviour and, therefore subsequent team effectiveness (Cannon-Bowers, Salas and Converse, 1990). The last cluster of input variables are the team characteristics which Tannenbaum et al. describe as the make-up of the team including its power distribution, team resources, homogeneity, cohesiveness and team climate. This model indicates that these team characteristics have a direct influence on the team processes, which take place in order to achieve team effectiveness.

The second phase of the team effectiveness model proposed by Tannenbaum et al. (1992) is the throughput phase, which incorporates the team processes and the team interventions. Team processes have been defined as 'the intragroup and intergroup actions that transform resources into a product' (Gladstein 1984). Tannenbaum et al. (1992) state that team processes refer to team members' interaction, conflict resolve, decision-making, problem solving and action co-ordination. All influence team performance.

Team interventions encompass individual and team training, and team building interventions. Team training can influence performance by either enhancing the team process skills, or enhancing team characteristics (interpersonal skills, team climate). For example, access to training has been shown to differentiate higher performing teams from other teams (Sundstrom et al. 1990). Training team skills (communication, co-ordination) result in improved team performance (Lassiter, Vaughn, Smaltz, Morgan and Salas, 1990). Tannenbaum et al. also identified team building as a team intervention. Team building can improve goal setting; enhance team characteristics and interpersonal relationships, thus improving the team processes.

The final phase proposed by Tannenbaum et al. (1992) is the outputs. Tannenbaum et al. identify three clusters of outputs – team changes (e.g., new roles, change in cohesion); team performance (quantity and quality of products and services, as well as time, errors, cost and overall productivity); and individual changes (e.g., enhanced skills, change in attitudes and motivation). The team and individual changes can influence the team's performance. In turn the team's performance can serve as feedback on individual

characteristics, work structure, or other team inputs and processes. In addition, Tannenbaum et al. suggest that ongoing evaluation (feedback) of team performance may affect team processes, and therefore team performance.

The key advantages of the model proposed by Tannenbaum et al. include the emphasis on the context of the team and the dynamic aspects of team functioning. This model is also very comprehensive in that it distinguishes between teamwork and taskwork on both an individual level and a team level.

#### 4.2.4 Cannon-Bowers, Tannenbaum, Salas, and Volpe (1995)

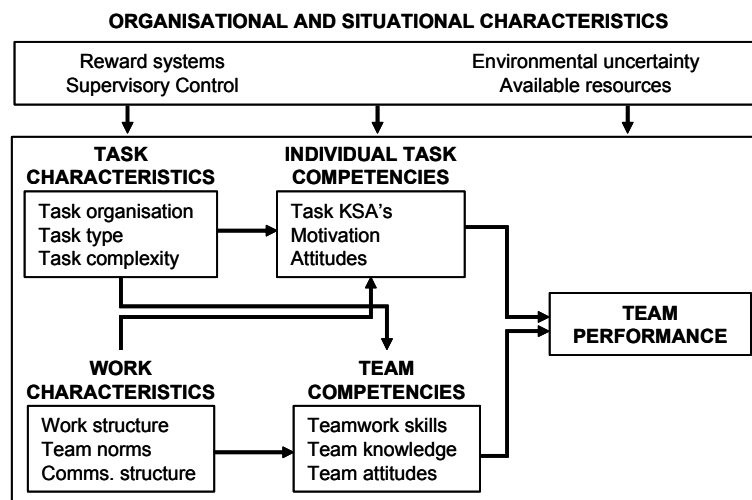
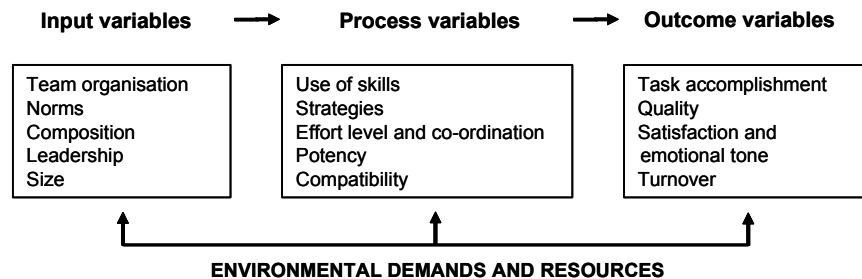


Figure 7: Model of Team Effectiveness from Cannon-Bowers, Tannenbaum, Salas, and Volpe (1995).

This model indicates that a number of factors influence team performance. Cannon-Bowers et al. (1995) suggest that organisational and situational characteristics have an impact on several aspects of the functioning of teams and team performance (therefore, the need to consider the context is crucial). Task and work characteristics determine which individual task and team competencies are required for successful team performance. It is proposed that possession of these competencies is a prerequisite of effective team performance. Having the appropriate competencies to fit the environment, task and work situation will determine team effectiveness.

The key advantage of this model is that it emphasises the importance of context and the role of team competencies in team training and performance. However, the model does not go beyond team performance.

**4.2.5 Klimoski and Jones (1995)**



**Figure 8: Model of Team Effectiveness Proposed by Klimoski and Jones (1995).**

The model of team effectiveness proposed by Klimoski and Jones (1995) also adopts the Input, Process and Outcome approach. The input variables identified by Klimoski and Jones (1995) are outlined as follows:

- Organisation – the division of labour and authority among team members.
- Norms – the informal rules that regulate team members. These norms not only reflect the values of the team members, but also the work history of the team.
- Composition – the mixture of Knowledge, Skills and Attitudes (KSAs) plus other team characteristics. Klimoski and Jones (1995) thought any individual difference variables would influence team performance (e.g., Gender, race, age) (Morgan and Lassiter, 1992).
- Leadership – the deliberate attempt to influence team outcomes through direct or indirect interpersonal means. Klimoski and Jones (1995) suggested that both formal and emerging leadership roles have leadership consequences on the team performance.
- Size – it is not the case that the size of the team is determined only by the task. In addition, available resources, leader’s personal beliefs, and whether the task is being conducted for the first time can govern the size of the team (i.e., if a task is being conducted for the first time, or a team is being formed for the first time, it is unlikely that the optimal team size will be known).

Klimoski and Jones (1995) identified the following process variables:

- use of skills;
- strategies;
- effort level and co-ordination;
- potency;
- compatibility.

Klimoski and Jones (1995) emphasise that team effectiveness does not emerge from individual effort. If each team member exceeds his or her personal best, then this would not necessarily equate to team success, especially where no group strategy exists. Instead, the interpersonal dynamics of the team, the level of hostility or distrust in the team, and levels of compatibility between team members, are all factors that can shape the effectiveness of a team. For example, high compatibility carries the potential of easy communication and smooth interaction (thus influencing team performance) (Bass 1982). Where high levels of hostility exist, it is unlikely there will be high levels of concerted effort or effective sharing of information (at least not without process costs), again, influencing team performance and effectiveness.

Potency refers to the members' perceptions of the team's adequacy. These perceptions of the types and levels of expertise of the team have an influence on their performance expectations, and ultimately on the team's outcomes (Guzzo, 1986 and Guzzo, Yost, Campbell and Shea, 1993).

Klimoski and Jones (1995) identified the following output variables:

- task accomplishment;
- quality of outcomes;
- satisfaction and emotional tone;
- turnover.

Klimoski and Jones (1995) deliberately separated task accomplishment and quality of outcomes, because 'going through the motions' does not necessarily equate to quality. The teams' emotional tone (e.g., supportive, pleasant atmosphere, etc.) can be both an outcome and a process variable, as it can influence the quality outcome of the team. The turnover of a team can also be predisposed by team members' level of satisfaction and emotional tone (O'Reilly, Caldwell and Barnett, 1989). In addition, team composition can influence both the social integration of the team, and their decision to remain within the team, therefore influencing turnover, and subsequently team performance and effectiveness.

The key advantages of the model of team effectiveness proposed by Klimoski and Jones (1995) include the fact that it emphasises environmental demands placed on a team, and separates the outputs as task-based and team/social-based. The significant drawbacks to this model of team effectiveness are that no distinction is made between the individual and the team. Finally, the model suggests a clear linear process, without any feedback loops. Therefore, the distinction between the input, process and output factors is clear-cut. However, this hides some of the nuances that many of the variables may contain. For example turnover can be an outcome, but can also influence processes.

#### 4.2.6 Shanahan (2001)

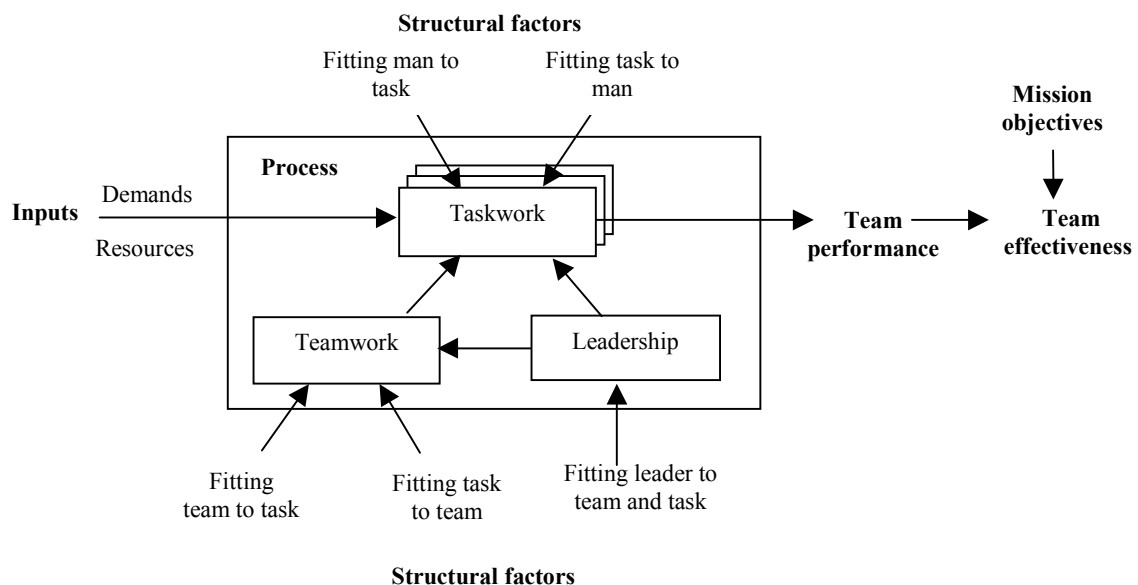


Figure 9: Level Model of Team Effectiveness from Shanahan (2001).

## REVIEW OF TEAM EFFECTIVENESS MODELS

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The model developed by Shanahan (2001) has four main elements: process, inputs, outputs and structure. At the heart is the process, including some range of activities which involve potential interactions between humans and machines. This process receives, as inputs, a dynamic set of demands and a set of resources (information, ammunition, platforms, etc.), which it can use in dealing with these demands. The process then produces a set of outputs, which collectively determine team performance and team effectiveness as mediated by mission objectives.

The process itself is divided into three parts: taskwork, teamwork and leadership. It is the primary function of taskwork to turn inputs into outputs (team performance). Each member of the team has his or her particular taskwork responsibilities. How well the taskwork is carried out is influenced by teamwork, (especially how well the team members co-ordinate their activities and provide each other with mutual support), and by how well the team is led. Leadership therefore, is considered here as a function that must be performed. This function may be uniquely identified with the formal team leader, although in higher performing teams it is more likely to be taken up by the team members who consider themselves to be best placed to exercise this function at the current time.

The overall process is further influenced by a variety of structural factors. These are largely 'givens' and may be physical resources (e.g., technical equipment, workspaces, buildings) or the results of prior organisational processes (e.g., selection, training, career planning). These factors can be usefully considered under the traditional taskwork-oriented headings of 'fitting the man to the job' and 'fitting the job to the man,' suitably extended to cover the teamwork and leadership dimensions. Lastly, in this framework team effectiveness is measured through a comparison of team performance with the mission objectives set for the team.



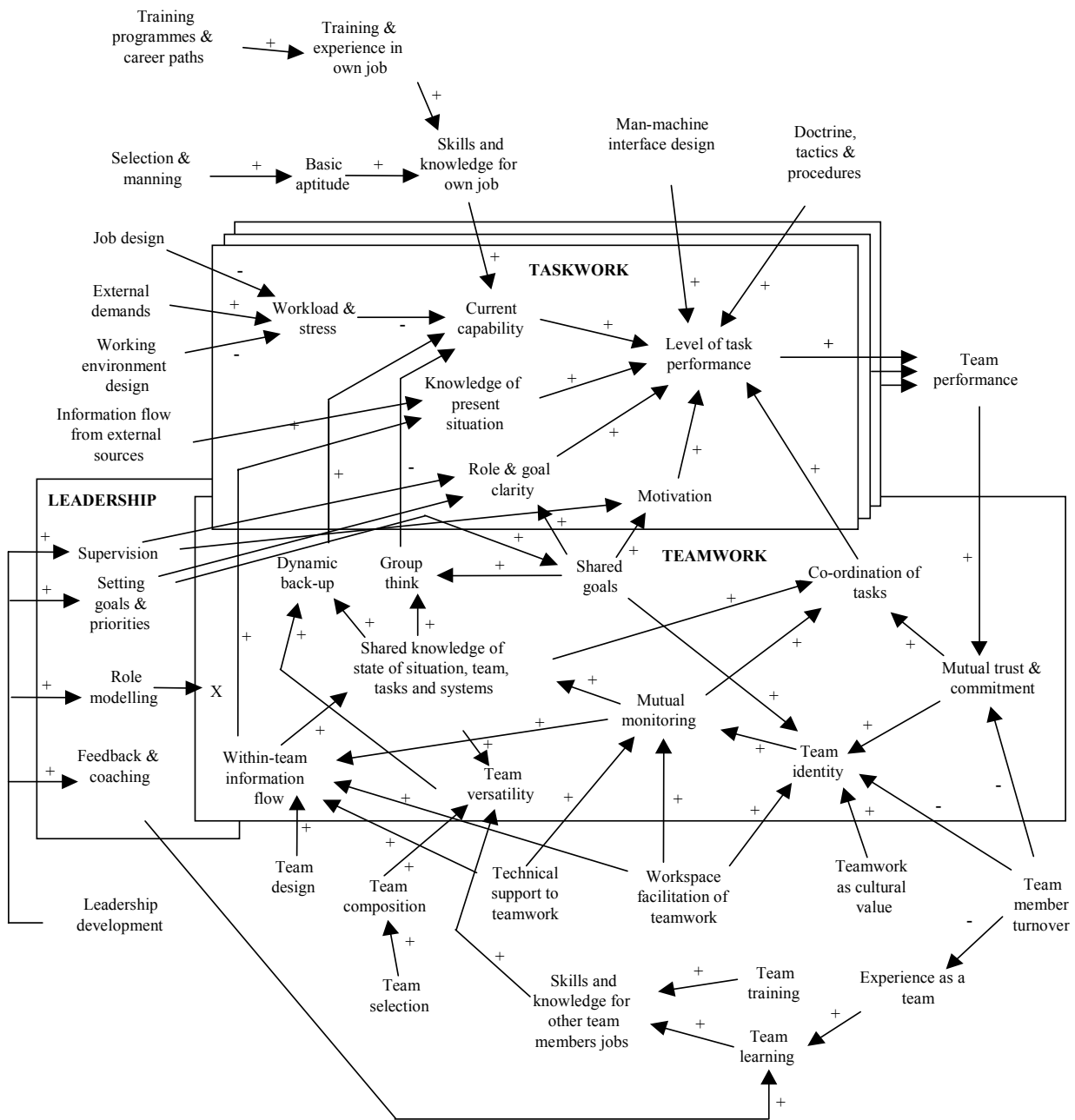


Figure 10: Detailed Model of Team Effectiveness from Shanahan (2001).

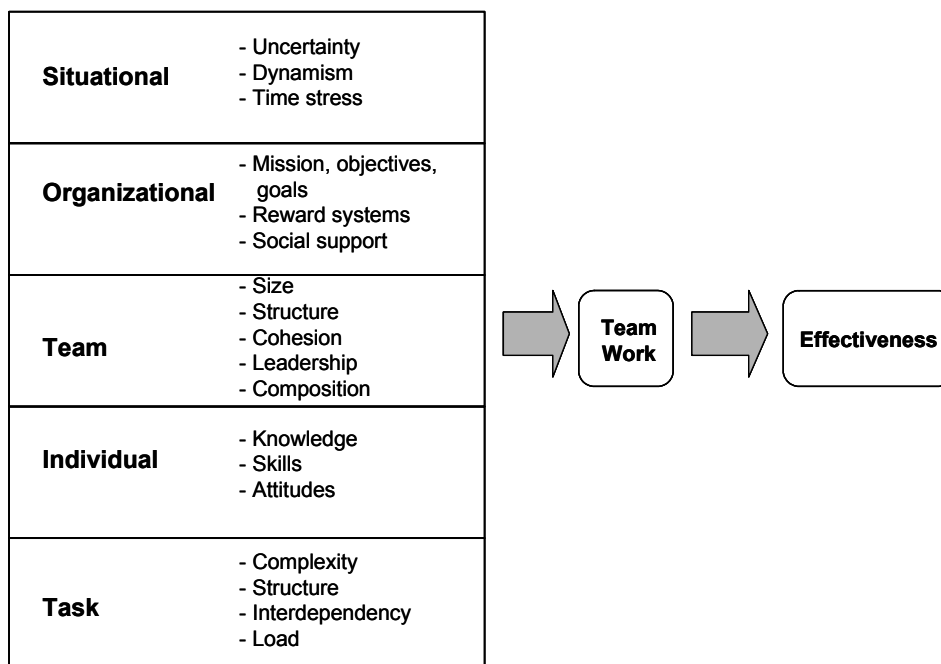
As is evident in the figure, this model proposed by Shanahan, emphasises the complexities associated with understanding the components of team effectiveness. In particular, this model focuses on the process of teamwork, taskwork and leadership, and demonstrates the relationships between the attributes occurring within this process.

#### 4.2.7 Rasker, van Vliet, van den Broek, and Essens (2001)

Rasker, van Vliet, van den Broek, and Essens (2001) provided a comprehensive review of the team effectiveness literature and proposed a theoretical framework, henceforth referred to as the TNO model (see Figure 11). According to this view, team effectiveness is principally determined by the organisational,

## REVIEW OF TEAM EFFECTIVENESS MODELS

situational, team, individual, and task factors that comprise the operational context for the team. All of these factors, taken together, are mediated by teamwork, which ultimately determines team effectiveness.



**Figure 11: Team Process Model from Rasker, van Vliet, van den Broek, and Essens (2001).**

On this model, team effectiveness is comprised of those observable, predefined objectives such as accuracy, timeliness, and the extent to which those goals were satisfied. Often, goals may be conflicting and thus are based on subjective criteria or the criteria of stakeholders outside of the team. In addition to these ‘product’ or task-related measures of effectiveness, the TNO-model considers that ‘process’ or team-related criteria are also important indices of effectiveness (e.g., motivation, satisfaction). These factors are thought to play a more critical role when the team must operate together for long periods of time or on diverse problems.

As mentioned, the operational context of the team is defined by five factors, each with a set of specific variables that collectively define the concept. Situational factors, for example, are factors imposed on the team from the outside world (e.g., uncertainty of the task, dynamism of the operational setting, and time stress). Organisational factors are also variables outside of the team itself, providing both direction and constraints on the functional abilities of the team (e.g., mission objectives, goals, reward systems, support, rules of engagement – ROEs). Task factors (e.g., complexity, structure, interdependency, load) are those factors that comprise what the team must do to achieve their goals. The final two factors make up the human elements of the model both at the team (e.g., size, structure, cohesion, leadership, composition) and individual level (i.e., knowledge, skills, and attitudes).

In their review, Rasker et al. (2001) provide empirical support for the role that the principle contextual factors play in affecting some aspects of team effectiveness. However, a critical component of the model – the factor that mediates all other factors – is teamwork. According to their view, teamwork is comprised of two kinds of behavioural activities: task-related activities and team-related activities. Task activities include all of those individual behaviours directly related to the job at hand. Team activities, on the other hand, include all of those behaviours (e.g., communication, coordination, backing up) that “serve to strengthen the quality and functional cooperation of the team members”.

#### 4.2.8 Blendell, Henderson, Molloy, and Pascual (2001)

The Blendell et al. model (2001) was the result of a ‘Workshop on Team Modelling’ conducted at TNO Human Factors, the Netherlands. The overall aim of the workshop was to communicate and develop modelling concepts for understanding and predicting effects of team organisation and interaction.

As shown in Figure 12, factors relating to the team have been split into three areas: input, process and outputs. The model indicates that the input factors (e.g., leadership style, experience, team composition, etc.) impact on, or influence the process factors occurring within the team, which will, in turn, impact on the activities conducted by the team i.e., the output factors (e.g., team satisfaction, error rates, etc.).

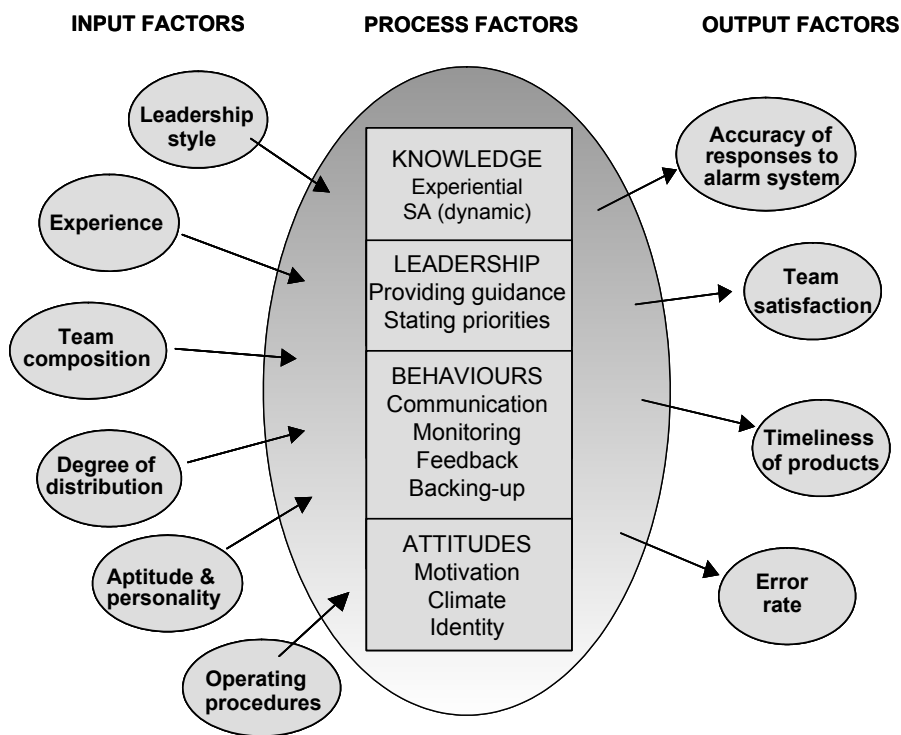


Figure 12: Team Process Model from Blendell, Henderson, Molloy, and Pascual (2001, after McGrath, 1984).

This model places most emphasis on the process factors that occur within the team (i.e., Knowledge, Leadership, Behaviours and Attitudes). However, the identified input factors and output factors have no real structure (e.g., individual characteristics, environment, etc.), and are examples as opposed to an exhaustive list.

### 4.3 CONCLUSIONS

This review indicated that within the models there were several critical factors (in the ‘input’, ‘process’ and ‘output’ components) that could be exploited for the CTEF model. However, some of these models do not explicitly capture military factors typical of a command team, e.g., mission framework. As such, it was felt that the models reviewed would require some adjustment in order to be a useful framework for command team effectiveness.

The review revealed that some of the models did not contain adequate feedback loops, or a sufficient representation of the dynamic and adaptive characteristics of a command team. Continuous assessment

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and adjustment within a team is critical to its effectiveness, both throughout the process and after the fact (i.e., at an After Action Review).

The majority of the models reviewed, and all of those outlined in this chapter, adopted a three-stage 'input' – 'process' – 'output' architecture. However, the term 'Input' can imply that this is a static condition. In fact, those components represented on the input side continually change, therefore the CTEF model prefers the term 'condition' to emphasise dynamism at this stage of the model (a key component of a military command team). However, the notion of a three-stage model is a useful framework for the CTEF model to demonstrate how all of the components operate throughout the overall process.

The review highlighted a number of important situational factors as well as individual and team KSAs (Knowledge, Skills and Attitudes) that impact on team effectiveness. Leadership was also shown to be a critical factor, as were aspects of the organisation. On the process side, it was clear that certain functions were specific to the team whereas others focused on the task. Likewise, on the output side, there were clearly important variables related to the team and the task.

In conclusion, the Tannenbaum et al. (1992) model appears best suited to understand military command teams. Critical elements include the specific components of the model, its three-stage structure, and the use of feedback loops. The CTEF model proposed by the NATO Task Group 23 builds upon this model, but identifies different factors to have priority in terms of influencing team effectiveness. It also places more importance on specific military concepts, such as the mission framework and the role of the after action review (AAR).

## Chapter 5 – DESCRIPTION OF THE CTEF MODEL

### 5.1 INTRODUCTION

Chapter 2 set the general scope of the CTEF model and the CTEF instrument. Chapter 3 focused on military command teams. Chapter 4 reviewed the literature on team effectiveness models. As discussed in Chapter 4, numerous factors contribute to some extent to team effectiveness. The challenge is to select those factors that contribute most to military command team effectiveness. In our CTEF model, we selected factors from the reviewed models, from our experience with military command and team effectiveness, and from military commanders themselves. Ultimately, we chose variables which:

- best fit the command teams' environment;
- have demonstrated a significant contribution to team effectiveness;
- have minimal overlap with each other;
- can be operationalised and, hence, measured.

Each of the major building blocks of the model (Conditions, Processes, Outcomes) includes a number of *components* (e.g., mission framework as part of Conditions), which are characterised by a number of *aspects* (e.g., situational uncertainty as part of mission framework), which are in turn concretised by a number of *features* (e.g., uncertainty about required resources). Each of these features – if not immediately self-evident – is instantiated by a number of examples (e.g., gas, personnel, etc.). This 'taxonomy' applies to the entire model, which is described in this chapter.

