



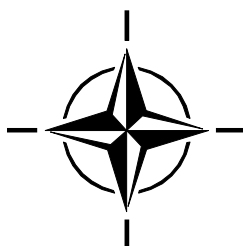
RTO TECHNICAL REPORT

TR-HFM-127

CTEF 2.0 – Assessment and Improvement of Command Team Effectiveness: Verification of Model and Instrument

(CTEF 2.0 – Diagnostic et amélioration de l'efficacité
d'un team de commandement : vérification
du modèle et de l'instrument)

This Technical Report documents the findings of a project on
'Command Team Effectiveness' by Task Group 127 for the
RTO Human Factors and Medicine Panel (RTG HFM-127).



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RTO Human Factors and Medicine Panel (RTG HFM-127).

by

Dr. Peter Essens (Chairman), Netherlands

Prof. Dr. Ad Vogelaar, Netherlands

Prof. Dr. Jacques Mylle, Belgium

Dr. Joe Baranski, Canada

Dr. Gerald Goodwin, U.S.A.

Wendi Van Buskirk, MSc., U.S.A.

Peter Berggren, MSc., Sweden

Tineke Hof, MSc., Netherlands

The Research and Technology Organisation (RTO) of NATO

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- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS System Analysis and Studies Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

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Programme Committee

CHAIRMAN

Dr. Peter ESSENS

TNO Human Factors
P.O. Box 23, 3769 ZG Soesterberg
NETHERLANDS
Tel: +31 346 356 319
Email: peter.essens@tno.nl

Dr. Joe BARANSKI

Defence Research and Development Canada Toronto
1133 Sheppard Ave West, P.O. Box 2000
Toronto, Ontario M3M 3B9
CANADA
Tel: +1 416-635-2146
Email: joe.baranski@drdc-rddc.gc.ca

Peter BERGGREN, MSc.

Swedish Defence Research Agency
Information Systems
P.O. Box 1165, SE-58111 Linköping
SWEDEN
Tel: +46 1337 8222
Email: peter.berggren@foi.se

Dr. Gerald GOODWIN

U.S. Army Research Institute
Basic Research Unit
2511 Jefferson Davis Hwy
Arlington, VA 22202
USA
Tel: +1 703-602-7965
Email: jay.goodwin@us.army.mil

Tineke HOF, MSc.

TNO Human Factors
P.O. Box 23, Soesterberg
NETHERLANDS
Tel: +31 346 356 407
Email: tineke.hof@tno.nl

Prof. Dr. Jacques MYLLE

Royal Military Academy
Behavioural Sciences Department
Renaissance Avenue 30, B-1000 Brussels
BELGIUM
Tel: +32 2 742 6600
Email: jacques.mylle@rma.ac.be

Wendi Van BUSKIRK, MSc.

Naval Air Warfare Center
Training Systems Division
12350 Research Parkway
Orlando, FL 32826
USA
Tel: +1 407-380-4558
Email: wendi.vanbuskirk@navy.mil

Prof. Dr. Ad VOGELAAR

Netherlands Royal Military Academy
Faculty of Military Sciences
P.O. Box 90002, 4800 PA Breda
NETHERLANDS
Tel: +31 76 527 3200
Email: ALW.Vogelaar@nlda.nl

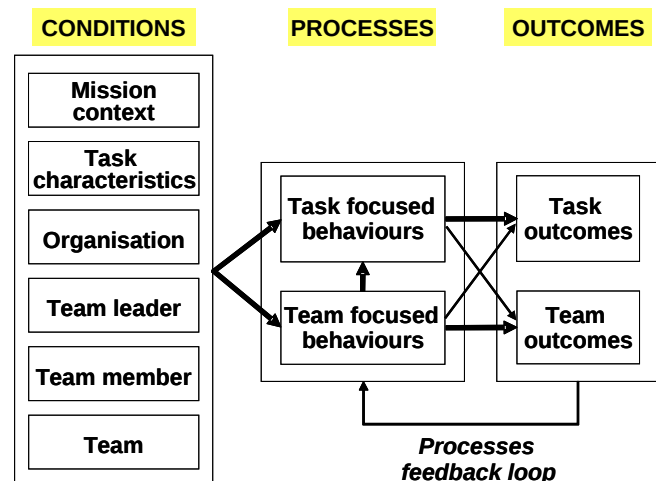
CTEF 2.0 – Assessment and Improvement of Command Team Effectiveness: Verification of Model and Instrument

(RTO-TR-HFM-127)

Executive Summary

Leaders need to gain and maintain better insight into the effectiveness of their teams or staffs. 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 at the lower command levels, has made effective teamwork a critical mission success factor. The objective of this study is to support leaders and their teams or staffs in achieving effective team performance. The focus here is on commander-staff and commander-sub-commander teams at operational and tactical command levels.

The CTEF 2.0 model, developed from the CTEF 2005 model, represents the scientific, empirical and theoretical consensus that effective teamwork is the result of conditions, processes, outcomes and feedback factors. The model comprises eleven components, such as mission context or team focused behaviours, each characterised by a set of features, which sums to 32 in total. Based on the CTEF model, an assessment instrument for commander and staff teams was constructed in the form of a questionnaire. Using this questionnaire, the status of the team's effectiveness can be reviewed, which can then be used for improvement during team evaluations.



The CTEF 2.0 model was developed based on the experience and results from applications in several operational settings, and from a survey version of the instrument (a web-based and paper-based questionnaire), which was administered in several NATO countries in the period 2008 – 2009. Respondents were asked to reflect on the performance and effectiveness of a command team they had been part of most recently, as leader or member. The survey resulted in 718 valid responses from 14 nations. The results allowed us to reduce the number of questions used in the CTEF 2005 version to the 32 of CTEF 2.0. Added was the strong effect of Team focused behaviours on Task focused behaviours, which was not predicted *a priori*.

Operational *usability* of the model and the instrument was high:

- 1) 70% of the respondents either “agreed” or “completely agreed” that the instrument addresses the important aspects of command teams; and
- 2) Approximately 80% of the respondents also indicated that they would be willing to use the CTEF instrument in educational, training, or operational settings.