### 5.2 CONDITIONS

#### Demands vs. Capabilities

Conditions specify a set of components that address the context and the people. Context versus people can be interpreted as 'demands versus capabilities.' Conditions represent a cluster of factors that determine how effective the team can be under the given circumstances. If the demands largely exceed the capabilities of the team members, then the chances are high that the team will be unable to reach its goal; if demands and capabilities are more or less in balance, then the team will be more likely to reach its goals. Finally, if the capabilities clearly exceed the demands, then it may be relatively easy for the team to accomplish its mission. The 'Context' is denoted by the mission framework, the (assigned) task, and the organisation to which the team belongs; the 'People' are denoted by the leader of the team, the individual team members, and aspects of the team as a whole.

#### 5.2.1 Mission Framework

The Mission Framework component attempts to capture some of the critical aspects that collectively provide a global description of the operational environment in which the team is performing. Indeed, numerous factors can potentially comprise this component. However, extensive discussions with high level military commanders from several nations converged on four aspects that seemed most relevant for command team effectiveness in contemporary operations: situational uncertainty, stress potential, constraints, and stakes.

## DESCRIPTION OF THE CTEF MODEL

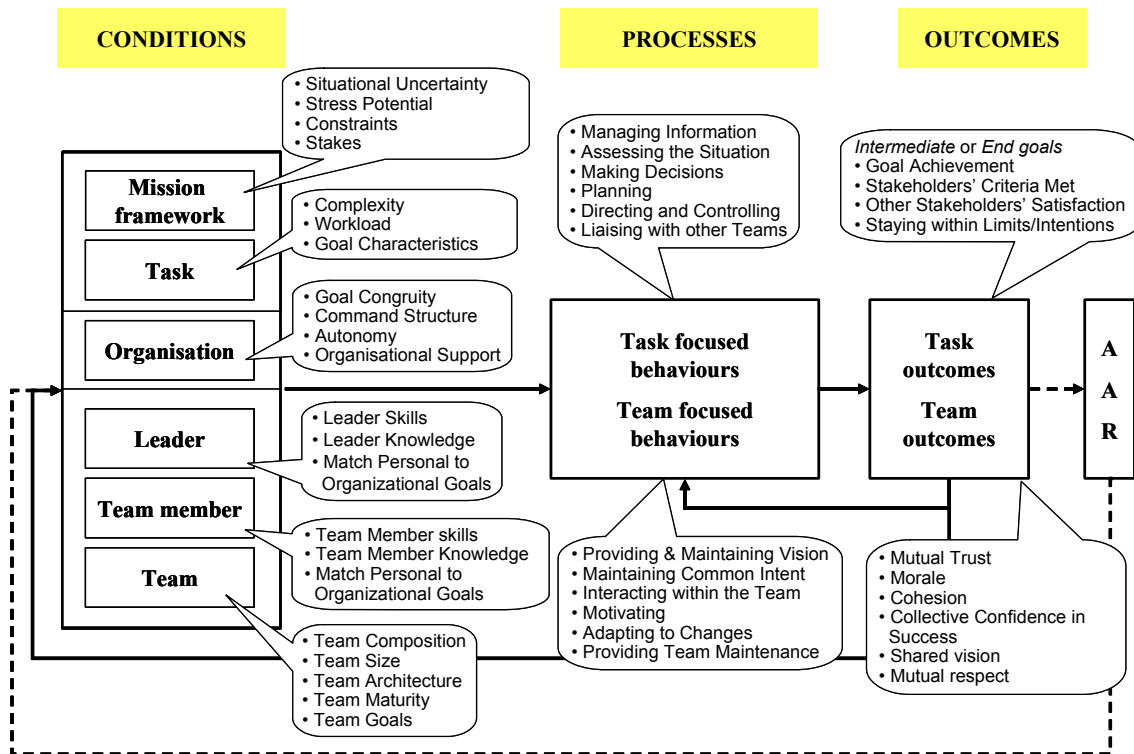


Figure 13: The CTEF Model, Showing all Aspects Addressed for Each Component.

### 5.2.1.1 Situational Uncertainty

Situational Uncertainty refers to the lack of information or understanding of objects and their properties in an operational environment. It is a principle impediment to effective command team planning and decision-making. Situational uncertainty can be further broken down into four basic features:

- Uncertainty about Intelligence refers to the (lack of) validity about incoming/available information.
- Uncertainty about Adversary's Intent. For example, the less that is known about the adversary's intent the more the team has to disperse its efforts to offset alternative actions.
- Uncertainty about Logistics or Required Resources. It may not be clear, for example, what kind and how many personnel are required for the assigned mission, how much food or gas is required, which types of communications will be used, or which means of transportation are needed.
- Uncertainty about Utilisation of Resources. This refers to uncertainty about whether or not the available resources can be effectively utilised. For example, obstruction of roads has an adverse impact on transportation of resources to a desired destination (in terms of timeliness, distance to cover, etc.).

### 5.2.1.2 Stress Potential

Military operations, by their very nature, have high stress potential. For the purposes of the current model, however, we focus on three main forms of stress potential due to their operational relevance and thus potential for affecting command team effectiveness:

- Danger refers more specifically to risks for physical harm such as enemy threat, mines, force protection issues, and overall risk.

- Operational Intensity is related to factors such as time pressure, sleep deprivation, information overload.
- Psychological Stressors such as the perceived impact of the mission, interpersonal/personal problems.

### **5.2.1.3 Constraints**

Constraints are external factors that directly or indirectly limit the range of the command team's actions or the degrees of freedom of action. Although each component on the People/Context side of the model possesses aspects that can constrain the team in one way or another, we focus here on those related to the broader mission framework within which the team is functioning. The following five constraints were identified as being particularly relevant in contemporary operations:

- Environmental Factors encompass issues such as weather and terrain, locally prevalent diseases, and availability of water at all stages of the operation.
- Political Factors that can limit the team include local and military legal issues, obtaining approval for actions, oversight from numerous and potentially conflicting stakeholders, and adherence to national criteria, such as ethical codes of conduct.
- Cultural Factors which may impede effectiveness include local religion and language, and working with multinational and multicultural coalition forces.
- Media Related Factors to take into account are considering local and international perception of the mission and interpretation of actions in fulfilment of the mission.
- Time-Space-Coordination refers to the management of potential actions within specific time and space boundaries. Needless to say that time-space-coordination might be critical in the context of force projection or deployment in the field.

### **5.2.1.4 Stakes**

An obvious and critical aspect that distinguishes military command teams from more conventional teams (e.g., sports teams, project teams) is the broader implications of their success or failure. These stakes form the basis of the mission and as such are intertwined with the desired end state or end goals. The constraints, uncertainties, and stresses encountered in a mission primarily stem from these initial stakes and thus the concept of stakes must be viewed as critical to the broader mission framework. For our present purposes, by stakes we refer here to the immediate, intermediate and/or long-term consequences of the mission outcome. This involves:

- Casualties; i.e., within own forces, either by enemy fire or by friendly fire, or in terms of the harming or killing of innocent civilians. The latter may be unacceptable to some stakeholders.
- National (Domestic) Impact; i.e., referring to the broader costs of success or failure in terms of political or economic impact, or in terms of public perception.
- International Impact; i.e., referring also to the broader costs but now at an international level in terms of political or economic impact, or in terms of public perception.

## **5.2.2 Task**

The Task component is important in the model of command team effectiveness because it describes the core characteristics of the work to be done. We are interested only in those aspects that have implications for the processes and the outcomes of the work. The aspects that we include in the model are task complexity, workload, goal clarity, and goal stability.

### 5.2.2.1 Task Complexity

Task complexity is a multi-featured concept that includes, for example, having to deal with rapidly evolving situations, cognitive complexity, interacting parts that have to be combined, and uncertain data (see e.g., Woods, 1988). In addition, for a team, a task can be complex if the work contains multiple and concurrent tasks, uncertainty, changing plans, compressed work procedures, and high workload (e.g., Xiao et al., 1996). A number of the above-mentioned features of complexity – such as uncertainty, changing plans, and workload – are covered by other aspects of the Task component or other components in the Conditions part in the model. Here, we focus on the following features:

- Task Difficulty refers to the cognitive or physical demands of the task. Does it require a high degree of skill of a person to execute the task, or can less-skilled people also perform the task effectively? In the case of the command team, this feature refers to each of the subtasks that the team members have to perform on behalf of the team.
- Number of Subtasks refers to the number of different subtasks that the team members have to perform, including whether they have to be performed sequentially or in parallel. It is obvious that if there are many subtasks that have to be combined, the task of the team is more complex than when there is only one task or a well-balanced series of tasks in which team members are involved.
- Subtask Interdependency refers to the degree to which subtasks are related to another. The interdependence can take several forms. For example, tasks may be sequentially interdependent; i.e., a given subtask cannot start before the former is finished. The latter can occur in information processing where the inputs of two subtasks have to be merged before a third activity can start. Needless to say that high interdependence requires good co-ordination processes.
- Subtask Interference refers to the potential influence that the execution of one subtask may have on the successful execution of another subtask. For example, when two team members have to use the same resource(s) to perform their own subtask.

### 5.2.2.2 Workload

Workload is related to the external demands arising from the present situation (Shanahan, 2001). It is an important characteristic to consider in a command team environment, since the workload in a command team can be very high. A number of features have to be considered regarding workload, including several related to the well-known NASA-TLX (e.g., Hart & Staveland, 1988):

- Physical Workload: The task may require team members to work long hours and get little sleep. This can result in fatigue levels that negatively impact the assessment of the situation, cause inattention to important cues, and thus poor decision-making.
- Cognitive Workload: The task may become too complex for the team members, such as when the information flow is too high or many mental transformations need to be performed. When the team members are not up to their task, they can make mistakes.
- Emotional Workload: The team may have to make decisions that have high emotional impact, e.g., moral dilemmas or conflicts within the team. Emotional workload may impair the ‘objectivity’ of the information gathering. Conversely, the incoming information may have a high emotional impact; e.g., the announcement of casualties on their side.
- Time Pressure: The team may have to perform too many tasks in too little time. This temporal workload may influence, for example, the thoroughness of assessments, decisions, and plans.



### **5.2.2.3 Lack of Goal Clarity**

Goal clarity for a command team can be defined as the degree to which the team members know and understand the objectives and priorities. This concept is thus related to the concept of ‘commander’s intent’. Goal clarity is crucial for sense-making or sense-giving to the tasks implied in the mission. There is a large body of literature on the impact of goal clarity on performance and hence on effectiveness (e.g., goal setting theory, Locke & Latham, 1990).

### **5.2.2.4 Lack of Goal Stability**

Goal stability is defined as the degree to which the goals to be reached remain the same over time. When goals are stable, the team can manage its activities in a predictive way. On the contrary, suddenly changing goals or gradually shifting goals, need particular attention from the team members to reorient themselves and adapt to the new situation.

## **5.2.3 Organisation**

The Organisation, as a broader framework within which the team operates, can have a positive or a negative influence on the performance of the team and hence its effectiveness. Thus, some aspects of the organisation can be seen as ‘enablers’ that support the team in its efforts in reaching the goals, whereas some aspects should be viewed as ‘constraints’, which limit the team in attaining its objectives.

Most of the models discussed in Chapter 4 refer to one or more aspects of the organisation as a context variable that have a direct or an indirect impact on team effectiveness. In our model the component Organisation encompasses four aspects: congruity of the team’s mission and the organisational goal, clarity of the command structure, autonomy of the team, and organisational support.

### **5.2.3.1 Congruity of the Team’s Mission and the Organisational Goal**

This concept refers to the degree to which the team’s goals fit with the organisation’s goals. The team goals may be at variance with the organisational goals when the team chooses so deliberately, but also when the goals are unclear or ambiguous. Such a situation may occur for example in peace support operations where military and humanitarian objectives have to be pursued simultaneously.

### **5.2.3.2 Clarity of Command Structure**

In line with the former component, it may be unclear who is authorised to give orders to the team. For example, in a matrix structure – as opposed to the classic staff-and-line structure – command teams are confronted with different responsibilities in the horizontal chain of command and in the vertical one, have different authorities to report to, may face problems with prioritising with regard one or the other chain of command, etc. This component refers to the simplicity of command lines.

### **5.2.3.3 Autonomy**

This component refers to the degree to which the team is given the freedom to make decisions about its conditions, its processes, and the way to reach its goals. It is obvious that, in operational settings where troops are widely dispersed over the area of responsibility and where the situation can evolve quickly, autonomy is or may be a crucial variable for team effectiveness (Mylle et al. 2001; 2002).

### **5.2.3.4 Organisational Support**

The organisation enables the team to perform its tasks by implementing a number of aspects.

- Recognition for what a person or a team has done is the psychological core concept of the reward structure and may energise the team.

## DESCRIPTION OF THE CTEF MODEL

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- Supportive Climate refers to the open mindedness of the organisation and the degree to which mistakes are considered learning opportunities. In an atmosphere in which mistakes are not allowed, persons and teams will not be willing to take risks. Confidence and (mutual) trust come into play here.
- Material support implies that teams receive the means that are necessary and sufficient to fulfil the assigned mission in an efficient and effective way, not only before (initial resources) but also during the mission (e.g., through reallocating resources). Even the material support of the family back home has a marked influence on performance of the individual and thus indirectly on the team.

### 5.2.4 Leader

Despite recent exploration of ‘leaderless teams’ (e.g., Kickul & Neuman, 2000), there is a longstanding body of research that demonstrates the positive impact an effective leader can have on team performance (e.g., Hogan, Curphy, & Hogan, 1994; Judge, Piccolo, & Ilies, 2004; Kureca, Austin, Johnson, & Mendoza, 1982). The leader shapes team members’ understanding of the task (Weick, 1993; McCann & Pigeau, 2000), directs and influences member task behaviour, and mediates resource and information flow with the larger organisation. The leader’s influence may be realised through direct influence on the team product and/or indirect influence on the product through facilitation of best-possible performance of team members, individually and collectively.

There are many types of leaders, and many models of leadership have been proposed (e.g., see Northouse, 2004). Within task-oriented teams it is possible to distinguish among assigned leaders and emergent leaders (those who have informal influence within the team due to their task knowledge and/or their personal skills). It is possible to distinguish between leaders who are primarily focused on directing the task performance of team members and those who are primarily focused on facilitating the social interactions among team members. In addressing the leaders of command teams, we have chosen to address the assigned leader, the person who is designated by legitimate authority as having immediate responsibility for the performance and outcome of individual team members and of the team as a whole. We assume that this assigned leader (who may be a Commander of a unit, a staff section head, etc.) will need to fulfil the interpersonal aspects of the leader’s role as well as the task-oriented elements of the leader’s role.

We focus on the capabilities of the leader, not on questions of his or her style or approach to fulfilling the role; following Hersey and Blanchard (1982, 1993), Bass, Avolio, Jung, and Berson (2003) etc., we see style of leadership as a matter of choice, and the interpersonal abilities involved in effective leadership can be seen as the mechanism for making style choices. The aspects of the leader considered in this framework, then, are leader skills and knowledge and the match between the leader’s personal goals and the organisational goals.

#### 5.2.4.1 Leader Skills

With respect to the leader’s skills, we are concerned both with the leader’s abilities as they relate to the military task at hand and with the leader’s abilities as leader of the team. The skills are:

- Tactical Skills are those skills needed for solving tactical problems, that is, problems concerning employment of units in operations.
- Technical Skills are job-related abilities. They include basic soldier skills. The leader must possess the expertise necessary to accomplish all tasks and functions assigned.
- Interpersonal Skills for a leader involve those developed abilities to deal fairly with team members. They include coaching, teaching, counselling, motivating, negotiating, conflict resolution, and empowering. It is important to be able to understand other’s feelings and beliefs,

recognise their personal goal structures, and to be able to provide direction at the appropriate level of detail. It is important to have the skills to mediate different viewpoints, to resolve conflicts, and to negotiate acceptable compromises as necessary. A team leader who is deficient in many of these skills may be able to compensate by delegating direct oversight of team members to a trusted subordinate with higher skills in these areas, but there is a potential to introduce ambiguity into the authority structure if this approach is taken.

- Cognitive Skills enable the leader to handle ideas. They involve sound judgement as well as the ability to think creatively and reason analytically, critically, and ethically.

#### **5.2.4.2 Leader Knowledge**

The requisite leader knowledge encompasses all of the knowledge, wisdom and experience, which the leader can bring to bear in accomplishing the mission. This includes knowledge of the task itself as well as means to accomplish the task, knowledge of how to guide effective teams as well as knowledge about the particular members of this team, and knowledge of the organizational context within which the team is operating.

It is not necessary for the team leader to know all, or even most of, the critical elements needed to get the job done, but he or she must have sufficient understanding to be able to effectively guide others in the technical details of the task:

- Task Knowledge – the information, wisdom and experience held by the leader about the task to be completed. The team task will typically be too broad for any one person to accomplish in a reasonable time, but there is an expectation that the leader will have most of the knowledge necessary for the task. An ongoing challenge for the leader will be to determine where, if at all, to bring his or her own personal knowledge to bear. Usually this will involve giving guidance to others on appropriate directions to explore rather than providing detailed problem solution by the leader.
- Team Knowledge – the information, wisdom and experience of the leader about the team (e.g., such as strengths and weaknesses of team members, and the team norms). Particularly with respect to problem solving (Lussier, 1990) and information sharing (e.g., Chapanis 1996) aspects of team performance, more effective teams will tend to be those who share knowledge on a many-to-many basis rather than funnelling all issues and information through the leader. Subject to organisational and technological constraints, the team's effective allocation and sharing of knowledge is brought to bear through the leader's knowledge of the team.
- Organisational Knowledge – the information, wisdom and experience of the leader about the establishment within which they are operating (e.g., hierarchy, information system and culture). The leader can play a crucial role in 'boundary spanning', i.e., in facilitating flow of information and understanding to and from the team itself. The leader needs to understand imposed resource constraints and needs to understand who to approach to have those constraints relaxed. Even in those situations where these responsibilities are delegated to one or more team members, the leader plays a crucial role in mediating contacts with the larger organisation (Ancona & Caldwell, 1992).

#### **5.2.4.3 Match of Personal Goals to Organisational Goals**

There is little research that directly addresses the issue of the match (or miss-match) of the team leader's personal goals and those of the larger organisation. One slim thread of research (Pilisuk and Halpin, 1967) has identified a tendency for members of an organisation to be subject to an implicit socialisation process that brings members' belief structures, values and goals into line with that of the organisation at large. There is work in organisational commitment (e.g., Gustafson & Mumford, 1995; Schneider, 1987;

Schneider, Goldstein, & Smith, 1995) that addresses the likelihood that persons will leave an organisation if there is too large a mismatch of personal to organisational goals. It can be expected that a close match of personal to organisational goals will permit more effective team outcomes due to increased leader motivation, increased leader understanding of the assigned mission and, in common terms, through increased 'buy-in' by the leader.

### 5.2.5 Team Members

The literature strongly indicates that the competencies of an individual or team member will have significant bearing on the effectiveness of a team; research has shown that this finding is evident in both military and civilian teams (Thordsen et al., 1994; McIntyre & Salas, 1995). Team member input characteristics have been defined as a cluster of input variables that have a significant bearing on the team process. Within the review of team effectiveness models, outlined in Chapter 4, it was seen that many of the models place a great emphasis on the importance that team members have on overall team effectiveness (Tannenbaum et al., 1992; Rasker et al., 2001). The variables of the team member input are team member skills, team member knowledge, and matching team member personal goals to that of the organisation.

#### 5.2.5.1 Team Member Skills

Team member skills are the requisite abilities held by individual team members which enable them to complete their tasks within the team setting. To date, research has indicated that team effectiveness requires individual team members to acquire a certain level of competence in their specific assigned task. Furthermore, the acquisition and mastery of individual skills is a necessary condition for serving as an effective team member (McIntyre & Salas, 1995). The requisite skills identified as most critical to team effectiveness include:

- Tactical Skills – the ability of the individual team member to determine/plan forthcoming tasks.
- Technical Skills – the ability of the individual team member to conduct the required tasks.
- Interpersonal Skills – the ability of the team member to be able to co-operate and communicate with others both internal and external to the team.
- Cognitive Skills – the ability of individual team members to exploit activities such as critical thinking methods, problem solving, decision-making and their mental model.

#### 5.2.5.2 Team Member Knowledge

Team member knowledge refers to the requisite information, wisdom and experience held by individual team members, which enables them to complete their task within the team setting. Research has shown that the performance of the team proportionally increases in relation to the individual level of task knowledge amongst its team members (Bouchard, 1972). Models of team behaviour have also shown that the more knowledgeable individuals are about each other and the role they each conduct, the better they will be able to perform each other's jobs; this provides greater versatility within the team, leading to improved team performance and effectiveness. The requisite knowledge identified as the most critical to team effectiveness includes task knowledge, team knowledge and organisational knowledge.

- Task Knowledge – the information, wisdom and experience held by the individual team member about the task to be completed.
- Team Knowledge – the information, wisdom and experience of the team member about the team within which they are operating (e.g., such as strengths and weaknesses of other members, and the team norms).

- Organisational Knowledge – the information, wisdom and experience of the individual team member about the establishment within which they are operating (e.g., hierarchy, information system and culture).

### **5.2.5.3 Match of Personal Goals to Organisational Goals**

Whereas a considerable amount of research has looked at individual skills and knowledge, comparatively little research has been conducted to examine the similarity of personal goals (the aim of an individual towards which their endeavour is directed) to organisational goals, and its subsequent impact on team effectiveness. Furthermore, the models of team effectiveness, outlined in Chapter 4 do not explicitly refer to the influence of matching personal goals to those of the organisation. However, within these models the influence of personal goals is alluded to through the use of the term ‘individual motivation’, as seen in Tannenbaum et al. (1992). Nevertheless, research from the team modelling community suggested that the greater the congruence between personal goals and organisational goals, the greater the sense of a ‘common’ goal amongst the team; hence the team members will be more interdependent and experience less conflict. Research has also concluded that when individuals understand the performance benefits to be gained from sharing a common goal, team members will place greater emphasis on the performance and success of the team; allowing this to take precedence over their own personal goals. This alignment of goals will enhance motivation within the team, creating more desire to perform team and task behaviours more efficiently in order for the team to become more effective (Brennen et al., 2003).

## **5.2.6 Team**

The aspects of the Team component are Team Composition, Team Size, Team Architecture, Team Maturity and Match of Team Goals to Organisational Goals.

### **5.2.6.1 Team Composition**

Team composition refers to the mix of people on the team according to certain criteria, such as skills, traits, seniority, etc. Operationally, team composition includes the following features:

- Mix of Skills. The question is to know whether in the team the capabilities across members match the task requirements. Team member characteristics considered important for task accomplishment include intelligence, experience, training, individual military-technical skills and abilities, tendencies, aptitudes, strengths, weaknesses, and teamwork skills. Moreover, it is indicated to have a proper balance of these characteristics within the team to execute the task. For example, command and control teams require individuals who have uniformly high abilities in their respective duties. Their functions are both highly specialised and interdependent, and hence the entire team can suffer if one team member does not have the requisite skills for the task and no one is able to back up for it (Paris, Salas, & Cannon-Bowers, 1999).
- Mix of Demographic Characteristics (e.g., age, gender, ethnicity, and culture). Whether more homogeneity or more heterogeneity is optimal depends upon the task structure or the complexity of the situation at hand. It is clear that the set of skills required in a contingent staff for a classic military operation (partly) differs from the set required for peace support operations.
- Mix of Personality Traits (e.g., extraversion, need for structure) encompasses traits such as attitudes, values, and preferences. Examples of key behaviours resulting from these attributes include risk-taking, propensity to take action versus propensity to do fact-finding, tolerance of stress, co-operation, conflict resolution behaviours, and motivating or reinforcing behaviours. These characteristics determine how individuals interact with other team members and how they perform. They are critical for teams that require more co-ordination, such as command and control teams (Klimoski & Jones, 1995; Paris, Salas, & Cannon-Bowers, 1999).

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- **Stability of Team Composition over Time.** It is obvious that the longer the average tenure (time on team) is, the higher the potential for effectiveness is (everything else kept constant) because for example, members co-ordinate more implicitly than explicitly. Conversely, the higher the turnover within the team, the more effectiveness is at risk. However, even if stability of membership is important, turnover may introduce new skills, perspectives, etc. and hence may sometimes be healthy for the team.

### 5.2.6.2 Team Size

Team size refers to the number of individuals in the team. The core question is, on the one hand, to know if the team is sufficiently staffed to accomplish the task within the given constraints (as defined in mission framework) and, on the other hand, if the team is not too large so that conflict and discord do not disrupt decision-making processes. Team size limits the manner in which the team can be organised and how members can interact as related to the nature of the roles and the tasks to be performed. It is important to stress that team effectiveness is not a linear function of the team size. Among others, adding more people to a team heightens co-ordination needs and does not necessarily increase the team's productivity due to opportunities for social loafing (Gladstein, 1984; Kidd, 1961; Latané et al, 1979; Paris et al, 1999; Steiner, 1972; Sundstrom et al., 1990). As a rule, teams should be staffed to the smallest number needed to do the work (Hackman, 1987; Sundstrom et al, 1990). Optimal team size, for reasons of span of control, is generally not more than seven members; however, in well-trained teams it can be as much as twelve. Optimal team size for decision-making or problem-solving tasks is generally no more than five or six members (Bass, 1982).

### 5.2.6.3 Team Architecture

Team architecture refers to the organisation and distribution of subtasks and roles, and how they are related to each other. It includes features such as decision authority, chain of command, procedural requirements, and constraints for managing and decision-making. It includes team member responses to demands imposed by team structure. Apart from a more formal architecture provided by the organisation, the architecture may be determined by the degree of perceived status or power differences among team members. Architecture also determines how team members respond to a high degree of interdependence among team members' responsibilities. Two key features of team architecture are considered here:

- **Physical proximity between members** (i.e., the physical distance separating team members) affects, among other things, communication modality or the nature of the medium through which team members engage in their interactions. Needless to say it is easier to assess the global message in face-to-face situations than in physically distributed teams where the non verbal communication is totally or at least deficient. Moreover, physical distance impacts both team processes such as decision-making or co-ordination, and team outcomes such as team cohesion (Paris et al, 1999; Urban, Bowers, Cannon-Bowers, & Salas, 1995).
- **Appropriate distribution of tasks** refers to whether tasks and roles are assigned to individuals with the appropriate expertise. Whereas team composition referred to the union of required characteristics, this feature deals with the person-task fit. Command teams in modern operations are facing a wide variety of responsibilities distributed over a wide range of tasks and roles; for example, the staff of a battle group encompasses not only the classic staff responsibilities (personnel, intelligence, etc.) but also psychological operations, liaison with local authorities, civil-military co-operation, damage control and the like. Moreover, certain tasks have to be executed sequentially, while others run in parallel or are independent of each other.

### 5.2.6.4 Team Maturity

Team maturity refers to the extent to which team members have worked together and developed as an intact team and have progressed along core phases of team evolution; i.e., forming, storming, norming,

performing, and adjourning (Swezey and Salas, 1992). Team maturity is manifested in the degree to which:

- the team can improve in the absence of its trainer (self-correction);
- the team can dynamically adapt its behaviours to changing conditions; and
- team members are capable of foreseeing one another's needs, thereby depending less upon overt communication to perform effectively.

Team maturity embodies team experience (based among others on the amount of time team members have spent working together or in other teams), shared knowledge & expectations, attitudes, and shared commitment to the team goals (Bowers, Braun, & Morgan, 1997; Morgan, Salas, & Glickman, 1994).

Team experience builds shared team knowledge, including knowledge of team-specific competencies and team-generic competencies. Team-specific competencies encompass an understanding of individual team member characteristics, traits, capabilities, etc., and how to optimise those characteristics in task execution. Team-generic competencies are easily transportable across teams and include such skills as communicating, co-ordinating, mutual performance monitoring, providing feedback, backing up, self-correcting, dynamically adapting behaviours to changing conditions, motivating/reinforcing team members, taking initiative, etc. (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995).

Greater experience also leads to shared task knowledge and expectations. Members come to hold a common understanding of the team's mission, objectives, norms, available resources, task information and demands, task sequencing, member roles and interaction patterns (e.g., who talks to whom, communication channels), and appropriate strategies for coping with task demands. They come to possess a collective repertoire of cue-strategy associations, e.g., associating cues in the environment to appropriate response strategies, knowing how and when to change co-ordination strategies (i.e., knowledge of 'if...then' rules), and ability to recognise and integrate task contingencies (Bowers, et al, 1997).

Finally, with team experience comes shared attitudes, including commitment to team goals and a shared vision. Collective team orientation grows, just as feelings of 'teamness', a belief in the importance of teamwork, a willingness to function as a team member, to accept interdependencies, to work toward common goals, to co-operate and resolve conflicts, to respect and reinforce one another, etc. The team also develops a sense of collective efficacy (team potency, or likelihood for success) and team cohesion (Bowers, et al, 1997).

#### **5.2.6.5 Match of Team Goals to Organisational Goals**

Team goals are accepted quantitative or qualitative results, achievements, performance outcomes, or measures of effectiveness toward which team members are willing to work. They should be consistent with mission objectives, outcome measures, and interests of stakeholders. They vary in terms of specificity, difficulty, and feasibility. Important is the degree to which team goals are clear and understandable, and the degree to which there is awareness of these goals, and both acceptance and commitment to them. A central question is if and to what extent the team's goals are aligned with those of the organisation.

### **5.3 PROCESSES**

Processes are the second primary building block of the CTEF Model, and they include two key components: Task-Focused Behaviours and Team-Focused Behaviours. On the one hand, these behaviours capitalise on the strengths inherent in certain Conditions (e.g.; motivating high skilled team members by delegating tasks to them); on the other hand, they serve to compensate for the limitations inherent in other Conditions (e.g., reducing situational uncertainty through an active search for information).

### **5.3.1 Task-Focused Behaviours**

The component ‘Task-Focused Behaviours’ is broken down into six aspects: Managing Information, Assessing the Situation, Making Decisions, Planning, Directing and Controlling, and Liaising with Other Command Teams.

#### **5.3.1.1 Managing Information**

Managing information is the team’s way of handling information or knowledge. A team’s effectiveness is tied to its ability to acquire the lacking information and to manage the information it possesses. Three features are important – obtaining, processing, and exchanging information:

- Obtaining information refers to the active search for information in order to compensate for the lack or scarcity of information as addressed under Situational Uncertainty.
- Processing information includes using and integrating information. Operationally formulated, information processing is how team members identify information related problems, how they synthesise mission-related information by piecing together what each member knows to ensure that all relevant information is considered in decision-making. In particular, optimising information processing under stressful conditions includes maintaining focus and avoiding tunnel vision and decision biases [e.g., failing to consider all possible alternatives, persevering with incorrect threat assessments regardless of new information (confirmation bias)].
- Exchanging information is linked to qualities such as timeliness, clarity, brevity, correctness, and completeness. Stated otherwise, exchanging information refers to the effectiveness and efficiency with which communications are received and delivered. These communications advance behaviours that contribute directly to the technical core of tasks that the team is performing (task-related communications) and should be considered distinct from communication that is devoted to ‘teamness’.

#### **5.3.1.2 Assessing the Situation**

Situation assessment embodies three primary dimensions. The first is the team’s awareness of the state of the system within which it is operating, or its shared perception of the environmental elements (with emphasis on the temporal and spatial dimensions) within its problem space. Second is the team’s evaluation of the state of the system, or its interpretation of the meaning of elements and their implications for action. Third is the team’s prediction of future events, based upon its understanding of the current situation. In short, it involves perceiving, recognising, and anticipating environmental elements or events. ‘Situation assessment’ extends the concept of ‘situation awareness’ (see Endsley, 2004) to include an evaluative component; that is, situation assessment involves understanding the meaning of situational elements as opposed to simply perceiving that they exist.

#### **5.3.1.3 Making Decisions**

Team decision-making includes: identifying or creating multiple options; choosing among alternatives by integrating differing perspectives and opinions of team members; implementing optimal solutions and monitoring the consequences. The effectiveness of a team’s decisions is defined by their quality and efficiency. Decision-making includes the following key features:

- Defining the problem space is brought about by sampling environmental cues and team members’ expertise in an informed and parsimonious manner. Team members then contribute their unique knowledge to define the problem space and formulate the best decisions.
- Managing the available time requires adaptive decision-making processes. Command and control teams frequently have very little time to make decisions and, as a result, tend to engage in



satisficing behaviours where a quick, viable option may be preferred to an optimal solution that may take too long to implement.

- Evaluating options and results refers to strategies that systemically analyse all possible options, as in analytic decision-making, for example. This contrasts with satisficing, as described above. Evaluating options and results can only be used when there is sufficient time to engage in a more exhaustive analysis. In complex realistic situations however, a decision cycle approach is used. This approach involves reasoning and acting. People engage in the iterative process of thinking, acting, evaluating outcomes, and reformulating their actions.

#### **5.3.1.4 Planning**

Planning is the process of formulating the actions that are necessary for attaining a team goal, determining the time needed for each of these actions, and comparing the latter to time available. Planning enables a team, for example, to respond more effectively to stressors such as unexpected contingencies, high workload, time pressure, or task/role ambiguity. Specifically, planning encompasses the following features:

- Anticipating future tasks and events, their demands, and potential contingencies; also prioritising and ordering the subtasks necessary for achieving team goals.
- Scheduling actions with respect to personnel, distribution of material resources, etc. in terms of time.
- Specifying resources such as personnel, time, tools, and materials.
- Defining strategies or an approach to accomplish the mission, including developing operational policies and procedures and assessing their effectiveness.

#### **5.3.1.5 Directing and Controlling**

Directing and Controlling encompasses three more specific aspects (i.e., processes that occur between planning and attaining the goal or reaching the objective); namely, organising, managing and monitoring progress.

- Organising refers to how the team will implement the plan. It is the process of systematically structuring, sequencing, or co-ordinating team actions to ensure efficiency in achieving a specified goal before the action starts. Other organising activities that produce efficiencies include optimal initial allocation of resources, determination of procedures, and clarification of roles to be fulfilled by all or some team members. As with planning, proper organising enables the team to better cope with stress.
- Managing is the process of governing, guiding, or steering the team toward successful accomplishment of goals during the course of action. Managing includes the following four processes:
  - Adapting procedures; that is, creating and evaluating processes or methods for conducting business;
  - Setting priorities and communicating them to team members;
  - Dynamically adjusting resources and schedule;
  - Managing expectations of stakeholders, team members, etc.
- Monitoring Progress means gauging or assessing advancement toward milestones, goals, and objectives. Monitoring progress can for example mitigate the effects of stress upon task performance when it results in dynamically reallocating workload, refocusing team members in light of rapidly changing priorities and performance objectives, and soliciting alternative explanations to help team members expand, rather than narrow, their focus or awareness, etc.

### **5.3.1.6 Liaising with Other Command Teams**

Liaising with other command teams refers to the process of interacting (e.g., developing and maintaining contact or communication) with other command teams, for the purpose of building alliances, engaging in cross-functional activities, conducting promotional activities, and collaborating across boundaries. A team can benefit from such co-ordination in many ways. It can scout for information, resources, processes, etc., to strengthen their internal support basis and facilitate goal achievement. It can profile for potential alliances by assessing capabilities and characteristics of individuals who can support/contribute to the achievement of team goals. It can promote relations and team image and convince others of the organisation's or team's point of view. It can help the team keep current with developments in the environment. Finally, it can facilitate cross-team planning for tasks that will require capabilities or resources specific to certain teams. These types of activities are also referred to in the literature as boundary management or boundary spanning activities.

### **5.3.2 Team-Focused Behaviours**

The component 'Team-Focused Behaviours' is broken down into six aspects: Providing and Maintaining Vision, Maintaining Common Intent, Interacting within the Team, Motivating, Adapting to Changes, and Providing Team Maintenance.

#### **5.3.2.1 Providing and Maintaining Vision**

Providing and maintaining vision is the process of generating and preserving direction and purpose for the team. This is often a function of the team leader, who strives to energise the team to perform in accordance with the team mission. Leaders may even encourage visionary thinking/goal setting or inspire team members to exceed standards or transcend the status quo.

#### **5.3.2.2 Maintaining Common Intent**

While maintaining vision keeps the team focused on their higher purpose or mission, maintaining common intent specifically operates to preserve a shared sense (i.e., common mental picture) of desired goals and objectives and how to reach them. Unless leaders can ensure a clear, accurate, and common understanding of those goals, the team's effectiveness may be compromised. Leaders need to communicate how team member roles and team strategies will be used to carry out a plan for achieving team goals, and to communicate priorities for the team, as well as limits or constraints on goal-directed actions. By focusing team members in light of rapidly changing priorities and performance objectives, by providing 'big picture' updates, and by dynamically modifying strategies in response to changing conditions, leaders can help the team to overcome obstacles and act adequately in the absence of the leader.

#### **5.3.2.3 Interacting within the Team**

While team interactions involve many different behaviours, three of these are thought to be critical for team effectiveness: Communicating, co-ordinating, and providing feedback.

- Communicating refers to aspects of openness, style, and expressing feelings and thoughts. These communications are directed specifically at modifying teamwork aspects. Team-related communications exploit opportunities that influence team interactions, organisation, and functioning. Team effectiveness is bolstered by positive communications (e.g., those that encourage, guide, or correct team behaviour). Negative communications (e.g., those that stimulate conflict, pessimism, destructive criticism, etc.), on the other hand, can threaten team cohesion. Similarly, communication style should remain positive, rather than negative. Team communications that bolster team interactions, commitment, and sustainability serve to enhance team cohesion and effectiveness, and mitigate the effects of stress.

- Co-ordinating means combining/acting in a harmonious, complementary, supportive manner to achieve goals. Co-ordinating involves synchronising team members' activities such that they reduce role conflicts and redundancies and ensures that members are able to tap each other's unique resources in order to work efficiently.
- Providing feedback encompasses offering advice to one another about how to improve performance. This advice can vary along a number of dimensions: e.g., intent, degree to which the feedback is tailored to the situation, whether feedback is solicited or received, source (e.g., from peers, supervisors), credibility (e.g., peer versus supervisor), and degree of objectivity and specificity of the feedback.

#### **5.3.2.4 Motivating**

Motivating is the process of influencing the direction, intensity, and persistence of team-members' behaviours using external contingencies or by inspiring team members to develop intrinsic interest in task- or team-related work. Motivating can result in team-level efficacy or 'esprit de corps' as a result of positive past performance and adequate feedback. Motivating the team extrinsically and intrinsically are the two features for this aspect of team-focused behaviours.

- Motivating extrinsically is done by tangible or intangible compensation or incentives to reward good performance (by recognising/rewarding).
- Motivating intrinsically is inspiring team members to develop intrinsic interest in the work (by mentoring/developing). Intrinsic motivation in performing team tasks can result from task exploration opportunities, learning from the task, exposure to new and varied experiences, knowledge of progress toward goals, etc.

#### **5.3.2.5 Adapting**

Adapting is the process by which team members change their behaviour and relationship with other team members according to the changes in the environment or in the team. Operationally, it includes any of the following behaviours: recognition of cues that trigger needed behaviours important for optimising the team's performance, compensatory behaviours, capacity for closure (e.g., disengaging from response patterns that are no longer relevant given the current context), mutual adjustment, flexibility, back-up behaviours, providing or requesting assistance, and finally, dynamically changing team composition or assignments, reallocating resources, altering task sequencing, timing, or execution strategies, or adjusting crucial information to the task being performed. In our opinion Adapting has three key features: monitoring, correcting, and backing-up:

- Monitoring occurs when team members observe and assess their own and each other's performance for the purpose of remediating deficient taskwork and teamwork behaviours. Such monitoring is an implicit, shared understanding among team members, who willingly provide or accept feedback for improving performance.
- Correcting (self and others) occurs when team members offer feedback or guidance to improve their team members' performance. They offer team members advice regarding effective task strategies when they observe them pursuing maladaptive or inefficient solutions to problems. They do this even when it is not their responsibility. 'Self-correcting' is the process by which a team is able to dynamically evaluate its own performance during or following a critical event to diagnose root causes of performance problems, identify solutions, and plan for future tasks. Members willingly engage in formal or informal after-action reviews to assess and identify actions needing correction, improvement, or reinforcement, when the climate for doing so is provided. Team members can analyse which teamwork processes they use well and which they do not. Evidence that a team has developed self-correcting capability can be found in its ability to improve in the absence of its trainer.

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- Backing Up occurs when team members support one another with compensatory behaviours (e.g., assuming duties, offering coaching, feedback, or assistance). Team members seek to learn about their team members' responsibilities so that they can assist them or take over, when necessary. They monitor team members' behaviours and notice when they are having difficulty performing a task. They provide assistance by taking on some of their team members' workload. Not only would team members offer assistance to others while completing their own duties, but they would request assistance from others when they are overloaded so that the team's performance does not suffer.

### 5.3.2.6 Providing Team Maintenance

Providing team maintenance refers to the actions that keep team members together. It includes four types of support, or features, as follows:

- Providing social support/integration refers to behaviours that buffer against stress (e.g., bolster esteem, offer companionship, offer material resources). Team members may demonstrate 'intra-member reinforcement' behaviours (e.g., thanking one another or complimenting one another). They offer encouragement to one another, giving team member's hope, confidence, or courage necessary to perform team tasks. Behaviours that provide social support tend to increase bonding and loyalty toward fellow team members.
- Regulating emotions (e.g., composure, morale) implies influencing emotions or maintaining emotional balance among team members. For example, team members might prevent excessive communication of negative emotions.
- Developing/maintaining cohesion happens through promoting unity, solidarity, or esprit de corps among team members.
- Managing conflict refers to handling conflict, such that maladaptive discord or friction is resolved or, if impossible, reduced as much as possible.

## 5.4 OUTCOMES

Outcomes are defined as the results of the processes. Two foci are important: 1) to what extent did the team reach its assigned goals (task outcomes); and 2) to what extent did the team develop itself (team outcomes).

### 5.4.1 Task Outcomes

The task outcomes provide important indications of what the team really achieved. A distinction is made between end goals – what the team has finally accomplished – and intermediate goals as steps toward the end goals. The task outcomes can be evaluated from the perspective of a number of stakeholders. The most important stakeholder is the one that the team is working for, i.e., the commander who assigned the mission (who is usually at the next higher hierarchical level). However, a variety of other stakeholders may also have expectations about what has to be achieved in order to be effective in the long run. These stakeholders have to be identified as clearly as possible as they may impact the (perceived) team effectiveness. Such stakeholders can include the local authorities, the local population of the region in which the operation takes place, the subordinates of the team members, or the soldiers outside the team (but within the organisation). Furthermore, the team members (including the team leader!) may have an opinion on the way the team was informed, organised, or led towards its goals and the level of achievement of its objectives.

#### **5.4.1.1 Achievement of the Goals**

The most important question is: To what degree did the team achieve the goals that were set out by the stakeholders? A problem with this measure, of course, is that if the goals are too difficult, then the team can never be successful; conversely, if the goals are set too easy, then the team will never fail. Because of this reason, achievement of the goals cannot be the only measure of effectiveness. With respect to the achievement of the goals, evaluation may take place after the team has finished its work or during the process on the basis of intermediate goals.

- Intermediate goals: The team evaluates how it is doing considering the time that has been spent already and what needs to be done to reach the goals. This evaluation may or may not be based on predetermined milestones.
- End goals: After the team has finished its job or when the deadline has passed, the team evaluates to what degree it has reached its goals.

#### **5.4.1.2 Criteria Set by the Stakeholder**

The stakeholder may have – explicitly or implicitly – set a number of criteria, which the team should satisfy. The most important stakeholder in the case of a command team is the superior commander (or the organisation). The criteria are, for instance, timeliness, adequacy of a plan, efficiency of a solution, flexibility of a plan, etc.

#### **5.4.1.3 Other Stakeholders' Satisfaction**

In any operation a number of stakeholders may be identified that influence the decisions or the actions of the team. These stakeholders and their interests should be identified in order to satisfy them as much as possible. This will guarantee better commitment with what the team is trying to accomplish.

#### **5.4.1.4 Staying within the Limits/Intentions**

The work of the team should stay within those rules or limits that are set for the operation. For example, in a Peace Support Operation the team must conform to the Rules of Engagement; in a search for weapons, no more force or violence should be demonstrated than is absolutely necessary.

### **5.4.2 Team Outcomes**

Team outcomes refer to the improvement of the team as a result of the team processes. Often, the team outcomes are not the reason why the team has been formed; rather they are emergent properties of the team. These team outcomes are in most of the cases desirable results of a team's actions to reach the goal. For example, a team will be more satisfied if it has achieved its mission; a team that has been working together for some time may have grown more cohesive, have better mutual trust, etc., and this will feed back into the initial Conditions; more specifically into the 'People' components, and subsequently improve its continued processes and effectiveness.

Our review of the team effectiveness models (see Chapter 4) identified a number of outcome measures. However, there was little consistency in the ways in which these outcome measures were depicted. For example, Tannenbaum et al. (1992) refer to these team outcomes as 'Individual Changes' which include attitudes, whereas Cannon-Bowers et al. (1995) refer to 'Team Competencies' including team attitudes but Klimoski and Jones (1995) refer to 'Outcome Variables' including satisfaction and emotional tone; finally Blendell et al. (2001) refer to 'Output Factors' including team satisfaction.

In the present work, we expand the scope of the team outcome component to include a number of aspects that have been shown to either impact team effectiveness directly, or emerge as a consequence of effective

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## DESCRIPTION OF THE CTEF MODEL

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team functioning. In addition, these aspects appear to hold particular significance within military team contexts; this has been confirmed through our interviews with military officers, representative of our target groups.

### 5.4.2.1 Mutual Trust

Recent work by Adams and Webb (2003) has reviewed the critical role that trust plays in military teams. Two broad theoretical views of trust were identified, one in which trust is based on long experiences with an individual (person-based) and the other based on recognition of features in an individual previously associated with trust (category based). A definition presented in a recent paper by Costa, Taillieu and Roe (2001) highlights the nature of trust as a psychological state: “Trust is a psychological state that manifests itself in the behaviours towards others. Trust is based on the expectations made upon behaviours of these others, and on the perceived motives and intentions in situations entailing risk for the relationship with those others.” With this definition, it is clear that trust as a psychological state is the core of the definition, and that trust behaviours can only logically exist as the manifestation of this psychological state.

### 5.4.2.2 Morale

Manning (1991, p. 457) describes morale as the enthusiasm and persistence with which a member of a group engages in the prescribed activities of that group. In this sense morale is a concept at the level of the individual, which can be influenced by both individual variables (such as having a goal, a role and self-confidence) and group variables (such as common experiences).

### 5.4.2.3 Cohesion

It is generally accepted that team cohesion is strongly related to team performance. Indeed, in a now famous quote from the classic Festinger et al. (1950), cohesion is referred to as “the ‘total field of forces’, which act on members to remain in the group”. Research has shown that, when a team is communicating well within the process stage, the cohesion level amongst team members increases (Shaw, 1981).

### 5.4.2.4 Collective Confidence in Achieving the Goal

According to Bandura (1986), collective efficacy refers to the ability of the team to perform effectively given a specific set of task demands. Cannon-Bowers, Tannenbaum, Salas and Volpe (1995), conclude from their review that collective efficacy has a facilitating effect on team effectiveness (see also Shea and Guzzo, 1987). The consensus of work in this area appears to support a motivational basis for the effect of collective efficacy on team performance. For example, team members who have high confidence in the team – i.e., believe that the team is up to the task – will be motivated to perform well, and thus increase the likelihood of a successful outcome.

### 5.4.2.5 Shared Vision

This outcome refers to the team having a shared common perception on how to behave in the future in a similar setting; combining both explicit intent (based on the commander’s statements and orders) and implicit intent which is based on underlying intentions assumed throughout the orders, based on military, cultural and political expectations (Pigeau and McCann, 1998). Research has indicated that a shared understanding of the commander’s intent will enable team members to fulfil the leader’s intentions better, thus improving team performance (Molloy et al., 2002).

### 5.4.2.6 Mutual Respect

According to McIntyre and Salas (1995), respect is one of the critical ‘principles’ regulating team effectiveness. It refers to the fact that team members try to understand each other despite their differences.

This applies as much with respect to the relationship leader-team member, as it does among team members themselves.

## **5.5 THE CONCEPT OF AFTER ACTION REVIEW**

An After Action Review (AAR) is a process that enables the commander, along with his/her team, to review how well the team performed both in terms of the outcomes as of task and team behaviours, and hence to judge how effective the team was.

An AAR session is essentially a structured team discussion that aims to elicit team members' opinions on the quality of teamwork and taskwork in previous training exercises and/or operations (Mills and Henderson, 2003). In its broadest sense, an AAR is:

- a structured team discussion;
- an opportunity to have a voice in the team;
- an opportunity to reflect in the team;
- an opportunity to learn as a team.

There are many types of AAR sessions differing with respect to their approach, format, and duration. However, all types of session are focused on understanding where the team has performed well, where it has performed less well, and how it can keep up the standard and where necessary improve (and to what level of improvement). However, to date, most commanders conduct an AAR either in a formal and/or an informal manner focusing mainly on the military and technical aspects and much less (if at all) on team aspects in general and its effectiveness in particular.

The process of conducting an AAR allows the commander and team members alike to identify lessons learned, and act upon these as necessary. In the model proposed, these lessons learned and subsequent actions are represented by the feedback loops. See Annex A for a process chart for performing an AAR.

## DESCRIPTION OF THE CTEF MODEL

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## Chapter 6 – EFFECTS OF CONDITIONS ON PROCESSES AND OUTCOMES

### Introduction

In this chapter, we review and evaluate the key relationships in the model based on an extensive literature review. We found that the literature is not well distributed over all components and aspects we captured in the CTEF model. In particular, the focus is on effects of (some of) the Condition components on (some of) the Process components. We discuss these by linking Condition components and aspects to Process components (the task and team-focused behaviours). For example, under Mission Framework, effects of Situation Uncertainty on Task-focused behaviours, such as Managing Information, and on Team-focused behaviours, will be discussed, as far as relevant references are available. Whether or not the effect on a Process aspect also affects Outcomes is mostly not addressed in the available literature, except to some degree for some of the team outcomes, such as trust, morale, and cohesion. Where relevant, these aspects are addressed related to the relevant Process aspects.

### 6.1 MISSION FRAMEWORK EFFECTS

#### 6.1.1 Situational Uncertainty

##### Task-Focused Behaviours

*Managing Information.* According to Worm (2001), a major factor that affects the ability of military teams to execute their missions is having limited access to an information structure that supports and improves real-time information and intelligence acquisition. This in turn inhibits the ability of mission-relevant information and intelligence to penetrate the organisational hierarchy, and thus to reach the intended decision maker in a secure and timely manner.

In a team context, situational uncertainty may complicate information sharing. Cramton (2002) notes that when trying to understand teams operating under uncertainty, it is important to take into consideration contextual information, the possibility of uneven distribution of information, and differences in what information is salient.

*Assessing the Situation.* Situation-awareness (SA) is crucial for effective decision-making, and is far more complex to obtain and maintain at the level of the team than at the level of the individual (Cobb & Mathieu, 1998). In addition, ambiguity and complexity in the environment negatively affects the establishment of team SA. Accordingly, in situations of uncertainty, team leaders should be taught to periodically generate situation updates that indicate problems with assessments, such as missing, unreliable, or conflicting evidence (Cohen, Freeman, & Thompson, 1998). Such updates not only provide team members with a shared mental model of the tactical situation, but also foster a shared meta-cognitive model of ongoing uncertainties in the situation model. A shared meta-cognitive model prompts team members to volunteer relevant information or insights. In addition, Cohen et al. (1998) provide encouraging evidence that ‘critical thinking’ training concepts developed in this way generalize to a wide variety of domains where decision makers have a limited amount of time to make high stakes decisions under uncertainty.