CTEF 2.0 is now the basis for further application and data gathering in operational, exercise, and training context. It is recommended that commanders learn to work with the effectiveness concepts proposed by the CTEF 2.0 model and apply it regularly, possibly selecting those elements they want target for improvement. We recommend that a next development of CTEF is to include features of more complex organisations, where multiple, more or less independent teams and diverse organisation elements work together to achieve common overarching goals (i.e., a team of teams).

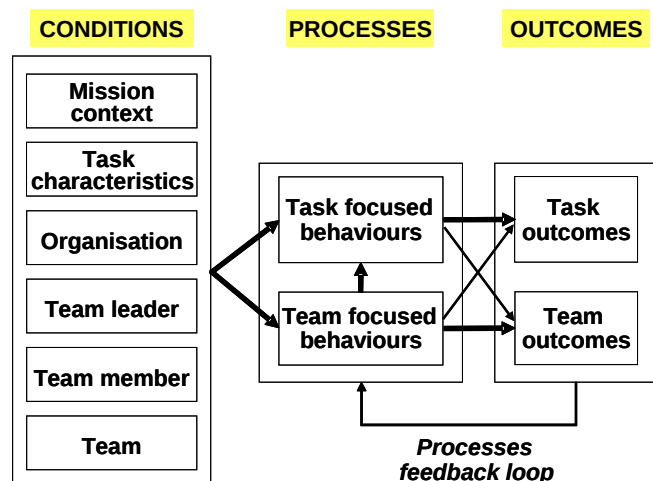
CTEF 2.0 – Diagnostic et amélioration de l'efficacité d'un team de commandement : Vérification du modèle et de l'instrument

(RTO-TR-HFM-127)

Synthèse

Il est nécessaire que les responsables aient une meilleure vision de l'efficacité de leurs équipes. Le mélange d'objectifs et contraintes militaires, politiques et sociétaux, ainsi que la nécessité croissante d'opérations militaires multinationales interservices dirigées par des équipes ad hoc, même à des échelons de commandement subordonnés, ont fait du travail en équipe efficace un facteur de succès critique d'une mission. L'objectif de cette étude est d'assister les responsables et leurs équipes à atteindre un niveau de prestation élevé. Ici, l'axe est mis sur des relations du type commandant-état-major et commandant-commandants subordonnés, aux niveaux de commandement tactique et opératif.

Le modèle CTEF 2.0, développé sur base du CTEF 2005 reflète le consensus scientifique, empirique et théorique prouvant que le travail en équipe efficace est la résultante des facteurs conditions, processus, résultats et compte-rendus. Le modèle comprend onze composantes, telles que le Contexte de la Mission ou les Comportements focalisés sur l'équipe. Chacune de ces composantes est définie par un ensemble de caractéristiques; 32 éléments au total. En se basant sur ce modèle, un instrument d'appréciation a été construit qui prend la forme d'un questionnaire. Ainsi, le niveau d'efficacité d'une équipe peut être mesuré et cette information peut alors être utilisée pour l'amélioration de l'efficacité.



Le modèle CTEF2.0 a été développé sur la base des expériences et résultats recueillis d'applications dans différents contextes opérationnels et d'une enquête réalisée à l'aide d'une version web et d'une version papier-crayon, appliquée dans plusieurs pays OTAN en 2008 – 2009. Il était demandé aux participants de réfléchir sur la prestation et l'efficacité les plus récentes d'une équipe de commandement à laquelle ils appartenaient, en tant que responsable ou en tant que membre. Quelques 718 réponses valides provenant de 14 pays ont été recueillies. Les résultats obtenus nous ont permis de réduire le nombre de questions du CTEF 2005 aux 32 se rapportant au CTEF 2.0. Outre des relations prédites nous avons trouvé une association forte entre les Comportements focalisés sur la Tâche et les Comportements focalisés sur l'équipe.

L'utilité opérationnelle du modèle et de l'outil est considérée comme haute :

- 1) Quelques 70% des répondants étaient « d'accord » ou « totalement d'accord » sur le fait que l'outil met en évidence les aspects importants d'un team de commandement ; et
- 2) A peu près 80% mentionnaient qu'ils utiliseraient l'outil en situation opérationnelle, d'entraînement et/ou de formation.

Le CTEF 2.0 constitue dorénavant la base pour des applications futures dans un contexte opérationnel, d'exercice ou de formation. Il est recommandé que les commandants apprennent à travailler avec les concepts proposés dans le modèle CTEF 2.0 et l'emploient régulièrement, tout en sélectionnant le cas échéant les éléments qu'ils visent à améliorer. Nous recommandons également qu'un développement futur du CTEF inclue les caractéristiques d'organisations plus complexes, dans lesquelles une multitude de teams plus ou moins indépendants et d'autres éléments organisationnels travaillent ensemble pour réaliser des objectifs communs d'ordre supérieur (c.à.d. des teams composés de teams).

Chapter 1 – INTRODUCTION

1.1 BACKGROUND

Since the end of the Cold War, military missions have become increasingly complex. Military commanders are confronted with a broadening range of mission types, ranging from humanitarian relief, to peace support operations, to traditional warfare. In addition, they are also held accountable by a wider range of stakeholders, potentially representing diverse objectives: societal, political, economic, and military. Furthermore, operating in multi-national settings with ad hoc task forces composed of multiple services and multiple countries has become normal practice. Covering larger operational areas with fewer forces and quickly changing operational conditions require commanders to delegate to the lower levels of command. In these complex contexts commanders must rely on the effective interaction, communication, and collaboration of their staffs, sub-commanders, and other civilian and military parties outside the chain of command.