*Making Decisions.* Uncertainty is intimately linked with error: the greater the uncertainty, the greater the probability of making an error (Lipshitz et al., 2001). According to Cohen et al. (1998), in uncertain environments, more experienced decision makers differ from less experienced decision makers along a variety of dimensions, such as:

- going beyond pattern matching to create plausible stories for novel situations;

- noticing conflicts between observations and a conclusion;
- elaborating a story to explain a conflicting cue rather than simply disregarding or discounting it;
- sensitivity to implausible assumptions in explaining away too much conflicting data;
- ability to generate alternative stories;
- planning against the possibility that the current assessment is wrong;
- paying careful attention to the time available for decision-making.

In addition, proficient decision makers are both recognitionally skilled and meta-recognitionally skilled, where recognitionally skilled refers to the ability to recognize a large number of situations as familiar and retrieve an appropriate response. Meta-recognitionally skilled, on the other hand, refers to the fact that, in novel situations where no familiar pattern fits, the decision maker can supplement recognition with processes that verify the results of recognition, and can correct problems. This is linked to the notion of team confidence, which is postulated to mediate the behaviours of selecting a course of action and following that course (Snizek, 1992).

### **Team-Focused Behaviours**

*Providing Team Maintenance.* In situations of uncertainty, Peterson and Thompson (1997) found that teams of friends were more cohesive than were teams of strangers. In addition, teams of friends were also more concerned about maintaining their relationship than were teams of strangers. Similarly, friends indicated greater relationship concerns when having to deal with distributed information, whereas information distribution had no effect on the relationship concerns of strangers. Thus, overall, friendship has a positive impact on team maintenance.

### **6.1.2 Stress Potential**

Military operations, by their very nature have high stress potential. Team effectiveness and effective task completion are often critical to the mission. In fact, effective team performance is often most important when stress is at higher levels and thus when stress-induced decrements are most likely to occur (see Driskell, Carson & Moskal, 1986). To overcome the effects of stress, teams must be highly skilled and familiar with the stress environment.

All of the mission framework components have stress potential; i.e., high stakes, environmental uncertainty, and mission constraints. Although there is considerable research on the negative aspects of stress, in some cases stress can have a positive effect on team performance (Driskell, Salas, & Johnson, 1999). Importantly, although the occupational stress literature is vast, a considerable portion of this work focuses on the individual; i.e., we know considerably less about the impact of work-related stressors on the functioning and performance of groups (Jex & Thomas, 2003).

### **Task-Focused Behaviours**

*Making Decisions.* A number of studies have shown that decision-making is vulnerable to time pressure stress (Lehner et al., 1997; Zaccaro, Gualtieri et al., 1995). Urban, Weaver, Bowers and Rhodenizer (1996) showed that time pressure significantly degraded team performance relative to baseline, although time pressured teams responded more quickly to individual monitoring tasks. In particular, when the decision to be made was inconsistent with normal heuristic decision processing, increasing the time pressure decreased task effectiveness. As temporal stress increased, the ability to use trained strategies decreased (Lehner, 1997).

Not all views are so pessimistic. Although increased time pressure may prevent the use of analytical decision-making strategies, Klein (1996) claims this is not necessarily a cause for concern because

analytical strategies are rarely used in naturalistic settings. This claim is partially supported by TADMUS research on the effects of time pressure (Johnston, Poirier, & Smith-Jentsch, 1998).

More recently, Adelman et al. (2003) examined how 3-person, hierarchical teams adapted to increasing levels of time pressure. The goal was to understand why previous team research has not necessarily found a direct relationship between team processes and performance with increasing time pressure. They found that teams initially adapted to increasing time pressure without showing any performance decrements by accelerating their cognitive processing, increasing their implicit coordination by sending more information without being asked and, to a lesser extent, filtering (omitting) certain activities. In addition, teams performed the task differently with increasing time pressure, but often achieved comparable levels of performance. Finally, as expected, there was a level of time pressure beyond which performance could not be maintained, although that level differed across teams.

Finally, stress can have negative effects on centralization-of-authority. For example, when under stress, low status group members are more likely to defer to decision inputs of higher status group members (i.e., become more subordinate); conversely, high status group members are less likely to defer to subordinate group members (Driskell & Salas, 1991). This is important because relevant information may not be expressed due to a subordinate group member's hesitancy to exert influence. This situation has been noted particularly in the context of flight crews (Driskell & Salas, 1991).

*Organising.* The ability of teams to overcome the effects of stress is well documented in the literature on TADMUS (i.e., tactical decision-making under stress, see Cannon-Bowers & Salas, 1998a, b). For the most part, this work has focused on increased overall performance readiness (knowledge and skill), training on stress coping skills (stress inoculation), and targeting skills that are vulnerable to the effects of stress (i.e., communication skills).

Kleinman and Serfaty (1989; see Cannon-Bowers & Salas, 1998a) showed that effective teams can maintain performance even under conditions of high workload when communication opportunities are reduced, using a process called implicit coordination (IC). Success with this process depends to a large degree on the team's ability to draw on a common understanding of the task. Teams use implicit coordination to coordinate behaviour and select task strategies in the absence of explicit coordination activities. Under conditions such as high workload, time pressure and other stresses, IC appears to be critical and is central to the concept of team shared mental models (SMM; Cannon-Bowers, et. al., 1993).

SMM provide team members with a common understanding of who is responsible for what task, and what the critical information requirements are. This allows members to anticipate each other's needs so they can work effectively. Stout, Cannon-Bowers, Salas, and Milanovich (1999) showed that effective planning increased the SMM among team members, allowing them to utilize efficient communication strategies during high-workload conditions, and improved coordinated team performance (see also, Serfaty, Entin & Johnston, 1998).

Finally, training strategies that develop shared mental models have the potential to improve team performance under stress (Kleinman & Serfaty, 1989; see Cannon-Bowers & Salas, 1998a). The concept centres on automating skills to the point that they can be performed rapidly and effortlessly even under extreme conditions (Kirluk et al., 1998). Another approach called cross training is to have team members trained on each others' tasks, thereby understanding the shared team and task demands (for a review see McCann et al., 2000). Another approach is to train under the stressor directly, thereby reducing the effects on performance, a process called stress inoculation training (Driskell & Johnston, 1998).

### **Team-Focused Behaviours**

*Interacting Within the Team.* Stress can lead to a decrease in pro-social behaviours, such as helping one another (Mathews & Canon, 1975). However, high task cohesion (or shared task commitment)

can improve team decision-making under temporal stress (Zaccaro et al., 1995). This is attributed to the fact that high task-cohesive (HTC) teams devote more time to planning and information exchange during the planning period, and communicate task-relevant information more frequently during the performance period than low task-cohesive (LTC) teams (Zaccaro et al., 1995). In addition, Moldjord et al. (2003) showed that social support in the form of group comradeship was an important factor in reducing the effects of strong stressors at the team level.

*Providing Team Maintenance.* Employees experiencing high levels of work-related stressors have negative perceptions of the groups in which they work (Jex & Thomas, 2003). Although they did not test whether this reflects actual decrements in group functioning, they theorize that negative perceptions might cause members with negative perceptions to withdraw, contributing to a reduction in group performance.

Considerable research suggests that interpersonal conflict leads to reductions in collective efficacy, which ultimately increases psychological strain. For example, Hackman (1987) found that job satisfaction and well-being are closely tied to group effectiveness. Jehn (1994) suggests that although conflict over how to approach a task may be productive, interpersonal conflict generally has a negative effect on the performance of groups. These findings are critical because comradeship may be among the most effective methods of coping with peacekeeping stress (see Bliese & Castro, 2003; Milgram, Orenstein, & Zafir, 1989; Moldjord et al., 2003).

One of the more well-established findings in the research literature is that stress leads to a restriction or narrowing of attentional focus. Driskell et al. (1999) extend this concept to the group context. They proposed that, in a team environment, the narrowing of attention induced by stress may result in a shift in perspective from a broad team perspective to a more narrow or individualistic self-focus. This loss of team perspective may result in degraded team performance. The results of an empirical study found that stress resulted in a narrowing of team perspective and that team perspective was a significant predictor of team performance. Moreover, when the effects of team perspective were controlled, the effects of stress on team performance were substantially weakened. These results suggest that one way in which stress impacts team performance is by narrowing or weakening the team-level perspective required for effective team behaviour.

### **6.1.3 Constraints**

Command teams are composed of individuals who have high levels of skills and abilities, are specialized in their respective duties, and come together for a short period of time to work interdependently toward a common valued goal (Paris et al., 2000). The environment within which these teams operate is fast-paced and members are required to deal with large amounts of information that must be processed in limited amounts of time. Accordingly, teams must constantly plan, revise actions/strategies based on changing situations, and monitor feedback from team members. Many of the constraints to be reviewed in this section reflect limitations on these actions, either directly or indirectly.

For example, political constraints can have a profound effect on team planning and decision-making. Militaries are constantly challenged by a paradox of having to “protect the professional culture necessary to perform its missions in the unnatural stresses of war and within the legal prerogatives of government, and yet remain responsive and appropriately attuned to the civilian culture it serves” (Hillen, 1999, pp. 9-10). Considerations such as these, especially in fluctuating international political environments, confront military planners with complex challenges (Bowen, 2003). Just War Theory contends that for a war to be justified, a political community must fulfil the following criteria: Just Cause, Right Intention, Proper Authority and Public Declaration, Last Resort, Probability of Success, and Proportionality (Sullivan, 2003). To satisfy these criteria, team decision-making and planning will likely be constrained.

Another example is the media. To date, most publications on this topic have focused on the influence that the military has had on the media (i.e., censorship, relaying false information regarding success during

wartime, spreading of propaganda, etc.). However, little has been done on the impact that the media has on the military. For example, increased media coverage may jeopardize operational security or troop safety. Indeed, some U.S. military officers believed the negative press coverage contributed to U.S. defeat in the Vietnam war (Sharkey, 2001).

### **Task-Focused Behaviours**

*Managing Information.* Open and flexible communication patterns are essential for effective team functioning and performance, especially when the task is complex. The effectiveness of a team decision is usually a function of the information available; thus, optimal decisions must utilize all relevant information at the team's disposal (Dose, 1999). Under high stress, communication decreases (Kleinman & Serfaty, 1989). Accordingly, in environments where there are multiple sources of information, as well as multiple recipients, the effective management of communication can be a significant problem. Closed-loop communication can help, whereby communication is initiated by the sender, the intended recipient acknowledges receipt of the message, and the sender follows up to ensure the message was interpreted properly. During periods of high stress, teams must effectively synchronize or coordinate actions and use clear communication to ensure tasks are integrated and completed within established time constraints (Tesluk & Mathieu, 1999). More generally, managing information is an important enabler of obtaining and maintaining effective situation awareness (Paris et al., 2000).

A critical factor related to managing information is the reality of networked, widely distributed working environments (e.g., NCW or NEC). There may be some time delay when communicating through electronic media, and some social and verbal cues may be lost, both of which can lead to misunderstandings and miscommunication (Townsend, DeMarie, & Hendrickson, 1996). When the physical distance between team members is reduced, cohesiveness and communication are positively affected; greater distances exert negative influences (Paris et al., 2000).

An important consideration for effective communication and management of information is demographic diversity (e.g., gender, race, age, intelligence, expertise, and personality). For example, multicultural or multinational teams show an increased likelihood of degraded communication, including more difficulty managing meanings, beliefs, and attitudes (Tesluk & Mathieu, 1999). Jex and Thomas (2003) report that culturally homogenous teams out-performed culturally heterogeneous groups on group tasks. On the other hand, the effect of diversity on group processes can lead potentially to either positive or negative outcomes. As a result, Guzzo and Shea (1992) have admitted that "the right combination of members has been difficult to specify" (p. 301). Dose (1999), for example, argues that common work values can mitigate against the negative effects of demographic diversity.

*Making Decisions.* When time is at a premium and information is uncertain or ambiguous, decision-making may not follow a rational/analytical model, whereby each probable alternative is considered and weighed. Such processes are too time-consuming, and experts often trade decision accuracy for speed (Tesluk & Mathieu, 1999). Experts operating in time compressed situations typically look for situational cues within the problem that indicate some type of pattern. If the situation is perceived as similar to one previously experienced, a similar decision will be made (Klein, 1997). Time pressure is negatively correlated with the reliability of decision-making: as time pressure increases, the reliability of team decision-making drops (Adelman, Zirk, Lehner, Moffett, & Hal, 1986).

*Assessing the Situation.* The use of automated technology can decrease situational awareness, as a result of complacency due to over-reliance on automation. Endsley (1997) recommends that one way to maintain situational awareness is to use intermediate levels of automation, thus reducing complacency and allowing human operators to perform critical functions (cited in Paris et al., 2000). On the other hand, the use of computer based decision support systems can increase SA in teams. An example is TADMUS (Tactical Decision-making under Stress), which organises and presents tactical data for Naval command and control environments in a form that is consistent with that used by experts (Paris, Cannon-Bowers, & Salas, 2000;

Morrison, Kelly, Moore, & Hutchins, 1998). However, no amount of technology and automation can overcome certain fundamental constraints. In his review of why Slobodan Milosevic decided to settle the conflict over Kosovo on June 3, 1999, Hosmer (2001) noted that “The NATO air effort was hampered by a number of factors, including poor weather (cloud cover was greater than 50 percent more than 70 percent of the time); rugged mountainous and forested terrain in parts of Kosovo; the Serb use of dispersal, camouflage, dummy targets, concealment, and hardened bunkers, and their exploitation of civilian populations and facilities as shields” (p. 82).

### **Team-Focused Behaviours**

*Interacting Within the Team.* Cohesiveness is viewed as a positive team characteristic resulting in low levels of interpersonal conflict, the perception of shared goals, similarity in preferences for team regulation, and commitment to the task. A recent meta-analysis found a positive relationship between cohesiveness and performance (Mullen & Copper, 1994).

*Providing Team Maintenance.* Individuals in cohesive teams reach group goals more efficiently because they need to devote less effort to group maintenance (Sapolsky, 1960; Shaw, 1981; cited in Dose, 1999). On the other hand, team cohesiveness brought about by interpersonal similarity can lend itself to dysfunctions such as groupthink, conformity, or over-attention to interpersonal issues (Ziller, 1963; Janis, 1972).

#### **6.1.4 Stakes**

For the type of high-level, command team functions on which this report is focused (i.e., planning, strategizing, decision-making), the concept of ‘stakes’ is not well represented in the empirical literature. The domain of military teams is uncertain, complex, and includes multidimensional factors and dangers, which contrasts sharply with the main body of literature on decision-making (Serfaty, 1997 p. 233).

Upon consideration of the literature, it appears that stakes themselves are not what is investigated in team effectiveness or decision-making studies; they are at a more meta-level – implied rather than explicitly stated. We would argue that stakes form the basis for the mission and as such are intertwined with the desired end state or goals. The constraints, uncertainties, and stresses encountered in a mission primarily stem from these initial stakes. Since there are always stakes, determining their impact on the effectiveness of the team is very difficult. Nevertheless, the concept of stakes must be viewed as critical to the mission framework.

To illustrate, suppose that the mission is to capture a particular hill. The primary stake is then that if the hill is not captured, then the commander’s intent is not met and hence the overall objective of the mission may also fail. There are also stakes within the mission, including the risk of own force casualties, civilian injuries (which has moral as well as political implications), and hardships to the local people if there is destruction of buildings or resources.

The strategic teams that are of interest to us cannot be created artificially in a lab setting, so relevant research will be in the domain of naturalistic decision-making (NDM) studies. According to Serfaty (1997) NDM is not conducive to systematic empirical investigations of hypothesis, and this is particularly true in our situation where we wish to investigate the impact of stakes on team effectiveness. Given that relevant stakes are not feasible as independent variables, the impact of stakes on team effectiveness will need to largely be inferred.

### **Task-Focused Behaviours**

*Managing Information.* The ‘Estimate of the Situation’ (e.g., as outlined in the Canadian Army Doctrine report Command, B-GL-300-003/FP-000), is a formal process taught to commanders on how to make

decisions during a mission. The definition of the Estimate of the Situation is the orderly analysis of a problem leading to a reasoned solution. The commander considers what must be done, together with the circumstances affecting how it is to be done, in order to arrive at a sound course of action. As the situation changes, the mission and relevant factors are re-evaluated in a logical manner. Stakes are present in the process as the initial mission, and as factors to be evaluated, including the enemy, the environment (ground, water, population, culture, religion, media) and friendly forces.

In practice, formal Estimate procedures may not be closely followed in tactical exercises. This is mainly due to the mismatch between the doctrinal procedures and what is actually possible under time-constrained conditions (see, Halpin, 1995). High stakes make it necessary to act quickly and decisively in order to have the advantage in battle. More information requires more processing time, leading to “paralysis by analysis” (Rogers, 1994).

Importantly, when there are important decisions to be made with high stakes, people who are risk averse have a higher workload due to their reluctance to commit to a course of action. Their preference to have all the information before making a decision can cause critical opportunities to be missed (see Pascual & Henderson, 1997). Moreover, if overall stakes are high, the cost of gaining information may be perceived as a higher risk than estimating the situation. There may be an inability or failure to check assumptions. This leads to decisions being made on false or incomplete information, so there is a potential to act on a team bias thereby degrading team performance (Jones & Roelofsma, 2000).

*Making Decisions.* In order for teams to be effective in high stakes environments, it is necessary for the commander to adopt an intuitive, ‘coup d’oeil’, approach that allows for more speed, creativity, and tolerance of uncertainty than traditional analytical decision-making approaches. Due to the nature of the stakes and the tempo of the situation, a more naturalistic, ‘intuitive’ approach is necessary (see Van Creveld, 1985). For example, Bergstrand (1998) notes that analytical decision-making is excellent for making purchases, or deciding where to place a battalion, but has severe limitations in realistic military situations. Lipshitz et al. (2001) use the recognition primed decision-making model (Klein, 1997) to describe how experienced decision makers are able to mentally simulate various courses of action, and look for unintended negative consequences (stakes), and thereby make better decisions.

### **Team-Focused Behaviours**

*Motivating.* There is a paucity of research on the relation between stakes and team effectiveness in the military context. However, since collective rewards help motivate groups whose tasks are interdependent (Wageman, 1995), and successful completion of the mission (which is the main stake of the team) can be seen as a reward, it follows that a U-shaped relationship may be expected in terms of the impact of stakes on team effectiveness. If there are very low stakes, then the mission may seem meaningless and thus there may be a lack of motivation. Conversely, if the stakes are too high, stress may interfere (i.e., the Vincennes incident), leading to a less effective team. Moderate stakes, on the other hand, may heighten focus on the task, increase team cohesion, motivation, and even morale, through knowing that they are working on something that truly matters.

## **6.2 TASK EFFECTS**

In this section the task-aspects are explored in terms of their relationships to the task- and team-focused processes of the CTEF model. In the first section, we describe task complexity. In the second section, goal clarity and goal stability are jointly described because both concepts have similar effects on the processes. Task Workload is elaborated in section three, where it is shown that it is partly a consequence of task complexity and a lack of goal clarity and goal stability.

### 6.2.1 Task Complexity

#### **Task-Focused Behaviours**

Task complexity is a task characteristic closely related to the task-focused processes that teams have to perform. All of the task-focused behaviours in the model have an impact on the complexity of the task. In command teams (see Chapter 3), information has to be gathered and processed in order to make an assessment of the situation and to make effective decisions and plans. The execution of these plans has to be organised, managed, and monitored. The task of a command team is more complex when the information that is required is hard to obtain or difficult to process (managing information), or when the information is hard to interpret, making it difficult to get a clear perspective on the situation (assessing the situation). The complexity of the team task is also higher when finding a good course of action is critical but the method is unclear, and when there is high time pressure (decision-making). Complexity of the task may also increase when it is hard to formulate what needs to be done to reach the goals, when many activities in the plan are dependent on each other (planning), when it is hard to determine procedures, when there is a need to clarify the roles of different team members, or when there is a lack of feedback on the progress of the team (directing and controlling). Finally, task complexity may be enhanced by more complex relationships with other teams in the organisation with whom the team should be sharing information (liaising with other command teams). Therefore, many processes that are required to complete the task successfully can contribute to task complexity.

*Directing and Controlling / Liaising with Other Teams.* Complexity that results from the interdependent parts of several tasks necessitates a high need for communication between the commanders and sub commanders. There is considerable literature on the creation of self-managed work teams and on ‘mission command’, which deal specifically with the issue of how to function effectively under reduced levels of explicit communication. In self-managed work teams, much of the responsibility and authority that is usually vested in a leader’s position is delegated to the team members. This stimulates autonomy and as a consequence of that autonomy less task-related communication is necessary (e.g., Kuipers & Kramer, 2002). The same effects can be created by introducing the principles of mission command, in which commanders provide autonomy to sub commanders, who are in turn responsible for all the decisions about how to complete the assignments (Vogelaar & Kramer, 2004). When responsibilities are clear, commanders have only to assess whether their subordinates accomplish their assignments. Furthermore, when the assignments have been clearly bounded from other teams, the necessity to liaise with other teams is reduced.

*Managing Information / Assessing the Situation / Decision-making.* Increasing diversity of team roles (e.g., disciplines, member specialty represented in the team) increases the need for timely, accurate, clear, and synchronized communication in order to ensure that team members develop and maintain knowledge that is relevant or specific to task execution. Communication or exchanging information that is task-directed (involving plans, strategies, intentions, possibilities, explanations, warnings, and predictions) is beneficial for handling novel or difficult problems and is needed to develop a shared mental model of the problem. Task-directed communication also ensures that team members are able to interpret the communication and develop compatible explanations and expectations of the information and strategies needed (Stout et al., 1999, as cited by Rasker, 2002).

#### **Team-Focused Behaviours**

*Providing and Maintaining Vision.* A study by Brink (1996) found that college presidents (in their role as leader of a management team) had an important task as the primary interpreter. It was found that interpretation of the complex strategic issues facing the organisation had an effect on organisational outcomes. The cognitive abilities of presidents which were examined in relation to management team response certainty (i.e., perception of the organisation’s ability to respond effectively to strategic issues) are cognitive complexity, focusing attention, reducing uncertainty or ambiguity, and building consensus.



This underscores not only the importance of a correct assessment of a complex strategic situation, but also the importance of providing and maintaining vision in order to reduce complexity and to stimulate response certainty. Furthermore, Brink's study shows that three cognitive abilities of the leader – cognitive complexity, focusing attention, and consensus building – contribute to the top management team's perception of the organisation's ability to respond effectively to strategic issues.

*Maintaining Common Intent.* Cross-functional interdependence (one of the features of complexity) creates challenges for leaders who must co-ordinate the activities that need to be done. In teams where members have different functional backgrounds, team meetings have been found to be time consuming, and it can be difficult to get sufficient participation from members who also have responsibilities in a functional department and may be on more than one team (Denison, Hart & Kahn, 1996). The functional diversity of the members also increases communication barriers. Each function usually has its own jargon and ways of thinking about things. The functional subunits represented by team members often have different objectives, time orientation, and priorities. These differences tend to create conflicts.

Various potential conflicts may also arise as a consequence of the resulting ambiguity of multiple and concurrent tasks, i.e., who is responsible for what. These conflicts have to be dealt with adequately. It is important that team members know their own role and the roles of other team members. There are a number of models to enhance performance in situations in which the roles are not clear. Tannenbaum, Smith-Jentsch and Behson (1998) focus on the training of team leaders to facilitate team discussions before and after team activities, in order to maximize learning from those experiences and to enhance subsequent interactions and performance. The Team Dimensional Training (TDT) consists of four steps – pre-brief (to clarify mission, etc.), perform/observe, diagnose performance, and debrief. In these discussions the focus is on the ATOM-dimensions of teamwork (i.e., information exchange, supporting behaviour, communication, and initiative/leadership). The authors discuss the role of the team leader as a performance/learning facilitator, and present a cyclical model of team learning with a focus on post-action reviews. TDT is best used when a team is given (a) the objective and forum to discuss teamwork-related objectives, (b) sufficient time to conduct a thorough team debrief, and (c) the opportunity to have all key members participate. Minionis (1995) empirically tested the notion that teams that possess overlapping team mental models are more successful on an interdependent task than teams in which these mental models have not been shared. Analyses indicated that shared team mental models significantly enhanced coordinated performance.

*Interacting Within the Team:* Blickensderfer, Cannon-Bowers, and Salas (1998) investigated how team members anticipate each other's needs and co-ordinate their actions without overt communication. This included training strategies that would foster the shared understanding teams need to co-ordinate implicitly. They explicitly focused on cross-training. The lessons learned concerning cross-training are: (1) Cross-trained teams are better able to anticipate each other's needs (Volpe et al., 1996). Team members who become familiar with each other's knowledge, skills, and task requirements improve their ability to anticipate teammates' task, informational, and interpersonal needs; (2) Cross-training fosters interpositional knowledge (Cannon-Bowers et al., 1998). The positional rotation method of cross-training builds overlap in understanding of individual duties and responsibilities of team members. This is considered to be a building block for shared mental models. (3) Cross-training interventions should be designed on the basis of the interdependency requirements of the task. Only teams with high interdependencies should be given positional rotation, whereas teams with few interdependency requirements may need only basic knowledge of team structure. McCann et al. (2000) also studied the effect of cross-training on team decision-making under time stress. It was hypothesized that teams whose members explicitly experienced all team positions would perform better under time pressure. However, the cross-trained teams never reached the level of performance of the control teams.

As the diversity of roles or tasks, disciplines, and member specialty represented in the team increase, efficient and effective performance of intra- and inter-functional responsibilities depend on the degree to

which team members share a common set of task-related knowledge or experience. Shared task-related knowledge or experience is thought to improve team performance because it enables teams to form accurate explanations for a task using a common and sophisticated language, and allows members to co-ordinate actions and adapt behaviour to task demands, and to facilitate processing.

The amount of knowledge each member possesses concerning other team member duties contributes to higher degrees of overlap in understanding of their own and other members' tasks, effective coordination, and performance (Hemphill & Rush, 1952; Cream & Lambertson, 1975; Blickensderfer, Cannon-Bowers, & Salas, 1998).

*Motivating.* A task that is too complex for a team or its members negatively impacts their motivation. It is important that the team feels empowered to perform the task. A study by Spreitzer (1995) found support for the proposition that psychological empowerment includes four defining elements (see also Yukl, 2002): (a) Meaning: the content and consequences of the work are consistent with a person's values and ideals; (b) Self-Determination: the person has the capability to determine how and when the work is done; (c) Self-Efficacy: the person has high confidence about being able to do it effectively; (d) Impact: the person believes it is possible to have a significant impact on the job and the work environment. These four elements all are negatively influenced by tasks that are too complex for team members.

On the other hand, a task that is simple also has a negative impact on motivation, because it lacks possibilities for growth and autonomy (Hackman & Oldham, 1976; Vogelaar, 1990). There is an optimal level of complexity, depending on the level of experience and job longevity of the jobholders. The delegation of clear responsibilities and authorities to subordinates who are up to their tasks often has a number of potential advantages, including stronger commitment of team members to the work, improved quality, improved efficiency, more job satisfaction, and less turnover and absenteeism of employees (Yukl, 2002, p. 314).

### **6.2.2 Workload**

It is clear that workload is affected by the task characteristics that have been described previously. A complex task increases the workload. The same applies to the lack of clear goals and the lack of stable goals. The concept of workload is related to the concept of work stress, which is reviewed in the section on Mission Framework.

#### **Task-Focused Behaviours**

*Decision-making.* Jones and Roelofsma (2000) studied a number of biases that have an impact on team decision-making in general, but especially in situations that are characterized by time pressure and high levels of uncertainty. They note that command and control teams provide a clear instance in which these biases are possible. Jones and Roelofsma (2000) point out that the false consensus effect impairs decision-making in teams. This effect implies that people tend to see one's own behaviour as typical. People may make invalid assumptions about their own team member's anticipated behaviour. This means that team members can assume a shared mental model where one may not be present. Another bias that impairs decision-making is groupthink. Groupthink is a tendency for groups to produce poorly reasoned decisions, due to a perceived need for unanimity that results in the suppression of dissenting views. This effect is especially present in highly cohesive teams, in teams with strong leadership, in teams that are working under time pressure, and in teams in which important and complex decisions have to be made. Another effect is the escalation of commitment. This effect is a tendency to continue supporting a course of action, despite evidence that it may not be a viable option. This effect takes place in teams in which there is a strong pressure to 'save face' and to rationalise previous behaviour.

Task cohesion moderates the relationship between time pressure and quality of team decisions. Zaccaro, Gualtieri and Minionis (1995) found that high task-cohesive teams devoted more time to planning and

information exchange during the planning period, and communicated task-relevant information more frequently during the performance period than low task-cohesive teams. In examining high/low team cohesion as a function of time pressure, they found that low task-cohesive teams with high time pressure performed significantly worse than teams in the other 3 conditions.

*Directing and Controlling.* As discussed in a previous section, Adelman et al. (2003) studied how hierarchical teams adapted to increasing levels of time pressure. They found that team members initially adapted to increasing time pressure without showing any performance decrement by accelerating their cognitive processing, increasing the amount of their implicit co-ordination by sending more information without being asked and, to a lesser extent, filtering (omitting) certain activities. Skipping tasks in favour of more critical tasks may lead to ambiguity in terms of which tasks should be skipped and how the team should reorganise its members' activities when often-adopted procedures are not followed. In line with this research, Gladstein and Reilly (1985) found that a shift from decision-making under low time pressure to decision-making under high time pressure resulted in a restriction of information processing and increased stress, although there was no change in the centralization of influence within the groups.

### **Team-Focused Behaviours**

*Maintaining Common Intent.* As temporal workload rises, well-trained teams cope with the stress through internal mechanisms of decision-making, co-ordination strategy adaptation, and structural reconfiguration, in an effort to keep performance at a required level while maintaining stress below an acceptable threshold (Serfaty, Entin & Deckert, 1994). Shared team-related knowledge or experience can serve to mitigate the effects of stress. Also, team decision-making in natural environments depends on decision makers creating a causal model and using their knowledge to organise the problem, interpret the situation, and define what information is valuable for a solution. This enables speedy assessment, search, selection, and interpretation of relevant information, situation, and intentions of friend or foe – an advantage when faced with information overload. (Larkin, McDermott, Simon & Simon, 1980; Orasanu & Connolly, 1993).

*Interacting Within the Team.* Communication in the form of sharing information, along with setting goals, clarifying team member roles and responsibilities, and anticipating how to deal with high workload or unexpected events by agreeing to back up each other, results in the use of more efficient communication strategies under conditions of high workload during task execution, better performance, and shared mental models of each other's informational requirements (Stout et al., 1999; as cited by Rasker, 2002).

May and Schwoerer (1994) suggest that managers can design teams to minimize the stress and anxiety of team members by (1) providing teams with training on team building that emphasizes open communication and relationship building among members and (2) matching the team's job complexity and uncertainty with the member's skill level.

*Adapting to Changes.* Performing at acceptable levels while adapting to increasing work strain depends on the degree to which team members engage in contingency planning and maintain high levels of flexibility. In other words, adapting to dynamically changing conditions is an important characteristic of a reliable team; e.g., the team may have several organisational structures and can shift between them depending on whether the task environment is routine, high-tempo, or emergency. Furthermore, the team members should be sensitive to other members' workload and performance in high-tempo situations. Shared task-related knowledge, when obtained before potential problems are encountered, reduces the amount of cognitive resources needed under increased workload conditions when faced with an emergency. It enables each person to carry out his role in a timely, coordinated fashion, helping the team to function as a single unit with little negotiation of what to do or when to do it (Kraiger & Wenzel, 1997).

*Providing Team Maintenance.* A person who becomes emotionally upset will have more difficulty performing a task successfully, especially if it requires reasoning and problem solving. Emotional stress is

increased by unreasonable demands, uncontrollable problems, difficult interpersonal relations, dangerous conditions, and the risk of costly errors. People in such situations have more need for emotional support. Stress is reduced by showing appreciation, listening to problems and complaints, providing assistance when necessary, doing things to make the work environment more enjoyable, and buffering the person from unnecessary demands by outsiders (Elovainio, Kivimaeki, Eccles, & Sinervo, 2002; Cohen & Wills, 1985; Snyder, Lassegard, & Ford, 1986; Ilgen, Shapiro, Salas, & Weiss, 1987, Oser, McCallum, Salas, Morgan, 1989; McIntyre & Salas, 1995, as cited by Salas & Cannon-Bowers, 2000).

### **6.2.3 Goal Clarity and Goal Stability**

Goal clarity and goal stability are both characteristics that have an impact on the task-focused and team-focused behaviours that have to be performed by the team. Because of their obvious relationship they are discussed together in this section. Of note, readers with a more general interest in this topic should also consult the closely related Team Goals section towards the end of this chapter.

#### **Task-Focused Behaviours**

When goals are clear and stable, most of the task-focused behaviours of the team are focused on pursuing these goals. That is, the information seeking process is concentrated on how to reach the goals as efficiently as possible (managing information). Furthermore, the situation is assessed by clarifying: what is the situation now, where is the team going, and how can that be reached as effectively as possible (assessing the situation). The decision-making or planning that should take place is focused on performance strategies that are most effective in reaching the goals (decision-making and planning). The directing and controlling is focused on the steps that are necessary to go from the 'Ist' ('what is the situation now') to the 'Soll' ('what we are aiming for'); i.e., organising and managing the actions of subordinates and monitoring progress. Finally, relatively stable arrangements with other teams can be made (liaising with other teams).

These same task-focused behaviours are necessary when goals are not clear or when they are unstable, but in addition, much energy can be invested in the setting of the goals themselves. When goals are not clear, information has to be sought and exchanged in order to get as much clarity as possible. When goals are unstable, decision-making and planning have to be broader in scope so as to be adaptable to a wider range of possible outcomes. When the situation is uncertain, what the team needs to do can become ambiguous. For example, Cohen, Freeman and Thompson (1998) state that decision-makers must gauge the time available for collecting and analysing information and usually must act based on an incomplete picture of the situation.

#### **Team-Focused Behaviours**

*Providing and Maintaining Vision / Motivating.* Stable and clear goals put an emphasis on task-oriented and relations-oriented leadership. Task-oriented leadership is primarily concerned with accomplishing the task, utilising personnel and resources efficiently, and maintaining orderly, reliable operations. Relations-oriented leadership is primarily concerned with improving relationships and helping people, increasing co-operation and teamwork, increasing subordinate job satisfaction, and building identification with the organisation (e.g., Yukl, 2002, p. 65). The third type of leadership that can be distinguished is change-oriented leadership. This type of behaviour is primarily concerned with improving strategic decisions, adapting to change in the environment, increasing flexibility and innovation, making major changes in processes, products, or services; and gaining commitment to the changes (Yukl, 2002, p. 65). It is this type of leadership that is important in situations that need adaptability and flexibility. There is an abundance of research captured under the label of transformational leadership that studies the effects of providing vision. Transformational leadership captures four dimensions – idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration – that together have a strong impact on the motivation of subordinates (Bass & Avolio, 1990; Lowe, Kroeck & Sivasubramaniam, 1996).

The dimension of inspirational motivation includes communicating an appealing vision that not only provides direction but also attracts subordinates. Although it has been claimed that transformational leadership has universal relevance, a number of situational variables improve the likelihood of transformational leadership or enhance its effects on followers (Bass, 1996; Hinkin & Tracey, 1999; Pawar & Eastman, 1997). Examples include an unstable environment, an organic structure, an entrepreneurial culture, and dominance of boundary-spanning units over the technical core (Yukl, 2002).

*Maintaining Common Intent.* When goals are unclear or unstable, conflicts can arise in the perception of the situation and the tasks that need to be accomplished or in the decisions that need to be made. The model of Vroom and Yetton (1973) deals with the problem of leaders making decisions in different situations. A participative approach of decision-making is indicated when the manager does not have enough knowledge or information to make a good decision on his own and when acceptance of the decision is important, whereas this acceptance is not assured with an autocratic decision from the leader. The participation in the process improves the participants' understanding of what is aimed for and why it is important. Furthermore, it improves ownership of the final decision that has been made (Yukl, 2002). When all team members share the same problem definition, they can volunteer relevant information or strategies from their specialized perspectives, and interpret requests or commands unambiguously.

The more clarifying information that team members receive concerning the team goals and strategies, and team member key roles or actions, the more likely they are to develop shared problem or task models and engage in effective and efficient team processes. In other words, clarifying goals, roles, and strategies contributes to the use of more efficient communication strategies under conditions of high workload during task execution, better performance, and shared mental models of each other's informational requirements. Furthermore, it is possible to clarify each team member's roles and responsibilities, to share information, and to anticipate on how to deal with high workload or unexpected events, and to make agreements about backing each other up (Stout et al., 1999; as cited by Rasker, 2002).

*Motivating.* The setting of clear goals that are specific, measurable, ambitious, realistic, and time-limited has a motivating effect. The effects of setting these kinds of goals have been shown to improve productivity ten to twenty percent (Latham & Locke, 1991). The effects of goal setting have been ascribed to a combination of factors. Firstly, having challenging goals that are accepted as own goals stimulates team member effort. Secondly, goal setting focuses the attention on specific goals, so people try to find the most effective and efficient performance strategies. An important element of goal setting is the feedback from the task itself. People have to be able to measure how they are doing when trying to achieve the goals that they have set. Lack of feedback has a negative impact on both the motivation (Hackman & Oldham, 1976) and on the ability to find new and better task strategies.

Pritchard et al. (1988, 1989; see also Pritchard, 1990) developed an approach called ProMES (Productivity Measurement and Enhancement System) that is based on creating clarity of goals for the unit, and providing high-quality feedback. The idea is to give people the tools to do the work better while at the same time helping them feel a sense of ownership in the resulting system, and empowerment in determining important aspects of their work. One of the key elements in ProMES is feedback that is based on the objectives that the team should meet. People doing the work obtain regular, high quality feedback about how the team is doing with respect to the objectives that have to be met. The personnel in the team then use this feedback to develop plans for improving productivity, which results in increased likelihood of meeting the organisational objectives. There has been a considerable amount of research using this approach to measuring and improving organisational effectiveness (Pritchard, 1995). The results have indicated that the system can be developed in many different types of organisations doing many different types of work. The effects have proved to be quite strong.

Team goals increase motivation by affecting a task performer's perceptions of the relationship between acts and products, products and evaluations, and evaluations and outcomes. Goals at the team level, rather

than individual goals, contribute to less intra-group conflict and greater goal commitment and group performance quality (Tjosvold, 1991). Having clear team goals contributes to the use of more efficient communication strategies during task execution, better performance, and shared mental models of each other's informational requirements. Furthermore, clear team goals are consistent with behaviours that seek to clarify each team member's roles and responsibilities, sharing information, and anticipating how to deal with high workload or unexpected events, and making agreements about backing each other up (Hemphill & Rush, 1952; Cream & Lambertson, 1975; Blickensderfer, Cannon-Bowers, & Salas, 1998).

*Providing Team Maintenance.* Team goals as a form of organisational direction – context setting (i.e., clarity of the strategy, alignment of team and organisational goals, goal measurability and specificity) contribute to teams developing a shared understanding of priorities and work to be done, and to team effectiveness outcomes. Team leaders should be able to maintain team focus on stated goals. Interventions designed to train teams in setting goals, result in teams exhibiting higher levels of cohesiveness and perceived success while expressing reduced levels of conflict.

### **6.3 ORGANISATION EFFECTS**

This section examines team effectiveness in terms of the relation to the organisation within which it is operating. Although there is a vast organisational psychology literature that focuses on the functioning of organisations per se, there is very limited research on the specific topic of team effectiveness as related to the organisation. This should not serve to diminish the significance of this relation but rather to highlight the need for research in this domain. Accordingly, the aim of this section is to review the more critical organisational influences on team effectiveness. Moreover, other sections in this chapter, notably Leader and Team, provide additional information relating the team to the organisation. Accordingly, readers with more general interests in the relation between team effectiveness and the organisation are encouraged to consult those sections as well.

#### **6.3.1 Congruity between Assigned Mission and Organisational Goal**

A study by Wageman (1999) examined the impact of how organisations set and communicate direction for teams. The variables examined encompassed related elements in the organisation's direction-setting context: the clarity of the organisation's strategy, the alignment of individual team and organisational goals, and the measurability and specificity of those goals. Wageman also examined goal-setting processes in teams. The findings were based on a study of 108 teams from 26 businesses in 7 Fortune 500 companies. Results showed that contextual and process direction-sharing variables positively contributed to teams developing a shared understanding of priorities and work to be done, and also contribute to effectiveness outcomes. Developing a shared understanding contributes strongly to team effectiveness, but not to other effectiveness outcomes. Different direction setting variables relate to different aspects of effectiveness. The findings shed light on the nature of organisations that perform complex knowledge tasks and are designed to work laterally through teams. They also provide some evidence of the difficulty of the transition from a traditional hierarchically-oriented system to a team-based organisation.

#### **6.3.2 Complexity of Command Structure**

There is a paucity of studies directly examining the role of organisational complexity on the effectiveness of teams within that organisation. Only two studies are notable in this context. First, according to Crowley (2001), organisations can change their structure by introducing self-managed teams (SMT). Moreover, global cross-cultural comparison showed that team effectiveness of these SMTs is influenced by cultural factors. Second, a study by McIntyre (1996) examined the relations among Upper Management, Networking, Working Relationships, Decision-Making Process, and Decision Quality. All five factors were found to be significantly related to team member perceptions of effectiveness, but only two –

Relationship with Upper Management and Networking – were significantly related to upper management perceptions of effectiveness.

### **6.3.3 Autonomy**

Hackman and colleagues suggested in the '70s and the '80s that increasing task autonomy leads to positive work outcomes. Since then, considerable research has been devoted to team autonomy. Guzzo, Jette, and Katzell (1985) found that the introduction of self-managing teams (SMTs) had a moderate impact on productivity. Beekun (1989) also found that SMTs resulted in productivity improvements. Macy, Bliese, and Norton (1991) also found positive impacts of SMTs, taking into account hard measures of productivity, costs, and defects. Several effectiveness studies are based on the comparison of traditional teams with SMTs (Beekun; 1989; Cohen & Ledford, 1994; Guzzo & Dickson, 1996) to evaluate the effect of work autonomy. They found that self-managing teams performed better than traditional teams.

Sundstrom, de Meuse and Futrell (1990) have shown team effectiveness to be interdependent with organisational context, boundaries, and team development. Key context factors include (a) organisational culture, (b) technology and task design, (c) mission clarity, (d) autonomy, (e) rewards, (f) performance feedback, (g) training/consultation, and (h) physical environment.

Janz, Colquit and Noe (1997) investigated how autonomy, interdependence, and team development, along with process and contextual support variables, were related to the effectiveness of teams comprised of 231 knowledge workers from 27 work teams. Results found that interactions among design, process, and contextual support factors have important implications for team effectiveness.

In sum, most studies that address the concept of autonomy arrive at the same conclusion, which is that autonomy increases effectiveness.

#### **Task-Focused Behaviours**

*Managing Information.* According to Haas (2002), the more autonomy a team has, the better it can deal with distributed knowledge from within and beyond the organisation, and hence can improve the quality of the product.

#### **Team-Focused Behaviours**

*Managing Conflict.* Findings of a study with 61 self-managing teams suggest how organisational teams can be prepared to make use of their autonomy to deal with problems and conflicts so that they are productive (Alper et al., 2000).

### **6.3.4 Organisational Support**

Roberts (2002) investigated performance measurement, feedback, and reward processes in research and development work teams. Results showed that specific types of rewards were unrelated to performance although some evidence suggested that business unit rewards were superior to team and individual rewards. Hilgermann (1998) showed that a clear understanding of the rewards for reaching goals was particularly linked to team effectiveness.

An effective team is one in which development of a supportive social structure has occurred, with each individual adapting his behaviour to optimise his personal contribution to the team (Sheard & Kakabadse, 2002).

Hall (1999) studied relationships between organisational support and effectiveness, empowerment, and team characteristics. Support was operationalised by nine systems: executive management, direct

supervision, group design, performance definition, performance review, training, rewards, information, and integration. Support was rated in two ways: how important is support for performing work (Importance scales)? and how does support describe work environments (Presence scales)? Correlations indicate low relationships between importance and effectiveness. A low relationship was found between important executive management behaviours and effectiveness. High correlations between importance scales suggest that alignment between systems is an important component of supportive organisational contexts. Importance and presence scale comparisons suggest that organisations are providing less organisational support than ideal. Group design and defining performance had the highest means for both Importance and Presence scales. Employees were least satisfied with rewards and executive management support. Organisations may have the most difficulty implementing these systems. Organisational support was directly related to perceived empowerment and effectiveness. To ‘empower’ employees and increase effectiveness, organisations might implement supports studied in this research.

Past research has shown the importance of supportive organisational structures and team design for enabling team effectiveness (Edmondson, 1997). However, organisations that reported using teams [organisations with multiple departments, multiple divisions, higher sales, and more employees] did not necessarily support them in terms of team-level performance feedback or compensation practices (Devine, Clayton, Philips, Dunford, Melner, 1999).

Janz, Colquitt and Noe (1997) investigated how autonomy, interdependence, and team development, along with process and contextual support variables, were related to the effectiveness of teams. Results found that interactions among design, process, and contextual support factors have important implications for team effectiveness. The results also demonstrated that the relationship between job motivation and team process behaviours was more positive in teams who were developmentally mature. Process behaviours were positively related to effectiveness, but those relationships became more positive in the presence of certain contextual factors.

Finally, the results of a year-long study using 3 psychiatric wards show that feedback may enable a treatment team to increase their effectiveness, but an increase does not always occur. At least 3 conditions seemed necessary for feedback to enhance team effectiveness: (a) identification of strategy, (b) persistence and ability to change, and (c) institutional support (Ellsworth, 1973).

## **6.4 LEADER EFFECTS**

There is a substantial body of research that demonstrates the positive impact an effective leader can have on (multicultural) team performance of (e.g., Hogan, Curphy, & Hogan, 1994; Salas et al., 2004). The leader shapes team members’ understanding of the task (Weick, 1993; McCann & Pigeau, 2000), directs and influences member task behaviour (Marks, Zaccaro, & Mathieu, 2000), and mediates resource and information flow with the larger organisation. The leader’s influence may be realized through direct influence on the team product or through facilitation of the best-possible performance of team members, individually and collectively. There are many types of leaders, and many models of leadership have been proposed (e.g., see Northouse, 2004). In addressing the leaders of command teams, we have chosen to address the assigned leader, i.e., the person who is designated by legitimate authority as having immediate responsibility for the performance and outcome of individual team members and of the team as a whole. We assume that this assigned leader (who may be a Commander of a unit, a staff section head, etc.) will need to fulfil both the interpersonal aspects and the task-oriented elements of a leader’s role. The aspects of the leader considered in this framework are leader skills, knowledge, and alignment of the leader’s personal goals and the organisational goals. In this section we will discuss portions of the available scientific literature on the influence of the leader on task and team effectiveness as mediated by the key processes identified in our model.



As with other aspects in our CTEF model, we are not considering leadership as an Input in a set of Input-Process-Output (I-P-O) factors. Rather, we are describing a more dynamic ongoing set of relationships wherein, for example, the leader's behaviour not only influences outcome via process, but Process and/or Outcome will influence the conditions within which the team and leader are performing. Over time, the role of the leader and his or her interactions with team members may be expected to change. This approach is consistent with an emerging view (Ilgen, Hollenbeck, Johnson, & Jundt, in press) that a leader brings certain leadership skills and competencies to a team that are used to influence core processes, such as transition (e.g., strategy formulation), action (e.g., coordination), and interpersonal processes (e.g., conflict management) (Marks, Mathieu, & Zaccaro, 2001). Enhanced team processes are causally associated with team performance.

Although I-P-O models of team performance have served as a useful heuristic for conceptualising the pivotal role of team processes in addressing issues of team performance, they also have distinct limitations. Perhaps the most important of these is that the notion that outcome implies a final end state. In terms of the ongoing nature of leadership, team processes, and performance, it must be understood that whereas team performance might be an output for one time period, it is an input and part of the process leading to performance in a subsequent time period. (Ilgen et al., in press)

It is important to note a growing trend in the research literature that views leadership as an emergent set of processes or roles within a team (Zaccaro, Rittman, & Marks, 2001). From this perspective, leadership would be most appropriately considered at the team level of analysis because it is not tied explicitly to one individual within the team. From a traditional perspective, however, leadership is mainly conceptualised in terms of individual leader personality attributes, skills, abilities, and behaviours. These leader 'attributes' influence individual and team performance through the leadership influence process. Leadership processes can help align individual needs, goals, and expected outcomes across individuals (Van Velsor & McCauley, 2004). Instead of a set of independent (and possibly misaligned) individual identities, the leader can help team members to conceive of themselves in collective terms and allows for the identification of the needs of the team, collective goals, and expected team outcomes (Ellemers, de Gilder, & Haslam, 2004). Leader behaviours and actions are reflected in the team members' behaviours and actions; behaviours of the leader promote similar behaviours in team members (LaJoie & Sterling, 1999). The creation of a collective (i.e., team-based) identity serves as a potent leadership resource for subsequent performance. For example, one of the functions of the team leader is to facilitate leadership emergence within the team so that the team may adapt as task demands exceed the capacity of a single leader. To the extent that sub-tasks (or team functions) temporally overlap, a team can have multiple individuals in a leadership role simultaneously. In these cases, it is the role of the team leader to ensure harmonious functioning within the team and to reconcile situations where multiple leadership roles impinge on the team's performance. We have maintained a more traditional, static focus on distinct roles for leaders and team members in our model, but caution that the notion of emergent dynamic leadership processes points to a level of complexity that may need to be taken into account in future versions of the team effectiveness model.

#### **6.4.1 Leader Skills and Knowledge**

With respect to the leader's attributes, we are concerned both with the leader's abilities as they relate to the military task at hand and with the leader's abilities as leader of the team. Field Manual 22-100 (FM 22-100, 1999), which is the United States Army's doctrine on leadership, indicates that military leaders must be both technically and tactically proficient, possess the cognitive skills to think critically and creatively, and demonstrate the interpersonal skills to deal with team members.

Tactical skills are those skills needed for solving tactical problems, that is, problems concerning employment of units in combat. Military leaders must possess the requisite tactical skills in order to perform effectively on the battlefield (Fallesen, 1993), but they also need those skills in order to develop the skills in subordinates at lower levels in the military hierarchy (FM 22-100, 1999).

Technical skills are job-related abilities. They include basic soldier skills, such as operating equipment. The leader must possess the expertise necessary to accomplish all tasks and functions assigned. FM 22-100 (1999) indicates that technical skills are a core component of leadership, and clearly the leader must possess some technical skills in order to monitor the performance and progress of team members. However, technical skills (and tactical skills, for that matter) might be important to leaders for another reason. Subordinates who believe that their leaders are experienced and knowledgeable are more likely to be influenced by their leaders (Yukl & Falbe, 1991). Moreover, subordinates who perceive their leaders to have expertise are more likely to be committed to their tasks and rate their leaders as more effective (Yukl & Falbe, 1991).

Interpersonal Skills include the leader's ability to engage in productive interactions with their team members. Such skills include a host of leader activities, such as coaching, teaching, counselling, communicating, and motivating. Social judgment also has been found to be a predictor of leader performance in military cadets (Bartone, Snook, & Tremble, 2002), and the leader's interpersonal competence plays an important role in team performance. For example, leader coaching has been linked to group performance (Kureca, Austin, Johnson, & Mendoza, 1982) and team preparation (Edmondson, 2003).