The reality of ad hoc, multi-national, joint military and, increasingly, multi-agency teams in current operations has brought forward issues such as team maturity, leadership, cultural diversity, and organisational support in the context of operational stress, high stakes missions, diverse command structures, and their impact on the effectiveness of the team. Increasingly mission success will rely on how well commanders understand the strengths and weaknesses of their teams, and how well they can improve their effectiveness. Knowledge of the factors that affect the success of command and staff teams will help to build effective command teams, select the best personnel, improve organisational structures, rapidly develop team arrangements, and optimise processes in operational conditions, all in the context of mission goals and stakeholders expectations.

Building and maintaining effective teams is a continuous process. Commanders and team members 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. In addition, after a mission team processes and outcomes need to be reviewed in order for the organisation to learn from the experience for future missions. To support these efforts a NATO RTO HFM Task Group (HFM-087) developed a comprehensive model for Command Team Effectiveness (CTEF) and a corresponding instrument to meet these concerns (Essens et al., 2005). The CTEF model was based on an extensive literature review on team effectiveness and analysis of operational command teams. This model is discussed in more detail in the report of HFM-087 (Essens et al., 2005) and is briefly summarized below. A subsequent NATO RTO HFM Task Group (HFM-127) – the activities of which are reported here – applied the CTEF model and instrument in operational conditions with the purpose of empirically verifying the operational value and usefulness of the instrument for commanders and their teams.

1.2 GOAL OF THE STUDY

The primary goal of the study was to examine the operational utility and verify the theoretical underpinnings of the model-based instrument in the light of empirical data. We investigated the conceptual consistency with the existing team effectiveness research literature and psychometric properties of the instrument. Adjustments to the instrument were based on these empirical findings. The intention was to arrive at a well-grounded instrument that supports commanders and their teams in achieving effective team and task processes for operational effectiveness.

1.3 TARGET AUDIENCE

The CTEF model and instrument is primarily intended for military commanders and team members who want to improve their team performance and effectiveness. The CTEF instrument is intended to be

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generically applicable to command teams at staff levels independent of configuration, including multi-service, multi-agency, and international teams, co-located or distributed. Command teams are characterised by a high degree of dynamic interaction between team members directed to situation understanding, problem solving, planning, and decision making. In current operations, these teams may be standing teams or may be formed on an ad-hoc basis, focused on specific tasks or missions requiring concentrated efforts with diverse competencies and capabilities. These missions may last for short or long periods of time (months to years) with potential turnover of personnel. The CTEF instrument can be used by commanders, by command teams or staffs, by trainers and evaluators to perform assessments of the effectiveness of operational teams or staffs, or by scientists to collect data on team effectiveness in operational conditions.

1.4 METHOD OF WORK

The evaluation and verification process of the model and instrument was performed in two phases: application in operational exercise settings and administration of an international survey. First, we applied the CTEF instrument in several operational exercise settings to gain insights into the instrument itself, with particular emphasis on the ease and feasibility of administering the instrument (e.g., intelligibility of the items, interpretation of the scales, time to complete). In order to demonstrate the value of CTEF for commanders to continuously improve their team we closed the assessment loop. In addition to just collecting data with the instrument, we developed a rapid cycle of collecting and processing data with the CTEF instrument, and provided summary results to commanders that could be used as feedback to their teams while in operations. Administrations of the instrument resulted in some changes in terms of reduced detail (fewer items in several sections), and less complex wording of the items. We also developed a template for feedback to commanders. To increase the ease of administration and speed the reporting of results (within two days) we developed a computer-based version of the instrument and standardized the statistical analysis routines.

In the second phase, we administered the instrument in a survey format in 14 NATO countries. The survey was directed to commanders and team members who have been part of a command team in a recent deployment or other operational context. The resulting data (718 respondents) were used to verify the theoretical underpinnings of the CTEF model and to identify additional ways to enhance the utility of the CTEF instrument (e.g., by further reducing the number of items or responses required).

We operated as Task Group HFM-127 in the context of the Human Factors and Medicine Panel of the NATO Research and Technology Organisation. The Group consisted of representatives from Canada, USA, Belgium, Sweden, 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 also benefited from the contributions of researchers in Bulgaria and the UK). The Task Group worked from Spring 2005 to Spring 2009, during which we met eight times and processed operational and survey data, as well as wrote the report.

1.5 STRUCTURE OF THE REPORT

In Chapter 2 we provide a concise overview of the CTEF model and the version of the instrument developed by the earlier NATO Task Group ('CTEF 2005'; Essens et al., 2005). This is intended to provide the reader sufficient context for understanding the theoretical background of the instrument. In Chapter 3 we discuss several applications of the instrument in operational practice and the subsequent optimisation of the structure of the instrument. In Chapter 4 we examine the conceptual consistency of the CTEF model with a model fit test, and we explored the psychometric properties of the instrument based on the survey. The survey administration and results are analysed and discussed. In Chapter 5 the survey data are compared with data of an administration of the questionnaire during a mission. Chapter 6 provides an

overview of the results and draws conclusions leading to revisions of the model and the instrument: 'CTEF 2.0'. In Chapter 6 recommendations are presented. The Annexes present: Annex A – The CTEF Instrument based on CTEF 2005 model used in Joint Caribbean Lion; Annex B – The CTEF Instrument as employed in the multi-national survey Study; Annex C – Demographic frequencies for participants in the CTEF survey study; Annex D – The CTEF 2.0 Concepts resulting from the survey; Annex E – The CTEF 2.0 Instrument; and Annex F – Practical Guidelines for application of CTEF instrument.



Chapter 2 – MILITARY COMMAND TEAM EFFECTIVENESS: OVERVIEW

2.1 THE COMMAND TEAM EFFECTIVENESS MODEL (CTEF)

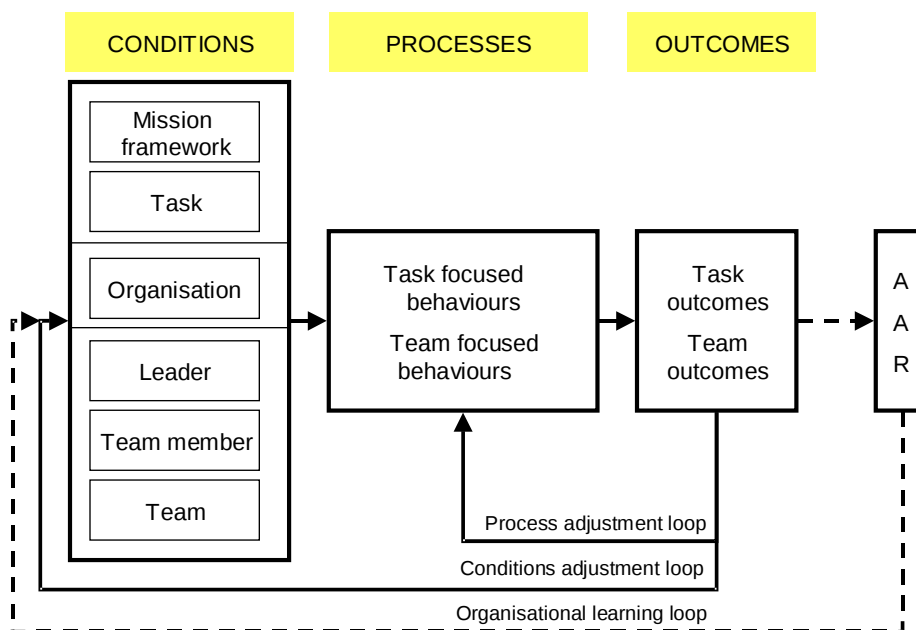
The NATO RTO HFM Task Group (HFM-087) developed a comprehensive model for Command Team Effectiveness (CTEF) and a model-based instrument to address the identified need of commanders to assess and improve the functioning of their teams before and during the mission ('CTEF 2005'; Essens et al., 2005). The CTEF model was based on an extensive literature review of team effectiveness and analyses of operational command teams.

The premise of the model is that the team to be effective, commanders must have a clear understanding of:

- a) The conditions they are working in (i.e., mission context, assigned task(s), degree of organisational support, and capabilities of team members, team leader, the team);
- b) The task and team processes that are needed to perform the mission and the tasks, given those conditions; and
- c) The objective end goals and intermediate goals, and the criteria for assessing the progress towards these goals (i.e., task and team output).

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 and improvement of effectiveness. The model will stimulate awareness of critical variables that may affect the team's effectiveness.

Figure 2-1 shows the original CTEF model with the top-level components of team effectiveness, their relationships, and feedback loops.



**Figure 2-1: 'CTEF 2005' Model with its Constituting Components
and Feedback Loops (Essens et al., 2005).**

MILITARY COMMAND TEAM EFFECTIVENESS: OVERVIEW

The Conditions component comprises one set that addresses the context the team is working in: *Mission Framework*, which captures the conditions of the mission of the team (e.g., 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 (e.g., task complexity, workload, goal clarity, and goal stability); and *Organisation*, which captures issues related to the fact that the team is embedded within the context of a broader organisation (e.g., goal congruity, clarity of command structure, autonomy, and organisational support).

A second 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); and *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 cover the activities directed at the operational tasks (e.g., 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 (e.g., 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 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 (e.g., achievement of the (intermediate) goals or achievement of the mission, meeting criteria set by stakeholders, other stakeholders’ satisfaction); and *Team Outcomes*, which address the maturity of the team (e.g., mutual trust, morale, cohesion, collective confidence in achieving the goals, shared vision, and mutual respect).

The model shows arrows between the components, which indicate 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: intrinsic feedback processes may be present within the team- and task-focused behaviours 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 Conditions, either in personnel, organisation, or mission and task factors; and *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. Table 2-1 provides an overview of the main components, aspects and features of the CTEF 2005 model, the first version of CTEF. The developmental details that led to changes in wording which was used in the Survey version of CTEF are described in Chapter 3.

Table 2-1: Main Categories, Components, Aspects, and Features of the CTEF Model, Respectively the Levels 1 – 4.

CONDITIONS (Level 1)	
Mission Framework (Level 2) Situational uncertainty (Level 3) Uncertainty about intelligence (Level 4) Uncertainty about adversary's intent Uncertainty about required resources Uncertainty about utilisation of resources Stress potential Danger Operational intensity Psychological stressors Constraints Environmental factors Political factors Cultural factors Media related factors Time-space coordination Stakes Casualties National impact International impact	Task Task complexity Task difficulty Number of sub-tasks Sub-task interdependencies Sub-task interference Workload Physical workload Cognitive workload Emotional workload Time pressure Lack of goal clarity Lack of goal stability
Organisation Congruity of team's mission and organisational goal Clarity of command structure Autonomy Organisational support Recognition Supportive climate Material support	Leader Leader skills Tactical skills Technical skills Interpersonal skills Cognitive skills Leader knowledge Task knowledge Team knowledge Organisational knowledge Match of personal goals to organisational goals
Team Member Team member skills Tactical skills Technical skills Interpersonal skills Cognitive skills Team member knowledge Task knowledge Team knowledge Organisational knowledge Match of personal goals to organisational goals	Team Appropriateness of team composition Mix of skills Mix of demographic characteristics Mix of personality traits Membership stability over time Appropriateness of team size Appropriateness of team architecture Physical proximity Appropriate distribution of tasks Team maturity Match of team goals to organisational goals

MILITARY COMMAND TEAM EFFECTIVENESS: OVERVIEW

PROCESSES	
Task-Focused Behaviours Managing information Obtaining information Processing information Exchanging information Assessing the situation Making decisions Defining the problem space Managing time available to make decisions Evaluating options and results Planning Anticipating Scheduling Specifying resources needed Defining strategies Directing and Controlling Organising Managing Monitoring progress Liaising with other command teams	Team-Focused Behaviours Providing and maintaining vision Maintaining common intent Interacting within the team Communicating Coordinating Providing feedback Motivating Extrinsically Intrinsically Adapting Monitoring Correcting Backing-up Providing team maintenance Providing social support/integration Regulating emotions Developing/maintaining cohesion Managing conflict
OUTCOMES*)	
Task Outcomes Achievement of the intermediate/end goals Meeting the Criteria set by the stakeholder Other stakeholders' satisfaction with (expected) outcomes Staying within the limits/intentions	Team Outcomes Mutual trust Morale Cohesion Collective confidence in achieving the goal Shared vision Mutual respect
FEEDBACK**)	
Processes Adjustment	Conditions Adjustment

*) For outcomes a distinction was made between 'Achievement of Intermediate goals' for assessments during an operation; and of 'Achievement of End Goals' for assessments at the end or after an operation.