One avenue of research relevant to the discussion of interpersonal skills stems from the Ohio State Leader Studies (see Judge, Piccolo, & Ilies, 2004). In the Ohio State Studies, two dimensions of leadership emerged—initiating structure and consideration. Initiating structure refers to the extent to which leaders define the various roles of team members, establish clear goals, and determine and communicate methods to achieve those goals. Although initiating structure may be classified as task or goal-driven, it should be noted that the activities of defining team member roles and communicating subordinate and team-level goals are largely interpersonal in nature. Conversely, consideration is more person-focused and refers to the extent to which the leader provides emotional support and treats subordinates in a courteous and respectful way. Both initiating structure and consideration behaviours are predictive of group and organisational performance (Judge et al., 2004), although initiating structure might be a slightly better predictor. It also should be noted that the initiating structure and consideration dimensions sometimes make appearances as constructs with new names, and these constructs also are linked to team-relevant variables. For instance, consideration has become part of the construct of transformational leadership, which has been linked to team performance (Lim & Ployhart, 2004). As another example, West, Borrill, Dawson, Brodbeck, Shapiro, and Haward (2003) conducted a study that indicated teams with greater leader clarity were more innovative and had better team processes. The authors defined team clarity as team members having certainty about which individual was responsible for coordinating team activities, a description that sounds similar to a leader high in initiating structure.

A team leader who is deficient in either initiating structure or consideration may be able to compensate by delegating direct oversight of team members to a trusted subordinate with better skills in these areas. Leadership researchers and theorists going back to Bales and his colleagues in the 1950's (e.g., Bales, 1954; Bales, 1958; Hare, Borgatta, & Bales, 1965; Northouse, 2004) have highlighted two roles for team leaders: task leadership and socio-emotional leadership. These are typically seen as distinct roles, fulfilled by different persons. Most often the assigned leader will fill the task leader role while his or her deputy, or an emergent leader from within the team, will fill the socio-emotional role, though sometimes this pattern is reversed. A general finding is that if both roles are not fulfilled, the effectiveness of the team can be compromised (e.g., Hunt, 1971). In a military unit there is a potential to introduce ambiguity into the authority structure when the roles are implicitly split between two or more persons, and leaders should be aware of the need to maintain explicit role definitions that subordinates understand.

Cognitive Skills enable the leader to handle ideas. They involve sound judgment as well as the ability to think creatively and reason analytically, critically, and ethically. Logical reasoning is a significant predictor of leader performance (Bartone et al., 2002) and the cognitive attributes of a leader appear linked

to team-level variables as well. Taggar, Hackett, and Saha (1999) found that emergent leaders in teams tend to be those who are high in cognitive ability (as well as the interpersonal attributes of conscientiousness and emotional stability), and that teams perform best when both leaders and team members are high in these attributes. Another study conducted by Kickul and Neuman (2000) produced similar results; emergent leaders tended to be high in cognitive ability, and conscientiousness and cognitive ability were predictive of team performance.

### **Task-Focused Behaviours**

*Managing Information.* The leader in a command staff team typically establishes a set of priorities for information he or she expects to receive in support of decision-making and situation assessment, and the tactical knowledge of the leader might play a role in prioritisation. For example, Serfaty, Macmillan, Entin, & Entin (1997) indicated that individuals with tactical expertise were better able to judge the complexity of the situation, identify what they needed to figure out, identify potential problems, and anticipate changes in the environment. The leader's priorities directly impact situation assessment and information management processes with the result that, when clear priorities are set: (a) situation assessment is more focused on issues which may directly affect the team's mission; (b) the team members who are responsible for situation assessment and information management will feel a stronger sense of purpose and identification with the team and larger organisation; and (c) more effective use is made of information collection resources (Marks, Zaccaro, & Mathieu, 2000; Phelps, Halpin, & Johnson, 1981).

Leaders also are often a central player in intra-team communication, functioning as a primary conduit of information into, out of, and within the team. Leaders also provide a frame of reference within which information is interpreted within the team (Hinsz, Tindale, & Vollrath, 1997). The extent to which leaders effectively manage information flow within a team has implications for the ability of the team to perform effectively (Cummings & Cross, 2003).

*Planning and Decision-making.* There is little direct research on the impact of leaders on processes such as planning and decision-making. Most research on these processes has focused on the processes per se and not on the possible role of a team leader in guiding the processes. For example, Fallesen and Pounds (2001) showed that training cognitive skills of leaders can improve tactical problem solving by the leaders themselves, but did not address the role of those leaders within their teams. As mentioned above, the work by Bales and his colleagues (Hare, Borgatta, & Bales, 1965) and similar work has shown the need for a task-oriented team leader to provide structure to facilitate effective processes. More recent work by Weick (1993) suggests that the leader plays a broad necessary role in 'sense making', helping subordinates make sense of the team's task and goals.

Work by Thamhain (2004) indicated that clearly defined goals and objectives are positively related to team performance, while Marks, Zaccaro, and Mathieu (2000) demonstrated that when team leaders lead their teams through planning processes prior to performance, the teams performed better. Ancillary benefits also accrue in terms of increased effectiveness of communication, as well as in shared understanding of the task and how the team is to function. Kane, Zaccaro, Tremble, and Masuda (2002) described how leaders structure and communicate task performance strategies to team members in order to maintain a common approach to performance.

*Directing and Controlling.* Effective team leaders choose when to participate in team activities, when to direct others in their activities, and when to sit back and observe. The leader's monitoring may well be one of the most crucial aspects of team performance as it enables adaptive team behaviour, both with respect to task performance within the team and with respect to goal attainment within the larger organisation. Leaders perform a critical function within the team of structuring and standardizing the model for intra-team interactions and behaviours, including monitoring others' performance and providing support and back-up to team members as necessary (Burke, 2000). Fleischman and Zaccaro (1992) pointed out that

there are two dimensions related to monitoring: systems monitoring (monitoring task progress and events in the environment), and performance monitoring (monitoring performance of teammates in order to coordinate activities and provide supporting behaviours as necessary); the effective leader will address both of these dimensions. Rasker, Post, and Schraagen (2000) showed that performance monitoring is one key aspect of back-up behaviours, and teams that engage in performance monitoring are, in general, more effective than teams that do not. Komaki, Desselles, and Bowman (1989) also indicated that monitoring performance and providing feedback is associated with team effectiveness.

*Liaising with Other Teams* (boundary spanning). Another of the critical functions of team leaders is to provide a liaison point with organisational units outside the team (Ancona & Caldwell, 1992). Although other members in addition to the team leader may serve in this boundary-spanning role, this is an essential function of leadership within the team. Moreover it is the role of the team leader to manage the boundaries of the team – defining the team boundaries, flexing the boundaries as necessary for team performance and survival, and coordinating activities with groups and individuals external to the team (Ancona & Caldwell, 1988).

### **Team-Focused Behaviours**

*Providing and Maintaining Vision.* Sensemaking is important not only for directing and coordinating team member task behaviour, but it plays a role as well in building and maintaining a team's sense of identity and purpose (Weick, 1993). Hogan, Curphy and Hogan (1994) noted that "... leadership concerns building cohesive and goal-oriented teams; there is a causal and definite link between leadership and team performance." Similarly, Burke (2000) showed that leaders perform a critical function within the team of interpreting environmental events and demands, and standardizing the model for intra-team interactions and behaviours.

*Maintaining Common Intent.* Shattuck and Woods (2000) showed the critical role of a commander in establishing subordinates' understanding of the mission and intent within a military unit. Those subordinates with a more detailed and accurate understanding of their commander's intent were better able to cope with unexpected variability in the task (e.g., attack from an unanticipated direction). Shared understanding goes beyond a task-focus, however. Articulating a vision is positively related to value congruence between leader and subordinate, as well as inspiration and trust in the leader (Kirkpatrick & Locke, 1996). In a similar vein, it has been shown that leaders play a critical role by establishing a common framework not only for understanding the task and environment, but also norms and standards for interactions within the team (Marks, Zaccaro, & Mathieu, 2000; Burke, 2000). This is most critical in task environments where teams are required to adapt to novel or changing circumstances on a regular basis.

*Interacting Within the Team.* Leaders establish the model for how other team members should behave and interact with their fellow teammates (Marks, Zaccaro, & Mathieu, 2000) and leader behaviours promote similar behaviours in team members (LaJoie & Sterling, 1999). There is some discussion in the literature of the necessary leader attributes to support effective leader intervention in team process; for example LaJoie and Sterling (1999) noted that the leader must be emotionally intelligent enough to know when members' perceptions differ.

*Motivating.* It has been proposed that leaders who are able to assess and influence the motives and emotions of team members have teams that are more motivated and perform better than teams with emotionally incompetent leaders (Prati, Douglas, Ferris, Ammeter, & Buckley, 2003). Although little empirical work has examined the role of leader emotional intelligence in team performance, some research suggests that emotionally competent leaders tend to have subordinates who are more satisfied and engage in extra-role behaviours (Wong & Law, 2002).

Other research has found that both consideration and initiating structure behaviours on the part of the leader have a positive impact on follower motivation (Judge et al., 2004). There is also an indication that transformational leader behaviours (e.g., intellectual stimulation, consideration, and communicating a vision) are positively related to empowerment, which in turn is related to collective efficacy and perceptions of group effectiveness (Jung et al, 1996; Sosik, Avolio, Kahai, 1997; Jung & Sosik, 2002). However, there is relatively little empirical evidence to strongly support the role of the leader in motivating team members, nor in the impact of motivation on team performance.

*Adapting to Changes.* The reader is invited to review the previous discussions of the leader's role in structuring and organising team task performance, and the leader's role in sensemaking (Day, 2000; Day et al., in press). Both of these aspects of leader behaviour would seem to directly contribute to a team's ability to adapt to changing conditions. In addition, leader coaching has been linked to group performance (Kureca, Austin, Johnson, & Mendoza, 1982) and team preparation (Edmondson, 2003). There is also evidence that leaders who encourage team members to voice their opinions, help team members to resolve their conflicts in constructive ways, and create a climate of mutual respect tend to have teams that engage in reflection and are better performers (Hirst, Mann, Bain, Pirola-Merlo, & Richver, 2004).

*Providing Team Maintenance.* To the extent that leaders have control over distribution of workload and incentives, leaders can have significant impact on a variety of factors that contribute both to team effectiveness and to the longer-term viability of the team. Such factors include willingness to cooperate within the team (Sinclair, 2003) and trust (Dirks, 2000). Leaders may be able to earn the trust of their subordinates by treating subordinates in a fair, respectful, and considerate manner, satisfying subordinate expectations, and including subordinates in decision-making activities (Dirks & Ferrin, 2002). LaJoie and Sterling (1999) showed that effective leaders promote trust in team members by allocating important responsibilities to team members.

#### **6.4.2 Matching Personal Goals with Organisational Goals**

There is very little empirical evidence on the impact of a match or mismatch of personal and organisational goals. However, there is strong anecdotal evidence that a mismatch of goals will cause severe strains on the individual (e.g., Dallaire, 2000; Everts, 2000). The leader, in the role of 'sensemaker', can work to alleviate the perceived mismatch for team members, but the leader himself or herself will be subject to similar or greater strain. Thus it seems that leaders whose personal goals match the relevant organisational goals will be more effective. One study of engineering project teams defined leadership as including four types of behaviour: communicating project goals, creating a 'good work ethic', promoting perceptions of empowerment, and aligning individuals' goals with team goals (Ammeter & Dukerich, 2002). They did find that leadership was related to both objective and subjective measures of team performance, implying a positive impact of goal alignment though the reported analyses do not make this clear.

If we think of organisational values as the instantiation of cultural values and ethical precepts, then we would expect that the 'value based' or transformational leader (Bass & Steidlmeier, 1999) would be more effective. Bass and Avolio (2000) showed that transformational leaders did achieve greater success as leaders of small army units in realistic tactical exercises, and some research suggests that leaders who engage in moral and ethical reasoning are more likely to be perceived as transformational leaders (Turner, Barling, Epitropaki, Butcher, & Milner, 2002). Thus, to be effective, leaders must be seen to be working within the 'proper' higher order framework.

#### **Summary**

There is a strong recognition of the important role team leaders play in guiding and shaping the behaviours of team members. Leader behaviours have been broadly characterized as task- or team-focused, but much

of the research in the literature does not explicitly maintain this distinction. Despite a huge literature on the attributes of effective leaders (e.g., Northouse, 2004), there is relatively little exploration of the impact of variations in leader skills or knowledge on team processes or performance. While it is expected that effective leadership requires a general moral and ethical congruence between leader and larger organisation, as well as detailed similarities in the leader's and organisation's goals, there is little empirical evidence on the impact of these factors.

## **6.5 TEAM MEMBER EFFECTS**

The research literature strongly indicates that the competencies of an individual or team member will have significant bearing on team processes, through both task and team focused behaviours (Thordsen et al., 1994; McIntyre & Salas, 1995). Through the impact on team and task processes, the individual can also affect the effectiveness of the team via task outcomes and team outcomes. This sub-section will discuss how each of the team member competencies (i.e., their skills, knowledge and personal goals) influences team performance and effectiveness.

### **6.5.1 Team Member Skills**

To date, research has indicated that team effectiveness requires individual team members to acquire a certain level of competence in their specific assigned tasks. Furthermore, the acquisition and mastery of individual task skills is 'a necessary condition for serving as an effective team member' (McIntyre & Salas, 1995).

#### **Task-Focused Behaviours**

Studies of the relationship between task-relevant abilities of team members and team performance usually assess the task proficiency of individuals, assigns them to teams with different levels of proficiency, and then assess and compares the performance of each team. The results of these studies generally indicate that a team composed of individuals with high levels of task specific skills, will show greater performance (Comrey & Staats, 1955; O'Connell et al., 2001). Likewise, O'Brien and Owens (1969) found that for a co-ordinated task (similar to those tasks conducted by a command and control team), individual group member skills strongly influence task performance.

Furthermore, the effects of individual skills on the effectiveness of the team can be observed in the task outcomes. Kabanoff and O'Brien (1979) and Tziner and Eden (1985) found that the accuracy and speed of team performance were positively related to the average skill level of individual team members. Teams comprised of members with high individual skills reached criterion performance with less training than those teams whose members had average or poor individual skills.

*Managing Information:* Kozlowski (1998) refers to the importance of individuals possessing 'skills of self-regulation,' which include the ability to monitor and adjust one's cognitive and behavioural strategies. He suggests that when individuals possess these skills, they are better equipped to manage information more effectively. When new data are presented, individual team members are better able to process this information and adapt their cognitive and behavioural thinking strategies as required.

Wickens (1992) also discusses the importance of individual cognitive skills to better manage information. Improving perceptual skills should enhance an individuals' ability to manage information through recognition, identification and categorisation of data. Furthermore, Wickens claims that these perceptual skills, through managing information, can be used effectively to detect particular problems or events.

Likewise, Klein and Pierce (2001) place great emphasis on the skills of the team member within an adaptive team with regard to attention management. They argue that the management of attention and data collection, in order to provide the most diagnostic data, will be directed by an individual's perceptual

capabilities. Furthermore, Klein and Pierce suggest that, with enhanced attention management skills, the team will have greater awareness of its information needs, and a better ability to maintain and share information. Additionally, these teams will then be better able to recognise the limitations of predetermined information collection plans, such as Critical Command Information Requirements (CCIRs), which are prone to change throughout the duration of an operation.

*Assessing the Situation:* Pascual et al. (2000) conducted a series of experiments examining the effects of experience on developing shared mental models with Police Armed Response Units. Within this study, the researchers found that where team members held more experience with regard to tactical and technical skills, the team within which they operated were rated as 'more effective' in assessing the situation (i.e., extrapolating information, organising this information, and making future predictions from this information). In addition, those teams that performed better in the tasks of containment and casualty evacuation, contained team members who were rated as having superior cognitive skills (e.g., the ability to think and reason analytically and critically).

*Decision-making:* Zsombok (1993) claims that there are three components which equate to effective decision-making: team identity; team conceptual level; and team self-monitoring. It is within the last two of these components that emphasis is placed on the importance of team member skills. Zsombok refers to a requirement of a certain level of ability (i.e., skill) of team members to think and solve problems in a given task environment. In particular, individuals possessing these skills will be better able to make decisions and deal with gaps and ambiguities. However, Zsombok states that effective team decision-making relies on the metacognitive skills of its team members.

### **Team-Focused Behaviours**

The influence of individual skills on team performance will also extend to influence the team focused behaviours. For example, team members with better requisite skills for a task will have to devote fewer cognitive resources to complete the task; the remainder can be used to provide vision and motivation, interact with other team members and provide team maintenance. In addition, as the interpersonal skills held by the team member improve, this should result in the team being better able to maintain common intent, communicate, co-ordinate and provide feedback (interacting with the team) and to motivate. However, there appears to be a gap in the research in relation to the impact of team member skills and their impact on team-focused behaviour.

*Maintaining Common Intent / Interacting Within the Team:* Research in the UK examined factors that influenced the effectiveness of formulating, disseminating and interpreting commander's intent. One of the critical influencing factors was the interpersonal skills held by the commanders and team members. A survey of the UK military in relation to factors that enhance a commander's intent process include: good communication skills (i.e., clarity and brevity); the ability to inspire and motivate others, and creating an open-climate whereby others are encouraged to seek clarification on ambiguities and concerns (Catchpole et al., 2002).

### **6.5.2 Team Member Knowledge**

As with team member skills, individual knowledge has an influence on the performance of the team, through both task focused and team focused behaviours, which in turn impacts on the team's effectiveness. Knowledge can be measured objectively, using tools/instruments such as intelligence test scores and military and/or academic course grades, or subjectively, using peer ratings of intelligence and competence (Hill, 1982). The research that has examined the relationship between knowledge and performance has viewed knowledge as an entity that can either:

- be combined in an additive fashion; or
- be combined synergistically (i.e., jointly / co-operatively).

Bouchard (1972) combined intelligence in an additive manner, and found that individual member intelligence could be used to predict the group performance when conducting a creative task. He concluded that performance is increased in proportion to the ability levels of the team members. Therefore, those teams whose members have high levels of individual intelligence would perform well. Rohrbaugh (1981) combined intelligence levels synergistically and found that team performance was higher than that predicted by an additive combination of intelligence levels.

### **Task-Focused Behaviours**

Research suggests that the knowledge, skills, abilities and experiences that members bring to the task help define the maximum level of group performance (Steiner, 1972). For example, on an intellectual task, for which there exists a single correct answer, group performance is determined by the resources of the most capable member (as established by Laughlin, 1980). On other types of tasks, performance levels may be limited by the average member of the group, or even by the least capable member of the group (Hackman and Morris 1975; Steiner 1972).

Tziner and Eden (1985) examined effects of individual ability and knowledge on performance in three-person tank crews. The results indicated that abilities seem to have an additive effect in teams that were heterogeneous in terms of knowledge and ability. Teams that were uniformly high in knowledge and ability performed considerably better, and teams that were uniformly low performed considerably worse than anticipated, on the basis of team member abilities. Thus, they concluded that the knowledge and ability of a given team member ‘influenced’ crew performance effectiveness differently, depending on the ability levels of the other two members. These findings suggest that in complex interactive tasks, combinations of team members with uniformly low ability levels should be avoided; maximum performance can be expected when all team members are selected to have high ability levels (Morgan and Lassiter, 1992).

It would appear that specifically for co-ordinated tasks (where team members contribute independently to the team's performance of the task), the knowledge and ability of the least able member seems to predict the team's performance. For collaborative tasks, the task proficiency of the most able member, or the sum of team member task proficiencies, seems to predict team performance (Morgan & Lassiter, 1992).

*Making Decisions:* Herman (1963) found that during times of stress, decision-making tasks often shift to the higher levels of the hierarchical structure within a team: the decision requires drawing knowledge from the more experienced individuals to ensure subsequent team effectiveness. Furthermore, theories of Naturalistic Decision-making (NDM) place significant emphasis upon the individual's knowledge and experience to make intuitive decisions (Klein et al., 1992).

*Planning:* Zsombok (1993) states that it is critical for individuals to have knowledge of their fellow team members, including an understanding of the task responsibilities and accountabilities of every team member. This shared knowledge and understanding enables teams to plan their moves, anticipate what can or should occur when circumstances change, and react accordingly. Zsombok concluded that without this more detailed knowledge, team members cannot assess whether the functions assigned to specific roles (people) are even being accomplished, let alone addressed at the level of quality required to meet the team goal.

*Directing and Controlling:* Zsombok (1993) suggests that as teams develop their knowledge of their fellow team members (referred to as the role and function definition process), they recognise the need to highlight pertinent aspects of these roles and to therefore emphasise how they relate to the task at hand. The advantage of team members having a higher level of knowledge of the team can lead to benefits, including:

- capturing any changes affecting team performance that may have evolved as the team progresses in its work;



- identifying shifts in a situation which calls for the reassignment or expansion of tasks;
- assigning team members to handle these new tasks;
- profiting from the resource of 'buried' expertise where team members have real-life experience relevant to a team task which is outside their assigned role.

*Liaising With Other Teams / Managing Information:* Pascual et al. (2000) found that Armed Response Police teams whose members contained more knowledge and service years experience, liaised more often with other command teams within the Police command structure. Yet the research found that not only was the level of contact greater than that of the less-experienced teams, but the quality of contact (in terms of accuracy and timeliness of information passed) was also far superior. The research concluded that individual knowledge and experience enabled teams to predict the quantity and type of information to be passed to other command teams.

### **Team-Focused Behaviours**

*Adapting:* As stated earlier, Zsombok et al. (1993) note that it is critical for individuals to have knowledge of their fellow team members, including understanding the task responsibilities and accountabilities of every team member. They argue that this knowledge is crucial to all team members to adjust and support each other when the need arises.

Models of team behaviour have also shown that the more knowledgeable individuals are about each other, and the role they each conduct, the better they will be able to perform each others jobs; this provides greater versatility within the team, leading to improved team performance and effectiveness. Furthermore, when team members have higher knowledge of the state of the situation, the team, the task and the system within which they are operating, they are better able to manage information, make decisions, and plan and organise tasks. Higher levels of individual knowledge will also increase the likelihood of team members engaging in team-related behaviours, thus improving their effectiveness (Brennen et al., 2003).

*Providing Team Maintenance:* Tuckman (1965) developed a model for explaining how individuals form a group. This model suggests that when developing into a cohesive group, individuals go through four distinct stages: Forming; Storming; Norming and Performing. Tuckman states that throughout the Storming/Norming phases of this process, individual knowledge is critical, and in particular the trade of this knowledge with fellow team members, in order to progress to the final stage of performing. In addition, Tuckman emphasises that this 'sharing' of knowledge will help to align the members of the team, and to enhance their cohesion.

### **6.5.3 Matching Personal Goals with Organisational Goals**

Comparatively little research has been conducted to examine the similarity of personal goals to organisational goals, and their subsequent impact on team processes and outcomes. The research that does exist suggests that the greater the congruence between personal goals and organisational goals, the greater the sense of a 'common goal' amongst the team; hence team members will be more interdependent and experience less conflict. For example, Blickensderfer et al. (1997) found a moderate relationship between shared goals within teams and team performance.

Incompatibility between individual goals and the goals of others, or of the team or organisation itself, is one of the main sources of conflict. If a team has high levels of conflict, this introduces greater cognitive demand, which leads to a reduction in the ability of the team members to process information, make decisions and to perform actions. In light of this finding, McShane and Von Glinow (2003) emphasise the value of a super-ordinate goal. They found that when team members focused on the goals of the organisation, rather than struggling over conflicting personal goals, the teams were more likely to succeed.

### **Task-Focused Behaviours**

*Planning.* Zsombok et al. (1993) suggest that team members must make effort to ensure they all share a similar understanding of goals and objectives. If this is not the case, then teams will produce plans that will be disjointed, poor in quality, and impossible to implement. One further risk of this is that the team may decide to adopt a view or approach which represents a compromise among competing viewpoints, yet which the team does not actually support at all. (Zsombok et al., 1993). Therefore, at the start of the team's existence, it is important to detect gaps and ambiguities between the goals of the team members and the wider organisation within which they operate.

*Directing and Controlling.* Hendrix (1996) claims that the establishment of a goal is one of the most important processes an individual team should perform. When the goal is shared with the team leader and the wider organisation, it provides the team with a sense of direction, and brings the individual members together for a common purpose. The goal gives the team a reference point; the team can measure its progress, and success, based on where they are in relation to reaching the goal.

Katzenbach and Smith (1984) suggest that the most important function of a common goal for individual members is that it directs and motivates the team. Without this common goal, the individual goals (each unique) will be pursued. Therefore, each team member will attempt to accomplish individual goals in order to strive for their own personal fulfilment and satisfaction.

*Making Decisions.* Hendrix (1996) places importance on the congruence of goals between and within the team members and the organisation. Therefore, it can be assumed that without this congruence, it is possible that individuals may be making decisions based on their own goals and not those of the organisation. Furthermore, decision-making should be made easier and be more effective if all the team members understand, and are working towards a wider common goal (Cooper, 1998).

### **Team-Focused Behaviours**

*Providing Team Maintenance.* Deutsch (1973) proposed that individuals pursue goals in their own self-interest. He claimed that how individuals perceive their goals in relation to that of their fellow team members and the wider organisation determines how these individuals will interact, and will subsequently determine the teams outcomes. For example, individuals may conclude that their goals are structured so that as they can work toward achieving their own goals above those of the team and organisation. Therefore, individual team members may actuate either the success or failure of the team. Deutsch stated that when individuals believe their goals are positively related with the goals of the team and organisation, they understand that their own goal attainment helps others reach their goals; as one succeeds, others succeed. They then share information, exchange resources, and in other ways support each other to act effectively.

Furthermore, Katzenbach and Smith (1994) claim that team members share an ideal and unique image of the future accomplishments when they work together. This image tells team members how their values and interests will be served by the accomplishments they are striving to achieve. The goal of the group creates a vision that focuses their efforts.

*Motivating.* Team modelling research has so far concluded that when individuals experience the team as a distinct entity to which they belong, and understand the performance benefits to be gained from sharing a common goal, they will place greater emphasis on the performance and success on the team, allowing this to take precedence over their own personal goals. This alignment of goals will enhance motivation within the team, creating more desire to performance team and task behaviours more efficiently in order for the team to become more effective (Brennen et al., 2003).