**) For Feedback only the Level 2 items (Processes and Conditions Adjustment) were specified in the CTEF 2005 model.

The CTEF 2005 model provided the basis for an assessment instrument with items that are organised along the structure of the model. The instrument allows the respondent to indicate the perceived level of an item and the impact that level has on team effectiveness. We distinguished 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. Then, a judgement is required to assess the potential impact of that status on team effectiveness. In the Figure 2-2 an example is presented (from Essens et al., 2005) with the main category Processes and component Task-focused behaviours and one of the aspects and the accompanying features. The items show an aspect level "Managing Information" (Level 3) and, four features (Level 4). Each item is scored on the magnitude¹ scale Very Low to Very High (1 – 5), or Not Available (i.e., N.A.). The *impact* of that magnitude rating on overall team effectiveness is scored on Very Negative to Very Positive (-2 to +2).

¹ Throughout the text of this report we use the terms magnitude, level, quantity interchangeably to indicate the assessment of status of a given construct.

TASK-FOCUSED BEHAVIOURS											
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>											
	Assessment of Task-Focused Behaviours						Impact on Team Effectiveness				
ITEM	N.A.	Very Low	Low	Moderate	High	Very High	Very Negative	Negative	None	Positive	Very Positive
Managing Information		1	2	3	4	5	-2	-1	0	+1	+2
Obtaining Information (i.e., through an active search to compensate for the lack of information addressed under situational uncertainty)		1	2	3	4	5	-2	-1	0	+1	+2
Processing Information (e.g., using, integrating information)		1	2	3	4	5	-2	-1	0	+1	+2
Exchanging information (e.g., timeliness, clarity, brevity, correctness, completeness)		1	2	3	4	5	-2	-1	0	+1	+2
Assessing the Situation (e.g., perceiving, recognising, anticipating events)		1	2	3	4	5	-2	-1	0	+1	+2
.....											

Figure 2-2: Sample of CTEF Instrument on the Basis of the CTEF (2005) Model.

The CTEF instrument can be applied at various stages of a team's mission to assess the status of the team at a given time. The instrument can be used to diagnose the team's conditions, processes, and intermediate outcomes in the preparation of and during a mission and identify which elements require improvement in order to improve effectiveness. The results and the required improvements can be discussed by the commander and the team in their regular team Progress Review sessions. The results can also be used as a benchmark against which the impact of an intervention can be evaluated. After the team's mission, the results can be used as a basis for an After-Action Review (AAR), to learn and to understand how and why things happened as they did, and how things can be improved. The instrument can be applied repeatedly to reveal how the team is evolving and performing over time. The development and initial applications of the CTEF instrument are described in Chapter 3.



Chapter 3 – DEVELOPMENT AND INITIAL APPLICATIONS OF THE INSTRUMENT

3.1 INTRODUCTION

In this chapter, we describe initial tests and applications and the subsequent fine-tuning of the CTEF instrument. The assessment instrument from the Essens et al. (2005) study was constructed as a straightforward representation of the model, without tests in operational conditions. Two lines of testing and verification of the CTEF 2005 model and corresponding instrument were initiated: we looked for operational applications in training and exercises; and an international survey study was planned. Several opportunities arose where we could apply the instrument, explore data, and evaluate how commanders use the instrument to assess their teams. On the basis of these data we improved the instrument while maintaining the CTEF structure. The international survey, described in Chapter 4, was intended to evaluate the operational relevance of the model on the basis of formulated hypotheses.

In Chapter 3 we describe the initial, ad hoc experiences with the model and the instrument, which resulted in several key changes (e.g., format, intelligibility, content, scales, data analysis, generation of feedback). Second, we describe a substantial application of the CTEF model and instrument in an operational exercise (Section 3.5 Joint Caribbean Lion). In our search for opportunities to collect data, we were especially interested in real operations and exercises in the field. However, other data sources were sampled, if available, in order to get feedback on the model and the instrument. The only common requirement in all cases described below was that respondents needed to have an operational background and, preferably, some experience with deployments. The initial stage of verification of the model and the instrument was subject to a number of limitations. First, the number of participants per case varied from twenty to fifty persons only. Second, there was a lot of variation in settings, in type and composition of the teams, and even in measurement. After each use of the instrument, we made revisions according to the feedback that we received.

The chapter is organised around four cases: the fourth Multi-National Exercise (MNE-4) with teams at the Canadian site; multi-national teams at the headquarters of Supreme Allied Command Transformation (SACT); the naval-air exercise Gammel Dansk of the Dutch Naval Operational School, and the sea-based amphibious exercise Joint Caribbean Lion (JCL). These cases allowed us to get feedback from the military on their appreciation of the model and use of the instrument as a whole, and to uncover the qualities and weaknesses of the instrument. In these cases we studied how teams scored the items. The naval exercise Gammel Dansk provided us with evaluation data on the instrument. The exercise Joint Caribbean Lion provided longitudinal data from team leaders, team members, and observers from which we could learn how teams developed during an exercise.

Each case in this chapter is described in four sections:

- 1) The context of the case (e.g., real operation or exercise, type of operation, number of nations involved);
- 2) The method of data collection (i.e., participants, type of instrument used, design);
- 3) The results of the data analysis (i.e., statistics, feedback from the field); and
- 4) The lessons learned to further improve the instrument.

The point of departure for the studies in this chapter was the CTEF 2005 model as shown earlier in Table 2-1.

We distinguished between three versions of the instrument:

- The long version encompassing all four levels of the model which comprise items of the aspects and the underlying features (see Table 2-1); e.g., there are questions relating to Situational Uncertainty (aspect level of items – Level 3) and to Uncertainty about required resources (the feature level – Level 4);
- The medium version consists of items of all aspects and the underlying features (Level 4) for the processes, but only the aspect-items (Level 3) for the conditions and the outcomes; and
- The short version only contains three levels of the model comprising the items of the aspects for the conditions, outcomes, as well as the processes.

3.2 MULTI-NATIONAL EXERCISE-4 (MNE4)

Our first data collection attempt with the CTEF instrument was in the context of the Multi-National Experiment-4 (MNE4; February-March 2006). Attempts were made to coordinate data collection with CTEF at different sites within the MNE4 study. In the end, however, data were collected only at the Canadian location at the Canadian Forces Experimentation Centre (CFEC, Ottawa, Canada), and involved a limited number of participants. Accordingly, the results of this study with respect to the development of the CTEF instrument were limited to structural changes and usability feedback from subject matter experts.

3.2.1 Context

The MNE4 experiment was the 4th study in a series of large technology demonstration experiments examining the robustness of the Effects Based Operations (EBO) process, as well as organizational, technology, and supporting concepts. The countries involved were Australia, Canada, Finland, France, Germany, Sweden, UK, and USA. Canada focused on Knowledge Management and MNIG (multi-national inter-agency group), cultural analysis, knowledge-based development, and common intent. The NATO Coalition Task Force (CTF) and NATO Response Force (NRF) provided two headquarters staffs, both utilizing EBO to address a stability operations scenario in current day Afghanistan.

The experiment was focused at the operational level of command. The traditional staff structure was not employed; instead each HQ was functionally organized with a Command Group supported by four multi-disciplinary staff teams based on the EBO framework: Effects Based Planning, Effects Based Execution, Effects Based Assessment, and Knowledge Superiority. Both HQs were supported by a Multi-National Inter-agency Group, composed of representatives from other organizations and NGOs. The CTF HQ operated in a distributed fashion from five nations, communicating via the Combined Federated Battle lab Network. The NRF HQ personnel were located in Istanbul, Turkey, and also communicated via the Combined Federated Battle lab Network.

3.2.2 Method

The structure of the instrument was modified to address more clearly the positive or negative impact of a particular magnitude of an item on the team effectiveness. The separate positive or negative direction replaced the -2 (Very negative) to +2 (Very Positive) scale of the original instrument (Figure 3-1).

TO WHAT DEGREE ARE EACH OF THESE ELEMENTS PRESENT IN YOUR COMMAND TEAM?	Rel	Quality/Magnitude	Direction	Strength of Impact
Situational Uncertainty <i>The lack of information about, or lack of understanding of objects and their properties in the area of responsibility</i>	(NR)	VL L M H VH	- 0 +	0 1 2 3 4
Stress Potential <i>Stress potential due to operational consequences</i>	(NR)	VL L M H VH	- 0 +	0 1 2 3 4
Constraints <i>External factors that limit the range of the team's actions or autonomy</i>	(NR)	VL L M H VH	- 0 +	0 1 2 3 4

Figure 3-1: Part of the Questionnaire that was used in MNE4.

The Canadian MNE4 location at CFEC in Ottawa had a total of 14 ‘players’; 11 of them participated in the survey. The CTEF instrument was administered three times during the course of the 3-week study – on days 4, 10, and 15. The response rate for the three administrations was 9, 11, and 11 participants, respectively. Due to time constraints, the ‘short’ version (only Level 3 for Conditions, Processes, and Outcomes) of the original CTEF 2005 model was administered. Participants made four assessments for each item: Relevance, Magnitude, Direction of impact, and Strength of impact.

Of the 11 participants, 10 had military experience (range: 6 – 30 + years); four had experience with effects based planning; all had participated in joint tours or postings; eight had participated in multi-national tours/postings; and five respondents had previously worked in a distributed collaborative environment. The background of the eleven respondents was Navy (2), Air Force (1), Army (5), government employee (1), and ex-military contractor (2).

3.2.3 Results of Respondent Feedback

Many of the participants found the layout of the survey confusing and thus had difficulty with answering each part of the question. One notable and consistent problem was with the “direction of impact” question. For example, people sometimes answered ‘0’ to the direction of impact, but then indicated a value for the strength of impact, which does not seem consistent. It was clear that it would be better to employ two rating scales for each item instead of four. In fact, we went back to the original structure and decided to use one scale for rating the magnitude of the item and a second “strength of impact” rating scale, with each employing a 5-point Likert scale.

Other feedback on the CTEF-instrument resulted from a global perspective on team performance in the study. Specifically, the type of team in this sample was not typical of a command team. They did not have at their disposal the tools they typically used in operations, the EBO process was new to them, and the technology to link the distributed teams was constantly going down, which influenced their ability to get their job done. Accordingly, it was clear that we should add an item to the CTEF reflecting the impact of technology on team effectiveness.

3.2.4 Conclusion

Based on the results of our experiences with MNE4, we decided to stay with the original two scales, for magnitude and impact.

3.3 SUPREME ALLIED COMMAND TRANSFORMATION (SACT)

We were provided with the opportunity to collaborate with the HFM-138 Task Group on Adaptability in Coalition Teamwork to collect feedback on the CTEF instrument from personnel at NATO’s Supreme

Allied Command Transformation (SACT) Headquarters in Norfolk, VA. SACT headquarters directs NATO's Allied Command Transformation (ACT)'s various subordinate commands such as the Joint Warfare Centre (JWC), The Joint Forces Training Centre (JFTC), and various NATO Schools.

3.3.1 Context

While we were interested in applying the CTEF instrument in operational environments, we did not want miss the opportunity to receive feedback on the instrument from multi-national military personnel. Therefore, the main goal of this data collection effort was to gain feedback and insight on how to make the instrument simpler and more usable. Specifically, we wanted to gauge respondent's perceptions of reading comprehension level, reduce confusion of item wording, and increase the clarity of the level and impact scales.