*Adapting.* Hendrix (1996) compared teams who shared common goals to those teams where no common goal was evident. He found that teams with a common goal were better able to adapt. He found these

teams were knowledgeable about what the team was meant to achieve; all members knew what was expected of them and therefore became more proficient. Furthermore, teams sharing a common goal were more likely to be co-operative, were more trusting of each other's ability to achieve, and have higher levels of morale. Finally, because the goals were shared with each other and the wider organisation, the teams were able to monitor and support each other to achieve the common goal.

## **6.6 TEAM EFFECTS**

In this section we describe the relationships among the aspects of the Team component of the model and the process variables, and we examine the impact of these relationships on the various team and task outcome variables. Although the aspects of a team are many and highly varied, we focus here on the five key aspects specified in the model: team composition, team size, team architecture, team maturity, and team goals.

### **6.6.1 Team Composition**

Creating the right mix of personality and ability attributes within a team, or aligning team member similarities and differences, may permit a realistic prediction of team productivity (Klimoski & Jones, 1995; Prince, Chidester, Bowers, & Cannon-Bowers, 1992). Effective staffing of a team can lead to team member stability, which in turn is important for achieving goals (Klimoski & Jones, 1995). Effective staffing resulting in goal accomplishment, for example, has been found to increase the teams' feelings of team potency, expectations for future successful outcomes, positive emotional tone, team member satisfaction, commitment, and team member stability (Klimoski & Jones, 1995). Age, race, and sex-based fit of employee teams have been found to predict the likelihood of turnover, specifically on teams that require a high level of interdependence such as in retail customer service (Sacco, 2003). Conversely, ineffective staffing can negatively influence task effectiveness. As an example, research has found that teams comprised mostly of males tend to be overly aggressive in their decision-making (Lepine, Hollenbeck, Ilgin, Colquitt, & Ellis, 2002; Rogelerg & Rumery, 1996).

Where team performance is likely to be influenced by the least capable person, homogenous teams may be a better arrangement than heterogeneous teams (Klimoski & Jones, 1995). For example, Wiest, Porter, and Ghiselli (1961) found that, "the more similar the two members of a team were in individual proficiency, the more likely they were to form a proficient and effective team." Moreover, research has demonstrated, repeatedly, that the selection of individuals with high abilities, skills, and task proficiencies favourably impacts team performance (Hall & Rizzo, 1975; Kabanoff & O'Brien, 1979; Klaus & Glaser, 1970; Terborg, Castore, & DeNinno, 1976; Tziner & Eden, 1985). In fact, if teams are composed of 40% or more untrained individuals in key or central positions, or if individuals in key positions leave or are replaced with untrained personnel, performance declines (Klimoski & Jones, 1995; Meister, 1985; Naylor & Briggs, 1965; Morgan, Coates, Alluisi, & Kirby, 1978; Ziller, 1963; Trow, 1964).

#### **Task-Focused Behaviours**

*Making Decisions.* In terms of team composition, it has been shown that individualists, as compared to collectivists, are associated with higher levels of decision-making performance (Sosik & Jung, 2002). As another example, Type A-predominant teams have been found to be more productive than their Type B counterparts; this difference is enhanced as the degree of competition is increased (Keinan & Koren, 2002). Finally, as teams become more male-dominated, there is an increase in the quality of their decision-making (Rogelerg & Rumery, 1996). However, when compared to all male teams, higher performance has been associated with lone female teams (Rogelerg & Rumery, 1996).

*Directing and Controlling.* Individual attributes play a key role in the degree to which teams are efficient, i.e., able to produce the desired result with a minimum of effort, expense, or waste. In other words, success

depends not only on knowledge, skills, and abilities for individual task performance, but also on a composition of team members who possess attributes that facilitate team functioning (e.g., learning ability, initiative, adaptability, tolerance for stress, risk-taking propensities). Such characteristics determine how individuals interact with other team members and how they perform, and are critical for teams that require more coordination, such as command and control teams (Klimoski & Jones, 1995). Demographic characteristics (e.g., gender, age, education level, relevant work experience, and academic discipline) are also related to team effectiveness but this influence is less than that found with team dynamic factors (Taylor, 1998).

### **Team-Focused Behaviours**

As the diversity of roles, tasks, and the number of members increase, goal achievement as a result of efficient and effective performance of intra- and inter-functional responsibilities will depend on the degree to which team members share a common set of team-related knowledge and/or experience.

*Providing Team Maintenance.* The relevant research on the relationship between team composition and team focused-behaviours for facets of team maintenance, such as cultural influences (e.g., increasing awareness of the value of specialized contributions to total outcome) are likely to play a significant role in decreased absenteeism and improved performance (Smith & Schabracq, 1997).

*Providing Vision.* Influences, such as providing vision, that are designed to foster team member compatibility (i.e., homogeneity of attitudes, values, and preferences) are likely to facilitate easy communication, smooth interaction, and high levels of concerted effort, whereas hostility or distrust is likely to stifle these processes (Klimoski & Jones, 1995).

*Providing & Maintaining Vision / Interacting Within the Team / Maintaining Common Intent / Providing Team Maintenance.* Working well together generally depends on the dynamics of belief, collaboration, and support, as well as providing vision in the team context (Bassin, 1988). For example, conflict reduces satisfaction within the team, and conflict resolution has been positively correlated with team effectiveness (Trimmer, 2001). Moreover, Faraj (1998) states that expertise coordination shows a strong relationship with team effectiveness. This relationship remains significant over and above the presence of expertise, administrative coordination, and team input characteristics.

*Maintaining Common Intent.* Shared team-related knowledge/experience, including team interaction knowledge, is positively associated with quality of teamwork, as measured by the rating of communication in assertiveness. The latter may be an indicator of mutual trust and/or mutual respect (Bowers, Braun, & Morgan, 1997). Rentsch and Klimoski (2001) assessed teamwork schema agreement using multidimensional scaling to analyse paired comparison ratings. Demography, team experience, team member recruitment, and team size were significantly related to team member schema agreement, which in turn was significantly related to team effectiveness. Shared beliefs, for example, that taking risks in the team will not lead to personal loss or harm, have been associated with learning behaviours in work teams (Edmondson, 1977).

### **6.6.2 Team Size**

Effective staffing of a team also includes consideration of team size for achieving positive task and team outcomes. As a rule, teams should be staffed to the smallest number needed to do the work (Hackman, 1987; Sundstrom, DeMeuse, & Futrell, 1990). However, when too few individuals are placed on a team where more members are needed, undue stress is placed on team members (Klimoski & Jones, 1995). Larger teams, on the other hand, tend to be detrimental to achieving positive outcomes, usually as a result of heightened coordination needs (Gladstein, 1984; Kidd, 1961; Steiner, 1972; Sundstrom, DeMeuse, & Futrell, 1990).

### **Task-Focused Behaviours**

*Making Decisions.* Gender representation within a team has been found to influence performance outcomes. More specifically, the number and percentage of males on a team have been found to impact decision-making outcomes (Lepine, Hollenbeck, Ilgin, Colquitt, & Ellis, 2002; Rogelerg & Rumery, 1996). For example, decisions emerging from male-dominated teams tend to be biased, i.e., they tend to favour the opinions of the male members of the team or group. Optimal team size for problem-solving or decision-making tasks is no more than five or six members (Bass, 1982), or the smallest number needed to do the work (Hackman, 1987; Sundstrom, DeMeuse, & Futrell, 1990).

### **Team-Focused Behaviours**

*Providing and Maintaining Vision.* In some instances, team focused behaviours, when ineffectively executed, can negatively influence the team. For example, in the course of 'providing vision', one may not only speak to anticipated outcomes in terms of the task roles or characteristics of team members, but also in terms of the number of individuals who represent certain categories presumed needed to achieve certain levels of performance (see also Randel, 2002).

*Providing Team Maintenance.* Biased decision-making is neutralized in male-dominated teams when team maintenance behaviours (e.g., feedback) are provided on past levels of over-aggressiveness (Randel, 2002).

### **6.6.3 Team Architecture**

Hierarchical and lateral team structures that are determined by either its members or the organisation differentially influence team processes and outcomes, depending on the combinations of the members involved and task structure (i.e., routine and simple vs. creative and complex).

### **Task-Focused Behaviours**

*Managing Information / Making Decisions.* Cross-functional interdependence creates challenges for leaders who must coordinate staffing for the day-to-day activities, bear responsibility for both information analysis and primary decision-making, and handle ambiguities and stress associated with significant delays in feedback for their decisions (Paris, Salas, & Cannon-Bowers, 1999).

Non-hierarchical team structures facilitate more effective decision-making and team coordination than hierarchical structures (Urban, Bowers, Cannon-Bowers, & Salas, 1995; Hollingshead & McGrath, 1995, as cited by Paris et al., 1999). Hierarchical team structures can be favourable, provided they are not strictly serial in nature. The performance of serially structured teams is determined by the weakest link in the chain, and overloading can become a distinct possibility (Paris et al., 1999). Therefore, the degree to which team members are dependent on one another has serious implications for performance. To be specific, research has shown high dependency among tasks and operators means that inadequate performance in one operator position will seriously affect another (dependent) position. Low dependency among tasks and operators means that inadequate performance at one position will have little effect on other operator positions.

### **Team-Focused Behaviours**

*Interacting Within The Team.* Depending upon the structure of the team, more communication will sometimes facilitate effective team performance, and at other times will impair team performance (Paris et al., 1999). Verbal interaction is, indirectly, influenced by team architecture (i.e., team architecture dictates the nature or quality of the medium through which team members engage in their interactions) and influences team decision-making in the following ways. First, discussion and analysis in distributed

team architectures is not as likely to be as in-depth or complete as in face-to-face communication (Paris et al., 1999). Second, groups need significantly more time to make decisions when they communicate by means of a computer rather than face-to-face (Urban et al., 1995; Hollingshead & McGrath, 1995, as cited by Paris et al., 1999). Finally, physical proximity impacts communication, to the potential benefit or detriment of team decision-making. When distances are smaller, there is the likelihood of greater diffusion of task relevant information. Thus, distributed team structures have important implications for member communication (Urban et al., 1995; Hollingshead & McGrath, 1995, as cited by Paris et al., 1999).

Physical proximity, as an inherent property of team architecture, influences communication patterns and ultimately team effectiveness (e.g., cohesion) to the potential benefit or detriment of team coordination. When distances are smaller, there is likelihood for greater self-disclosure and sociability (Urban et al., 1995; Hollingshead & McGrath, 1995, as cited by Paris et al., 1999). Additionally, psychological distance, resulting from chain-of-command and status distance, results in decreased communications (Urban et al., 1995; Hollingshead & McGrath, 1995, as cited by Paris et al., 1999). Furthermore, communication modality among team membership impacts team processes, including team coordination. For example, computer-based communication tends to obscure status differences, resulting in greater participation by members.

#### **6.6.4 Team Maturity**

As the diversity of roles, tasks, and member specialty represented in the team increase, efficient and effective performance of intra- and inter-functional responsibilities will depend on the degree to which team members share a common set of task-related knowledge and experience. Additionally, the more individuals train, practice, and work together as an intact team, the more they are likely to progress from levels of team- and task-work characterized by ineptness and exploratory interactions to the ultimate objective of efficient and effective performance.

Moreover, the more team members are able to anticipate each others interactions and task activities, and understand the influence of these activities on the team's objectives and goals, the more they can develop and have at their disposal a repertoire of team and task strategies to incorporate as needed under varying workload conditions. More specifically, shared mental models, i.e., expectations, attitudes, etc., as facets of team maturity, have implications for team performance and training in terms of likely performance problems if mechanisms for forming expectations and explanations are deficient (Bowers et al., 1997). Shared expectations are believed to be the most critical component of shared mental models that may be held for behaviours, responsibilities, mentoring activities, or decision-making (Isaacs & Clark, 1987, as cited by Bowers et al., 1997). Similarly, shared attitudes, also a facet of team maturity, are strongly associated with team processes and performance (Morgan, Salas, & Glickman, 1994, as cited by Bowers et al., 1997). Thus, different types of mental models, as presented in the following discussions, are offered as facets of the team maturity condition set.

#### **Task-Focused Behaviours**

*Managing Information.* As an underlying mechanism of team processes and performance, shared task-related knowledge and experience are hypothesized to allow team members to explain and predict the informational needs of teammates, efficiently and effectively (Bowers et al., 1997). To be specific, shared task-related knowledge and experience facilitate communication about systems, standard operating procedures and policies, and norms of behaviour and roles. This enables each person to carry out his/her role in a timely and coordinated fashion, thus helping the team to function as single unit with little negotiation of what to do and when to do it (Isaacs & Clark, 1995, as cited by Bowers et al., 1997).

*Making Decisions.* Shared task-related knowledge and experience for a problem creates a context within which decisions can be made by exploiting cognitive resources of the entire group and assures that

everyone is solving the same problem (Bowers et al., 1997). In other words, the more experience the team has, the more the interaction patterns contribute to decision-making performance (Rouse, Cannon-Bowers, & Salas, 1992; Kleinman & Serfaty, 1989).

*Directing and Controlling.* Shared task-related knowledge and experience, as an aspect of interpositional knowledge (i.e., knowledge about the roles and responsibilities and requirements of other positions in the team), contribute to higher degrees of overlap in understanding of a team member's own, and the other members' tasks. This in turn enables team members to monitor each other's progress (Durham, Knight, & Locke, 1998). Furthermore, shared task-related knowledge and experience is thought to improve team performance because it: "enables teams to form accurate explanations for a task using a common and sophisticated language, allows members to coordinate actions and adapt behaviour to task demands and facilitate processing" (p. 97, Bowers et al., 1997).

### **Team-Focused Behaviours**

*Adapting To Changes.* Shared task-related knowledge and experience, as a form of 'situating the change process' in the actual contexts where new ideas will be implemented, are likely to facilitate change processes (Morgan, Salas, & Glickman, 1994, as cited by Bowers et al., 1997). Additionally, shared task-related knowledge and experience, when not reflexive to handle responses to disasters, contribute to a lack of interagency coordination, flexible development of temporary multi-agency organisations, and distributed decision-making (Foushee, Lauber, Baetge, & Acomb, 1986, and Kanki, Lozito, & Foushee, 1989, as cited by Klein, Orasanu, Calderwood, & Zsombok, 1993).

*Motivating.* Shared attitudes, also a facet of team maturity, are varied and consist of those attributes that enable team members to coordinate information or actions, and function effectively as a team (Isaacs & Clark, 1995, as cited by Bowers et al., 1997). For example, shared attitudes, in the form of collective efficacy, are associated with stronger coordination processes in routine environments, whereas better coordination processes are displayed in teams with lower levels of collective efficacy in novel environments. In general, collective efficacy boosts team performance (Marks, 1999).

*Interacting Within The Team.* The more experience the team has, the more the team progresses along core development phases (i.e., from ineptness to final levels of efficiency, specifically in the completion of tasks (Bowers, Braun, & Morgan, as cited by Bowers et al., 1997). Additionally, shared attitudes consist of those attributes that enable team members to coordinate information or actions, and function effectively as a team (Isaacs & Clark, 1995, as cited by Bowers et al., 1997). Thus, shared attitudes among members of work teams, positively influence team performance (De Dreu, 2000; Marks, 1999).

The more experience the team has: (a) task-related disagreements increase (i.e., members feel free to disagree and task-related disagreements can be beneficial) (Foushee, Lauber, Baetge, & Acomb, 1986, and Kanki, Lozito, & Foushee, 1989, as cited by Klein, Orasanu, Calderwood, & Zsombok, 1993), (b) goal specification will increase (De Dreu, 2002), and (c) role and action specification increases (De Dreu, 2002). In addition, when all team members share the same problem definition, they can volunteer relevant information or strategies from their specialized perspectives, and interpret requests or commands unambiguously (Bowers et al., 1997)).

Finally, shared task-related knowledge and experience for a problem create a context within which decisions can be made, exploiting cognitive resources of the entire group. This assures that everyone is solving the same problem. When all team members share the same problem definition, they can volunteer relevant information or strategies from their specialized perspectives, and interpret requests/commands unambiguously (Bowers et al., 1997).

*Providing Team Maintenance.* Shared attitudes contribute to a team's strong feelings of shared team identity (Foushee, Lauber, Baetge, & Acomb, 1986, and Kanki, Lozito, & Foushee, 1989, as cited by

Klein, Orasanu, Calderwood, & Zsombok, 1993). Varying workload conditions influence to a team's shared expectations and attitudes. In other words shared expectations, along with participant attitudes, change over time in relation to performance, while team cohesion does not (Morgan, Salas, & Glickman, as cited by Bowers et al., 1997).

Shared attitudes, as predicted by balance theory, are facilitated by within-group similarity through which effective shared mental models are developed, i.e., individuals would be more likely to hold similar affect toward the knowledge elements constituting a shared mental model (e.g., hold similar goal structures (Bowers et al., 1997).

Shared attitudes and/or beliefs that are conducive to team functioning are likely to mitigate unhealthy team member competition, buffer the effects of job-related stress on performance, and influence team members' use of effective and efficient processes. In other words shared attitudes, are strongly associated with team processes (Morgan, Salas, & Glickman, as cited by Bowers et al., 1997).

Teams with shared attitudes, in the form of collective orientation (i.e., the shared capacity to take others' behaviour into account during team interactions or a belief in the team approach), have been found to perform significantly better than individual members, whereas egocentric teams have been found to perform no better than members performing as individuals (Paris et al., 1999).

Finally, shared attitudes of psychological safety (i.e., a shared belief held by members of a team that the team is safe for interpersonal risk taking), are associated with learning behaviour, but team efficacy is not, when controlling for psychological safety. An integrative perspective which utilises both team structures, such as context support, and team leader coaching and shared beliefs, can help shape team outcomes (Durham et al., 1997).

## **6.6.5 Team Goals**

### **Task-Focused Behaviours**

*Liaising With Other Teams.* Effective setting of team goals can permit efficient liaising with other teams (e.g., the use of task-related communication strategies) under conditions of high workload during task execution, and thus improve performance (Stout, Cannon-Bowers, & Salas, 1999, as cited by Rasker, 2002).

*Planning.* The more that teams engage in planning (i.e., develop clear, specific, and cooperative short- and long-term goals), the more likely they are to be motivated to attain team goals and develop implicit and explicit interaction patterns that are efficient under varying workload conditions during task execution. For example, group goals (e.g., planning), as opposed to individual goals, contribute less intra-group conflict and greater goal commitment and group performance quality (Resick & Bloom, 1997). Furthermore, when team goals are highly cooperative, task-related communication contributes to teams discussing their opposing views open-mindedly and constructively, which in turn develops confidence in team dynamics that contribute to effective team performance (Alper et al., 1998). Team goals, which are competitive, appear to interfere with constructive controversy, confidence in team dynamics, and effectiveness (Alper et al., 1998). One study of 70 university student teams across 12 course sections, found that groups with cooperative goals engaged in open-minded constructive controversy; teams with independent goals avoided open discussion. Teams with a high level of constructive controversy rated themselves as effective; these teams also were rated as giving high quality presentations as measured by instructors' marks but this result was not statistically significant (Tjosvold, Wong, Nibler, & Pounder, 2003). In sum, team goals, which are planned and organised in terms of short- and long-term projections, result in team members performing better and setting more difficult long-term goals than those team members who simply focus on long-term goals alone (Weldon, & Yun, 2000).



*Directing and Controlling.* Interventions designed to train teams in setting goals, a facet of team management, result in teams exhibiting higher levels of cohesiveness and perceived success while expressing reduced levels of conflict (Fandt, Richardson, & Conner, 1990).

### **Team-Focused Behaviours**

*Motivating.* Team goals have a significant effect on team motivation by affecting a task performer's perceptions of the relationship between acts and products, products and evaluations, and evaluations and outcomes (Naylor & Ilgen, 1984). Specifically, Poulton and West (1999) found that team processes (e.g., objectives, participation, quality emphasis and support for innovation) accounted for 23% of the variation between teams in their effectiveness. In addition, a clear understanding of the rewards for reaching goals was particularly linked to team effectiveness (Hilgermann, 1998).

*Providing & Maintaining Vision.* Team goals, as a form of organisational direction (i.e., clarity of the strategy, alignment of team and organisational goals, goal measurability and specificity) contribute to teams developing a shared understanding of priorities and work to be done, and to team effectiveness outcomes.



## Chapter 7 – DESCRIPTION OF THE CTEF INSTRUMENT

### Introduction

In the preceding chapters the model and its components, aspects, and features have been described and elaborated. In this chapter we introduce the CTEF instrument (see Annex B for complete instrument). We first describe a number of other instruments that we have used as a comparison for the development of our instrument. Next we describe the structure of the instrument and how it may be used.

### 7.1 GENERAL COMPARISON OF TEAM EFFECTIVENESS INSTRUMENTS

We conducted a non-exhaustive review of instruments relating to team effectiveness, with particular attention to their applicability to military command teams. The following paragraphs describe the major characteristics of each tool examined.

*Team Effectiveness Audit Tool.* This tool was developed to go beyond traditional team building methods, and to link organisational development to team effectiveness (Bateman, Wilson and Bingham, 2002). The audit questionnaire is clustered around six core themes: team synergy; performance objectives; skills; use of resources; innovation; and quality. The team effectiveness audit tool is used with all team members, including the leader, to assess their team's performance across the six core themes. These scores are then aggregated to rate the overall team performance. However, this audit tool is designed to be used in conjunction with a specific workshop, where feedback can be given on individual and team development issues. A significant advantage of the team effectiveness audit tool is that it has established statistical reliability and validity within the domain where it has been used. Therefore, teams can compare their own performance against normative data, and this allows teams to identify and prioritise areas for performance improvement. Currently, this tool has only been used within the health and social care profession, and has not been examined for its usefulness within military command and control settings. All of the core themes from the Team Effectiveness Audit Tool are represented in some form in the CTEF model and related CTEF instrument of NATO Task Group 023.

*Team Learning System.* This team effectiveness tool was developed by a UK consultancy firm, which aims to provide performance feedback to senior and mid-level teams (Praxis Development Consultants Ltd, UK, date unknown). Two tools are offered – a full-scale diagnosis (requiring team members to answer more than 200 questions) and a mini-diagnosis (containing 30 questions). Both tools require different sections of the questionnaire to be completed by different members of the team. Each question is a statement, which the team member has to agree or disagree along a 4-point scale. These responses are then converted to numerical scores, which are averaged across the team members to give an overall team score. The completed questionnaires are then sent to the consultancy, which provide a detailed diagnostic report. Whilst a report is offered, there appears to be little opportunity for team self-learning (aside from a Hawthorne effect). Furthermore, the developers offer reliability or validity data, and no information is offered about which teams in particular have exploited this tool. Therefore, its applicability to command and control teams cannot be judged.

*TADMUS Team Observation Measure (TOM).* The Anti-Air Warfare Team Observation Measure (ATOM) was developed under the U.S. Navy's Tactical Decision-making under Stress (TADMUS) program to evaluate team-level processes in tactical environments. The tactical environments in which it has been tested and used include the U.S. Navy's command and control teams, ship damage control teams, and ship engineering teams (Smith-Jentsch, Payne, & Johnston, 1996). This measure is based upon four major dimensions of teamwork that were empirically demonstrated to contribute to team performance outcomes. These four dimensions are information exchange, communication (i.e., quality of communication delivery), supporting behaviour, and team initiative/leadership. The dimensions are

## DESCRIPTION OF THE CTEF INSTRUMENT

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subdivided into eleven subcategories of behaviours, that have to be rated by observers. Each of the subcategories is rated on a 5 point Likert scale, followed by a rating of the overall dimension (to derive overall as well as composite scores for scoring teamwork). The ATOM has been shown to have discriminant validity (i.e., the dimensions have been shown to be independent of one another); convergent validity (i.e., high correlations exist among team ratings across multiple events); and criterion validity (i.e., the dimensions have been shown to predict team performance outcomes) (Smith-Jentsch, Johnston, & Payne, 1998).

*The Army Command and Control Evaluation System – ACCES.* The U.S. Army Research Institute's Research Unit at Fort Leavenworth, Kansas, conducted a long-term project to develop and evaluate a measurement approach for evaluation of command teams. The ACCES methodology (Halpin, 1996) was developed over the period 1986-1994 and was based on seminal work on organisational competence done at HumRRO in the early 1970's (Olmstead, Christensen, and Lackey, 1973) and related work by the U.S. Navy in developing a Headquarters Effectiveness Analysis Tool (HEAT) in the early 1980's (see Crumley, 1989). The HumRRO approach was based on a systems model of organisations which included three primary behavioural components with associated processes: reality testing (sensing, communicating information, and feedback); adaptability (decision-making, communicating implementation, and coping actions); and integration (stabilising). Taken together these comprise an 'adaptive coping cycle.' The HumRRO team developed measures of each of the major components (e.g., sensing: accurate discrimination between relevant and irrelevant information). This approach saw only limited application. The HEAT project overlaid the adaptive coping cycle concept on a simple model of command and control processes and developed similar measures of the individual processes. The ACCES project then expanded the HEAT measures, and modified the command and control model to better fit data collected from 20+ Army division-level multi-day exercises. The final ACCES tool included a number of primary measures related to each of the major functions of a HQ staff: the planning process (seven measures), handling of incoming information (ten measures); situation assessment (six measures); outgoing information handling (eight measures); information exchange (eight measures); course of action analysis (five measures); preparation of directives (nine measures); and decision context (six measures). The final tool was applied in ten division-level multi-day exercises and was found to provide valuable evaluative and diagnostic information in support of command and control training (Halpin, 1996).

### Summary

The instruments and approaches described provide useful examples of approaches involving both observation and direct data collection from team members via questionnaires. We determined that the most value for our intended use would be an instrument that would: a) involve data collection directly from participants rather than through observation; b) require little sophisticated data analysis; and c) closely mirror our developing model of team effectiveness.

## 7.2 STRUCTURE OF THE CTEF INSTRUMENT

The CTEF model is accompanied by the CTEF instrument, which can be applied to assess, control, and improve the effectiveness of the team using an assessment instrument. The CTEF instrument is organised along the lines of the model components, aspects and features. The CTEF instrument is a questionnaire that captures subjective judgements of the commander or the team on the current status of the components. Each component is addressed with its aspects and the features of each aspect. It starts with the items of the model's context variables, such as the state of the team, its leader and members, and the operational context (i.e., mission framework, task, and organisation) in advance of a military operation. Next are those items that assess the team's processes or behaviours during the operation, capturing the task- and team-focused behaviours. The last major section of the questionnaire assesses the team's output, measuring two types of outcomes: task outcomes and team outcomes.