3.3.2 Method

Twenty-two participants (19 male and 3 female; 13 military and 9 civilian) from SACT HQ completed the CTEF survey. The seven nations represented in this sample included: Canada, France, Great Britain, Greece, the Netherlands, Spain, and the United States. Two members of the HFM-138 Adaptability in Coalition Teamwork panel provided the medium length version of the CTEF to participants in one of 3 ways: Interview (N = 2); Paper-and-pencil (N = 13); and Desktop computer program (N = 7).

Following the CTEF questionnaire, participants were asked to provide reactions and feedback on the instrument.

3.3.3 Results of Respondent Feedback

The reduced reading level that was introduced after the first administration in Joint Caribbean Lion (see Section 3.5) did increase the understanding of the items overall, although there were still a few items that needed re-wording and clarification based on the SACT personnel feedback. For example, a few respondents commented that they were confused about the difference between questions regarding the *use* of knowledge (processes) versus *possessing* knowledge (conditions). Additionally, a large majority of participants did not understand the item 'team maturity'. These comments led to minor changes in the wording of the items.

The participants were asked to describe their team following the completion of the instrument. However, many of the participants did not understand which team was being referred to: was it the team that they were in now, or the team they were part of during their daily work? Also, the concept of team was not very clear to them.

Finally, a majority of the participants were confused about the magnitude and the impact on team effectiveness scale values. The major cause of confusion seemed to stem from the participants rating items on the magnitude scale ranging from 1 to 5 and then rating impact on a scale ranging from -2 to +2. Also, the SACT personnel indicated that there is a difference between no impact on performance and neutral impact on performance.

3.3.4 Conclusions

As a result of the feedback, we implemented two changes to the instrument. First, we moved the team description questions from a separate demographics list into the CTEF questionnaire itself. Additionally, we updated the instructions to make this connection to the team more salient. For example, the instructions now read for the survey: "*Questions on the following pages will ask you to reflect on the performance and effectiveness of a command team you have been a part of, as a leader or member. Please consider one*

command team that you have been a part of, in a recent deployment or other operational context. Remember that this team will be the reference of ALL upcoming questions.”

To reduce the confusion about the scales, we added text anchors. For example, the magnitude scales were labelled Very Low, Low, Moderate, High, and Very High. The impact scales we labelled to read Very Negative, Negative, No Impact, Positive, Very Positive. Also, a “not applicable” option was added to the impact scale.

3.4 GAMMEL DANSK (GD)

Gammel Dansk is an international naval-air training exercise executed yearly at the Naval Operational School in Den Helder, Netherlands. It was suggested by the head observer of Joint Caribbean Lion that the evaluation of the exercise could be improved by making use of CTEF. For us it was another opportunity for data sampling. We also wanted the respondents to evaluate the questionnaire.

3.4.1 Context

The Gammel Dansk exercise has an educational purpose, and is a final exercise and test at the end of a six week course on sea-air integrated operations. The purpose of the course is to train naval and air defence personnel in operational command, collaboration, and teamwork. Both trainers and trainees took part in the exercise. The trainees were assigned to the different teams in the exercise.

3.4.2 Method

The exercise involved five ship teams; four Air-Defence teams; and some other respondents. On the last day of the exercise the medium version of the CTEF instrument was administered as a paper-and-pencil-questionnaire. It was the same questionnaire that was used for JCL2 and JCL3, but it was translated back into English. However, it was the first time that we added feedback loop items and evaluation items. Instructions to fill out the questionnaire were given verbally by the Netherlands Task Group representatives.

3.4.3 Results

Forty-eight participants (44 male and 4 female) from Germany (N = 23), the Netherlands (N = 22), Belgium (N = 2) and Poland (N = 1) completed the CTEF survey.

Feedback to the commander was given for each team. In each case, we presented mean results and compared them with the results of the other teams. The comparisons have not been statistically tested, because the number of respondents per team was too small. Here, we report only some general trends.

3.4.3.1 Conditions

- Teams estimated their team leader (M = 3.8) and team members (M = 3.6) as rather competent.
- Team (M = 3.3) and Organisation (M = 3.2) were viewed somewhat less favourably.
- Mission framework (M = 2.3) and the task (M = 2.6) generally did not seem to be too complicated.
- One team agreed on the negative impact of a number of conditions for their team effectiveness, especially Unclear goals, Team leader skills, Adequate mix of people, and Team maturity. Other teams were very positive about the impact that their team leader and team members had on the effectiveness of their team.

3.4.3.2 Processes

- Teams scored well on all Task-focused behaviours (M = 3.6).
- Teams scored well on all Team-focused behaviours (M = 3.7), except for Motivating (M = 3.3).
- Most teams agreed that their level of Task-focused and Team-focused behaviours had a positive impact on team effectiveness.

3.4.3.3 Outcomes and Feedback

- Teams scored very well on task outcomes (M = 3.6) and team outcomes (M = 4.0) and task feedback (M = 4.0) and team feedback (M = 3.8).

3.4.3.4 Evaluation of the Items

The results of the evaluation questions are described In Table 3-1.

Table 3-1: Seven Evaluation Items (Percentage; N = 48).

	(Completely) Disagree	Neutral	(Completely) Agree
I think that the right aspects of team effectiveness are being addressed	7	40	53
I think the questions are clear	7	40	53
I think that the distinction between level and impact is clear	2	31	67
I think that the distinction between level and impact is useful	5	34	61
I think that the length of the questionnaire is about right	26	44	30
I learned something about improving team effectiveness	32	34	32
I would want to use the instrument in practice	37	30	33

3.4.4 Conclusions of Gammel Dansk

Gammel Dansk revealed that respondents were very positive about their team effectiveness. Especially, the team leader and team members were evaluated very positively. In general, the respondents were also positive about the model and the instrument. Most of the respondents thought that the right aspects of team effectiveness were being addressed and that the questions were clear. Furthermore, they found the distinction between the level and impact scores both clear and useful. However, only one third of the respondents found the length of the questionnaire right and also only one third would like to use the instrument in practice.