We distinguished between actual *status* of the component and potential *impact* of that status on the eventual effectiveness and ask the commander to assess the factors in two steps: *First*, an estimate is asked which describes the current status of a particular aspect or its features of a component, determined as objectively as possible. The user scores this item on a scale from negative (very low) to positive (very high). This is the user’s assessment on the quality of the aspect of feature, the actual state. *Subsequently*, a judgement is asked of the potential impact on team effectiveness of that status. The user expresses an estimate of the direction and seriousness of the impact on the achievement of the intended outcomes, on a scale from very negative to very positive. Respondents are requested to mark the numerical value of their choice for each scale. If a variable or sub-component does not apply to the team, it is possible to mark the not applicable (NA) column.

COMPONENT											
ITEM	Assessment of Current Status in Team						Impact on Team Effectiveness				
	NA	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
ASPECT (description, i.e., features)		1	2	3	4	5	-2	-1	0	+1	+2
Feature (e.g., ...)		1	2	3	4	5	-2	-1	0	+1	+2
Feature (e.g., ...)		1	2	3	4	5	-2	-1	0	+1	+2
....											
Count of scores											

Figure 14: Basic Structure of the CTEF Instrument.

### 7.3 CONCEPT OF USE

The primary use of the instrument is by the commander and the team. The instrument may be used in the following way. The commander and the team fill in all the items. Then, the distribution of the scores on all items is displayed to the team. These scores are the basis for a team discussion. An agenda should be made which items need priority in the discussion. We suggest that first those items should be discussed that have the largest negative impact on team effectiveness. The team should try to uncover and understand why these aspects or features have such a negative impact on their team’s effectiveness and what could be done to either improve the aspect or feature or mitigate its negative effects on team effectiveness. If the instrument is used repeatedly, development of functioning can be tracked.

As with the CTEF instrument itself, we anticipate that our suggestions for use will be modified based on assessments during the preliminary deployment in the follow-on validation phase of this project. In some of our discussions, for example, we have considered what might be the impact of a computer-based administration vs. a paper-based administration. We have considered possible differences in implementation according to whether the users are native English speakers, proficient in English as a second language, or less proficient. We have considered the possible implications of translating the instrument into the multiple NATO member-country languages, with all of the potential for unintended changes in meaning. None of these issues will be resolved by discussion alone, and will need to be addressed during the validation process. What follows below, then, provides our initial concept for appropriate use of the instrument.

The CTEF instrument developed by the NATO Task Group 023 team is designed for use by mid-level military commanders and their teams (e.g.; battalion level, brigade level, ships’ command teams,

## DESCRIPTION OF THE CTEF INSTRUMENT

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contingent commanders and staffs on airbases). It can be used in the field for military training and mission rehearsal, for the diagnosis (including team self-diagnosis) of team performance issues, for the improvement of team effectiveness, and for team building. It enables a commander to assess his team's current status or to assess the impact of a specific intervention. It can enable comparisons to be made – both cross-sectional (e.g., among units) and longitudinal (evolution of a team over time). The data generated by the instrument provides a basis for effective after-action reviews. The tool may be used in educational settings to provide insight into a model of command team effectiveness and how critical factors within that model bear upon effectiveness. Scientists may use the instrument as a research tool to contribute to the body of knowledge that currently exists with respect to command team effectiveness. Finally, consultants may use it for assessment purposes in business settings.

The CTEF instrument could be utilized at any one of several stages of a team's development. Shortly after a team is formed, application of the instrument could be beneficial in alerting and informing the team leader and members about aspects of team performance which might support (or be detrimental to) the team's task. This would allow 'self regulation' of team context, people and process aspects, at least to the extent that these were under the control of the team. As a team matures, it might be useful to do a status check to support internal or external adjustment for the sake of improved effectiveness. A readiness check on a 'mature' team may provide a senior commander with understanding of likely team effectiveness when faced with an upcoming challenge. For example, if a provisional task force headquarters has been formed for particular contingencies, it might be appropriate to assess the command team's readiness in parallel with assessments of subordinate units' readiness for deployment. A status check for an active team in the midst of an ongoing task might provide useful feedback on ways to improve team effectiveness. Utilisation of the instrument following completion of a major task could identify lessons helpful in the formation of a similar team in the future. In general, the instrument may be used either to assess current status or readiness at virtually any stage in the life cycle of a team. The accompanying table provides a description of an After Action Review process that illustrates one anticipated mode for utilisation of the CTEF instrument.

In summary, the emphasis of this tool is not to provide a definitive or final judgement of the team. It is meant rather to discover ways to improve the team and to sensitise the team to important issues.

### 7.4 PRELIMINARY VALIDATION

This instrument has undergone preliminary validation from selected commanders of several countries who have been interviewed. They were asked questions such as: Would you find such an instrument useful for teaching, training, or diagnosing problems in team performance? How feasible would it be to use an instrument like this in training situations / in field exercises / in operations? What format/medium would work best (paper, computer)? How long should the instrument be? What kind of help would you need (or accept) to use this instrument (i.e., in terms of feedback, outside help, observers)? For what level of command would the instrument best be applied? For the most part, the results of the interviews were promising and we have subsequently made every attempt to address the major issues raised in the interviews.

To build upon the preliminary validation, a more formal empirical investigation is planned. Specifically, the instrument will be applied in several military exercises in the context of the forthcoming NATO HFM Task Group: HFM-127/RTG Operational Validation of Command Team Effectiveness Instrument. The data from these experiments will be used to establish norms for team performance and to validate survey items. Where appropriate, a commander can compare the results for his/her team to previously established baseline levels. The planned validation should provide a first step in establishing these norms.

## Chapter 8 – CONCLUSIONS AND OUTLOOK

The concept of command as a team activity is gaining in recognition, precisely because modern operations are so dynamic and complex. The commander is increasingly dependent on staff members who are highly specialised. At the same time, the work of sub-commanders may be increasingly interrelated, particularly when circumstances are changing quickly and when accurate decisions are of utmost importance. The war on terror and network enabled capabilities will further stress the complex interactions among command team members that have to work in a synchronised effort.

Given the importance of teamwork, it is necessary to monitor and improve those aspects that can make teamwork successful. In this study we developed a model for command teams that is focussed on the effectiveness of those teams. The model contains those factors that can make a difference between successful and unsuccessful command teams. The model was derived from general models of team effectiveness and was based on knowledge of the specific features of command teams. Based on the model, we developed a draft version of a concise instrument that can be used to evaluate the effectiveness of a command team.

Although this instrument will already be very helpful for commanders to evaluate and improve their teams, the instrument needs a thorough validation:

- First, the instrument needs to be tested in command teams during operations in order to study if we have captured all the relevant components, aspects, and features.
- Second, the instrument needs to be tested in several kinds of teams in order to establish the scope of the teams that may use the instrument.

Finally, norms have to be established, based upon extensive data collection, so that teams may evaluate their levels of effectiveness.

## CONCLUSIONS AND OUTLOOK

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## Annex A – AAR TEAM EFFECTIVENESS PROTOCOL

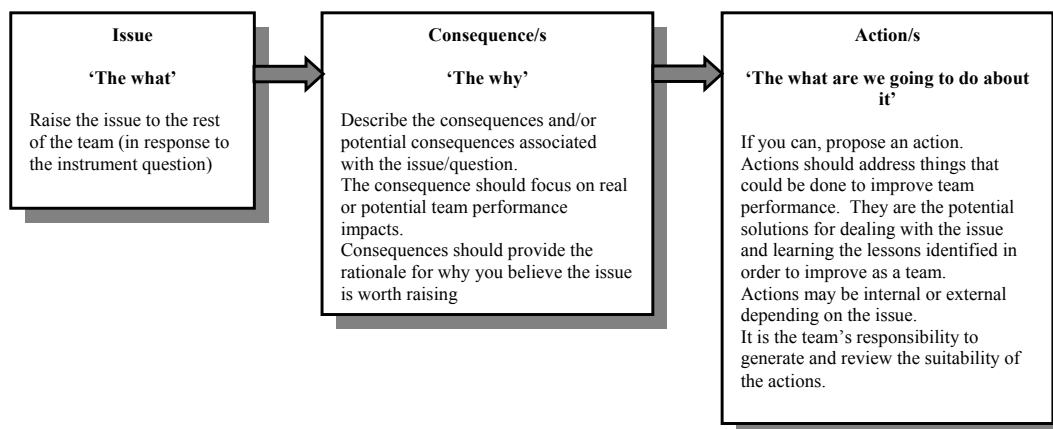
### A GUIDE FOR COMMANDERS TO CONDUCT AN AAR TO EXAMINE HOW WELL THE TEAM PERFORMED

#### Phase 1: Scene Setting

- State how the debrief will be structured.
- Emphasise the learning value of the exercise both for the individuals and the organisation:
  - The instrument is a tool designed to enable commanders and team members to make an assessment of the conditions within which the team has to operate, the team and task focused processes conducted, and the outcomes in terms of task effectiveness and team effectiveness.
  - Whilst the instrument does not profess to ‘train’ team effectiveness, it does enable teams to bring issues to the forefront to either discuss; simply become aware of; and/or make an judgement of in terms of enhancing the performance and effectiveness of the team.
- Ask one or more of the team members to give an overview of the exercise/operation.
- Make notes of the salient points raised during the AAR. In particular, noting any strengths and opportunities, weaknesses and threats as areas for improvement (use flip chart/whiteboard, so all can see).

#### Phase 2: Instrument Review – Individual/Team Level

- First select the instrument questions/issues you wish to address. You have many options here:
  - Take each question in turn, working through the instrument to begin with;
  - Select a component (and its related questions) which was of particular concern to the team;
  - Select a component (and its related questions) which the team thought was particularly good;
  - Randomly select instrument questions which to address;
  - Ask team members to pick an issue critical to them individually.
- On the instrument confirm the assessment of the component level and its level of impact on team effectiveness. Does everyone in the team agree with this assessment?
- Use the selected questions on the instrument to form the basis of discussion with the team.
- Keep the discussion simple. Use the ‘**Issue-Consequence-Action**’ model. This helps everyone clarify the rationale for raising the issue as well as presenting it in a constructive manner.



## ANNEX A – AAR TEAM EFFECTIVENESS PROTOCOL

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- Whilst conducting this process think about the following questions in relations to the team member responses (i.e., issues, consequences and actions):
  - Are all the responses the same or similar?
  - Are there any responses that stand out as being different from the others?
  - Are these responses wrong?
  - Is it feasible for them to come up with this response?
  - Have they used their initiative (i.e., thought of an innovative, but workable response)?
  - Do the responses indicate a shared understanding in the team?
  - Do the responses reflect a good understanding of the commander's intent?

### Phase 3: Wrap-up and Output

- Highlight the three key strengths of the team's performance – as agreed by all members (write up on flip chart).
- Highlight the three key areas for improvement – as agreed by all members (write up on flip chart).
- Discuss ways in which these improvements can be implemented.
- Issues and actions and suggested improvements should be recorded and monitored accordingly to make sure that learning and improvement is occurring.
- A commander may wish to collect the lessons emerging from the AARs to see if there are any issues appearing across all teams. Therefore, AARs can also be used to support both team and wider organisational learning.
- If actions and suggested improvements are not completed, effort should be made to explain why.
- If actions are suggested improvements completed, the team should be kept informed of developments.

### Other Things to Consider

- **Time:** Before the AAR begins everyone should be aware of how much time is available. The detail discussed in the AAR should be lengthened or shorted accordingly.
- **Participation:** The commander should create a climate where all team members feel they are able to participate openly and freely, without fear of comeback. The commander may also have to take additional members to ensure that all team members are participating in the discussion – e.g., ask another member to take the lead of conducting the AAR, ask a team member to summarise the issues/actions at the end of the AAR, go around the table to ensure all members participate.
- **Constructive Comments:** Remember that every suggestion, issue raised, etc. is valid and therefore, must be treated with respect. However, if a suggestion is not to be taken forward, or a comment may be taken personally, remember to be constructive in discussions.
- **Final Comments:** The questions in this AAR are not firm or fixed in anyway. These questions merely serve to supplement your own thoughts and ideas on team and task performance. You should seek to mix things together as appropriate and to make-up your own questions.

Adapted from: Mills and Henderson, 2003; and Mills and Blendell, 2003.



## Annex B – THE CTEF INSTRUMENT

<b>MISSION FRAMEWORK</b>											
The mission framework is defined by <i>situational uncertainty, stress potential, constraints and stakes</i> .											
ITEM	Assessment of Mission Framework Aspects						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Situational uncertainty</b> <i>The lack of information about, or understanding of objects and their properties in an environment</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Uncertainty about intelligence</b> <i>(validity of information)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Uncertainty about adversary's intent</b> <i>(lack of information)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Uncertainty about required resources</b> <i>(e.g., food, gas, communication, transportation, personnel)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Uncertainty about utilization of resources</b> <i>(e.g., obstruction of roads hampers transportation)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Stress potential</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Danger</b> <i>(e.g., enemy threat, mines, force protection issues, risk)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Operational intensity</b> <i>(e.g., time pressure, sleep deprivation, information overload)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Psychological stressors</b> <i>(e.g., perceived impact of mission, interpersonal/personal problems)</i>		1	2	3	4	5	-2	-1	0	+1	+2

## ANNEX B – THE CTEF INSTRUMENT

<b>Constraints</b> <i>External factors that limit the range of the teams actions or freedoms</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Environmental factors</b> <i>(e.g., weather, disease, terrain)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Political factors</b> <i>(e.g., legal, approval, oversight, national criteria)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Cultural factors</b> <i>(e.g., local religion and language, coalition forces)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Media related factors</b> <i>(e.g., local and international perception)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Time-space coordination</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Stakes</b> <i>The immediate and long-term consequences of mission outcome</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Casualties</b> <i>(e.g., within own forces, friendly fire victims, civilians)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>National impact</b> <i>(e.g., political, economic, public perception)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>International impact</b> <i>(e.g., political, economic, public perception)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores MISSION FRAMEWORK</b>											

<b>TASK</b>											
The task parameters considered are <i>complexity, workload, goal clarity, and goal stability</i> .											
ITEM	Assessment of Task Aspects						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Task complexity</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Task difficulty</b> (cognitive or physical demands)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Number of subtasks</b> (performed sequentially or in parallel)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Subtask interdependencies</b> (e.g., sequentially interdependent)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Subtask interference</b> (e.g., two tasks require same resources)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Workload</b> The required effort for the team		1	2	3	4	5	-2	-1	0	+1	+2
<b>Physical workload</b> (e.g., work long hours)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Cognitive workload</b> (e.g., high info flow, mental transformations)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Emotional workload</b> (e.g., the required emotional investment of team members)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Time pressure</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Lack of goal clarity</b> The extent to which the team understands its goals, objectives, and priorities		1	2	3	4	5	-2	-1	0	+1	+2
<b>Lack of goal stability</b> The extent to which goals change significantly over time		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores TASK</b>											

## ANNEX B – THE CTEF INSTRUMENT

<b>ORGANISATION</b>											
The organisational context parameters considered are <i>goal congruity, command structure, autonomy, and organisational support</i> .											
ITEM	Assessment of Organisation Aspects						Impact on Team Effectiveness				
	N.A	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Congruity of team’s mission and organisational goal</b> <i>Degree of fit between goals</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Clarity of command structure</b> <i>(e.g., report to national and international chain of command, staff and line versus matrix structure)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Autonomy</b> <i>Freedom of action allowed by the organisation</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Organisational support</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Recognition</b> <i>(reward structure for what one has done)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Supportive climate</b> <i>(e.g., open mindedness of the organisation, learning from mistakes)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Material support</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores ORGANISATION</b>											

<b>LEADER</b>												
<i>The Leader's skill, knowledge, and personal goals are considered as they may have an effect on team processes and performance.</i>												
ITEM	Assessment of Leader Aspects						Impact on Team Effectiveness					
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive	
<b>Leader skills</b> <i>Extent to which the leader has the requisite skills</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Tactical skills</b> <i>What to do</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Technical skills</b> <i>How to do it</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Interpersonal skills</b> <i>(e.g., negotiation, conflict resolution)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Cognitive skills</b> <i>(e.g., problem solving)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Leader knowledge</b> <i>Requisite knowledge and experience held by the leader</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Task knowledge</b> <i>(amount of knowledge on the task)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Team knowledge</b> <i>(on team characteristics)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Organisational knowledge</b> <i>(on relations with rest of organisation)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Match of personal goals to organisational goals</b>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Scores LEADER</b>												

## ANNEX B – THE CTEF INSTRUMENT

<b>TEAM MEMBERS</b>											
The team members are also defined by their <i>skills, knowledge, and personal goals</i> .											
ITEM	Assessment of Team Member Aspects						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Team member skills</b> <i>Requisite skills held by the team members</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Tactical skills</b> <i>What to do</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Technical skills</b> <i>How to do it</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Interpersonal skills</b> <i>(e.g., cooperation)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Cognitive skills</b> <i>(e.g., problem solving)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Team member knowledge</b> <i>Requisite knowledge and experience held by the team members</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Task knowledge</b> <i>(amount of knowledge on the task)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Team knowledge</b> <i>(on team characteristics)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Organisational knowledge</b> <i>(on relation of self with rest of organisation)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Match of personal goals to organisational goals</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores TEAM MEMBERS</b>											

<b>TEAM</b>											
Teams have different dimensions that include: <i>team composition, team size, team architecture, team maturity, and team goals.</i>											
ITEM	Assessment of Team Aspects						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
Appropriateness of team composition		1	2	3	4	5	-2	-1	0	+1	+2
Mix of skills		1	2	3	4	5	-2	-1	0	+1	+2
Mix of demographic characteristics (e.g., age, gender, ethnicity, culture)		1	2	3	4	5	-2	-1	0	+1	+2
Mix of personality traits (e.g., risk taking, extraversion, need for structure)		1	2	3	4	5	-2	-1	0	+1	+2
Membership stability over time		1	2	3	4	5	-2	-1	0	+1	+2
Appropriateness of team size		1	2	3	4	5	-2	-1	0	+1	+2
Appropriateness of team architecture		1	2	3	4	5	-2	-1	0	+1	+2
Physical proximity (e.g., face to face, distributed)		1	2	3	4	5	-2	-1	0	+1	+2
Appropriate distribution of tasks		1	2	3	4	5	-2	-1	0	+1	+2
Team maturity (e.g., team experience, shared knowledge and expectations, attitudes, shared commitment to the team goals)		1	2	3	4	5	-2	-1	0	+1	+2
Match of team goals to organisational goals		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores TEAM</b>											

## ANNEX B – THE CTEF INSTRUMENT

<b>TASK-FOCUSED BEHAVIOURS</b>											
Task-related processes include both productive and corrective behaviours: <i>managing information, assessing the situation, making decisions, planning, directing and controlling, monitoring progress, and liaising with other command teams.</i>											
ITEM	Assessment of Task Focused Behaviours						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Managing information</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Obtaining information</b> <i>(i.e., through an active search to compensate for the lack of information addressed under situational uncertainty)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Processing information</b> <i>(e.g., using, integrating information)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Exchanging information</b> <i>(e.g., timeliness, clarity, brevity, correctness, completeness)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Assessing the situation</b> <i>(e.g., perceiving, recognising, anticipating events)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Making decisions</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Defining the problem space</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Managing time available to make decisions</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Evaluating options and results</b>		1	2	3	4	5	-2	-1	0	+1	+2



<b>Planning</b> Formulating actions necessary to achieve a goal		1	2	3	4	5	-2	-1	0	+1	+2
<b>Anticipating</b> Identifying future tasks and contingencies		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scheduling</b> (personnel and resources in time)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Specifying resources needed</b> (e.g., personnel, time, tools)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Defining strategies</b> Defining an approach to accomplish the mission		1	2	3	4	5	-2	-1	0	+1	+2
<b>Directing and Controlling</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Organising</b> How to implement the plan (e.g., allocating resources, determining procedures, clarifying roles)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Managing</b> Steering toward accomplishment of goals (e.g., by establishing procedures, setting priorities, adjusting resources/schedule, and managing expectations)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Monitoring progress</b> Gauging or assessing advancement toward milestones, goals, and objectives		1	2	3	4	5	-2	-1	0	+1	+2
<b>Liaising with other command teams</b> Maintaining common knowledge at the next higher level; e.g., by giving and receiving info, coordinating activities		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores TASK FOCUSED BEHAVIOURS</b>											

## ANNEX B – THE CTEF INSTRUMENT

<b>TEAM FOCUSED BEHAVIOURS</b>											
The team-focused processes include both productive and corrective behaviours: <i>providing and maintaining vision, maintaining common intent, interacting within the team, motivating, adapting and providing team maintenance.</i>											
ITEM	Assessment of Team Focused Behaviours						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Providing &amp; maintaining vision</b> <i>Generating and preserving direction and purpose; is a often leader function</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Maintaining common intent</b> <i>Preserving a shared sense of goals, objectives and actions</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Interacting within the team</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Communicating</b> <i>(e.g., openness, style, expressing feelings/ thoughts)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Coordinating</b> <i>Combining/acting in a harmonious, complementary, supportive manner to achieve goals</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Providing feedback</b> <i>Offering advice to one other about how to improve performance</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Motivating</b> <i>Influencing the direction, intensity, and persistence of team members' behaviours</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Extrinsically</b> <i>Using tangible/intangible compensation or incentives to reward good performance (by recognizing/rewarding)</i>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Intrinsically</b> <i>Inspiring its members to develop intrinsic interest in work (by mentoring/ developing)</i>		1	2	3	4	5	-2	-1	0	+1	+2

<b>Adapting</b> Using strategies for changing circumstances		1	2	3	4	5	-2	-1	0	+1	+2
<b>Monitoring</b> Team members observing and assessing their own and each other's performance		1	2	3	4	5	-2	-1	0	+1	+2
<b>Correcting</b> Team members offering feedback / guidance to improve their team mates' performance		1	2	3	4	5	-2	-1	0	+1	+2
<b>Backing-up</b> Team members supporting one another with compensatory behaviours (e.g., assuming duties, offering coaching, feedback, or assistance)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Providing team maintenance</b>		1	2	3	4	5	-2	-1	0	+1	+2
<b>Providing social support/integration</b> Team members offering behaviours to protect against the effects of stress (e.g., bolster esteem, offer companionship, offer material resources)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Regulating emotions (e.g., composure, morale)</b> Team members influencing emotions or maintaining emotional balance among team members, considering emotional display norms		1	2	3	4	5	-2	-1	0	+1	+2
<b>Developing/maintaining cohesion</b> Promoting unity, solidarity, or esprit de corps among themselves		1	2	3	4	5	-2	-1	0	+1	+2
<b>Managing conflict</b> Handling conflict, such that maladaptive discord/friction is eliminated, reduced or at least stabilized		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores TEAM FOCUSED BEHAVIOURS</b>											

## ANNEX B – THE CTEF INSTRUMENT

<b>TASK OUTCOMES</b>												
<i>The task outcomes considered are the intermediate goals and end goals.</i>												
ITEM	Assessment of Task Outcomes						Impact on Team Effectiveness					
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive	
<b>Achievement of the intermediate goals</b> <i>(e.g., decision being made, plans ready according to standards)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Criteria set by the stakeholder met</b> <i>(e.g., accuracy, timeliness, completeness, productivity, etc.)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Other stakeholders' satisfaction with (expected) outcomes</b> <i>(e.g., parties that are influenced by the decisions, such as local authorities, local population, families of soldiers)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Staying within the limits/ intentions</b> <i>(e.g., decisions and actions in line with total operation, no illegitimate actions)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Achievement of the end goals</b>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Criteria set by the stakeholder met</b> <i>(e.g., accuracy, timeliness, completeness, productivity, etc.)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Other stakeholders' satisfaction with (expected) outcomes</b> <i>(e.g., parties that are influenced by the decisions, such as local authorities, local population, families of soldiers)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Staying within the limits/ intentions</b> <i>(e.g., decisions and actions in line with total operation, no illegitimate actions)</i>		1	2	3	4	5	-2	-1	0	+1	+2	
<b>Scores TASK OUTCOMES</b>												

<b>TEAM OUTCOMES</b>											
The team outcomes considered are <i>mutual trust, morale, cohesion, confidence, shared vision and mutual respect.</i>											
ITEM	Assessment of Team Outcomes						Impact on Team Effectiveness				
	N.A.	Very low	Low	Moderate	High	Very high	Very negative	Negative	None	Positive	Very positive
<b>Mutual trust</b> (e.g., team members have trust in each other’s competence, loyalty, and dedication to the teamwork)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Morale</b> (e.g., the team members are willing to continue their work, even under adverse conditions)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Cohesion</b> (e.g., the team members act as a team instead as individuals, they are glad to belong to the team)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Collective confidence in achieving the goal</b> (e.g., team members have a strong belief in collective efficacy)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Shared vision</b> (e.g., in general, team members perceive the task that they have to accomplish as a team in the same way)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Mutual respect</b> (e.g., despite their differences, the team members try to understand each other)		1	2	3	4	5	-2	-1	0	+1	+2
<b>Scores TEAM OUTCOMES</b>											



<b>REPORT DOCUMENTATION PAGE</b>																			
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<b>14. Abstract</b>	<p>The increasing use of ad-hoc, multi-national, joint military units in a diversity of operations has made effective teamwork a critical mission success factor. The objective of our study is to support commanders in guiding and controlling the team towards effective performance. We developed a model and an instrument of critical factors of command team effectiveness – the CTEF model and instrument. The instrument is a questionnaire comprising items with detailed model element descriptions, which the commander and/or team members can score on a negative-positive scale. The CTEF model and instrument provide NATO with a common reference to effectiveness and teamwork for use in missions and in training. In a follow-up study we will apply and validate model and instrument in national and international military exercises using a web-based version of instrument.</p>																		







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