3.5 JOINT CARIBBEAN LION

Joint Caribbean Lion was a joint, combined, amphibious (sea-land) exercise led by the Netherlands, including troops from the United States of America, United Kingdom, Canada, France, and Belgium.

The opportunity to issue the CTEF-instrument came up during meetings between TNO and the Royal Netherlands Navy. The commanders of the Dutch maritime contingent wanted to evaluate their staff during the exercise and improve it systematically over time. They had seen the CTEF model and recognized its potential for their purpose. The implementation of the CTEF-instrument for this exercise is described in Essens et al. (2008).

3.5.1 Context

As stated on the website (Dutch Ministry of Defence, 2007), the “Main purpose of the exercise Joint Caribbean Lion” was “to mobilize an expeditionary military force of the Dutch defence forces, supplemented with international participants, in order to react to a crisis in an out-of-area environment”.

The joint and combined (all services and multi-national) exercise was conducted in the period from 15 May to 16 June, 2006 – the first ever Netherlands Joint (multi-service) and Combined (multi-national) exercise on such a large scale. Besides the above mentioned troop contributing nations, Venezuela and Chile contributed with observers. About 4500 military personnel participated with 12 ships, 2 maritime patrol aircrafts, four F-16s, and transport planes. The exercise was based upon Chapter VII UN operation.

The Dutch maritime contingent consisted of a Command Amphibious Task Force and a Command Landing Force. The two staffs merged into one joint staff to plan and execute the maritime and amphibious operations. The command and control organization was new and exercising for the first time. Several positions were filled shortly before the exercise.

The commander’s intent was that the whole staff (about 70) would fill in an electronic version of the CTEF instrument at several points during the exercise, and that they would electronically send the data files to the members of the HFM-127 Task Group to be processed at short notice for the Commander’s operational feedback two days later. Data collection at Joint Caribbean Lion was the first large data collection opportunity. Most of the procedures of this distant data collection, data processing, and operational feedback had to be developed from scratch. We wanted to determine if teams could work with the model and the instrument, if the instrument worked as a tool for team improvement, and if different kinds of team members (i.e., leaders and members) would fill in the items in the same way. Furthermore, we wanted to examine in more detail the relationship between the magnitude and the impact scores.

During the Joint Caribbean Lion exercise a tropical storm passed through the area of operations that caused a major flood in Surinam. As a result, the population of Surinam was in need of emergency support, which was provided by, amongst others, the crew and staff involved in the Dutch contingent of Joint Caribbean Lion.

3.5.2 Method

The participants were leaders of a command team or a staff team (both navy and army teams), members of those teams (officers and NCOs), or observers of the exercise. A stand-alone desktop version of the CTEF instrument was used and made available to the staff via the ship’s network. The administration of the survey was overseen by the head of the observers. The instrument was filled out at the beginning of the exercise (T1), halfway (T2), and at the end of the exercise (T3). The respondents filled out the questionnaire at selected computer terminals within two days after the leader of the observers requested them to do so. He collected the raw data files and sent them to us via email. Within 48 hours we processed and analysed the data and made a concept (PowerPoint) presentation, which could be adapted by the lead observer to his own needs for giving feedback to the staff of JCL. The results were presented and discussed with the personnel that were present. At T1 not all personnel were in place and therefore not all were able to fill out the questionnaire at this point in time.

In Table 3-2 an overview is given of the number of responses per category for each point in time.

Table 3-2: The Number of Respondents at Time T1, T2, T3.

	T1	T2	T3
Team Leaders (and deputy team leaders)	10	14	27
Team Members	19	40	28
Observers	4	4	4
Incomplete Questionnaires	7	5	5
Total Valid Questionnaires	33	58	59

3.5.3 Results

After T1, the first JCL administration, the lead observers reported that the Dutch staff had serious complaints about the readability and the length of the instrument. This led us to change the instrument to a new version which was used at T2 and T3. We will discuss separately T1 and T2 +T3 results, referred to as JCL1 and JCL 2 and JCL3 below.

3.5.3.1 Results of First Administration – JCL 1

Forty participants from the command ship HMS Rotterdam responded at JCL 1. Of those, 7 were incomplete or duplicates, hence, 33 responses were used for analysis. Of these, 10 were leaders, 19 were team members (4 N/G2, 4N/G/SA3, 10 N/G5, 1 N/G6), and 4 were observers on the ship.

Issues that came to our attention from this phase:

- The concept of team did not seem to be clear in this context. Are the different staff sections the teams? Did some questions refer to the staff as a whole? For the lead observer, the concept of team that we as researchers had in mind, namely a commander plus his sub-commanders or section heads, was not clear. There were many ‘teams’ within the staff and one person could work in more than one team. Therefore, we needed to be clear which team we were interested in.
- Some respondents indicated a concern about privacy, because we asked them to identify in what section they were in, and whether they were a leader or a team member. Was the commander or the leader of the observers reading their responses? Could they give candid responses without being identified, in particular in small sections? Guarantees were given that the data would be handled confidentially and that the results would only be presented at group level.
- The wording of the instrument was considered to be too difficult for the respondents. Further analyses revealed that the reading level that was needed to read those items was indeed too high (13th grade).
- The respondents had difficulty answering the English items. They preferred the questionnaire to be translated into Dutch.
- The time needed to answer the instrument was too long. The number of questions and the time each question took needed to be reduced.

3.5.3.2 Conclusion JCL 1

As a result of the aforementioned comments we decided to use the medium version of the instrument for the next measurements (This version became the “standard” version for subsequent measurements).

Furthermore, we decided to optimise the readability level of the items from 13th grade to 9th grade level (using the Flesch-Kincaid Level for readability), and also translated the items into Dutch for the respondents of Joint Caribbean Lion (administrations JCL 2 and JLC 3). With respect to the concept of team, we analysed the data at the general level and did not split the results for the different sub-teams that could have been distinguished.

3.5.3.3 Results of Second and Third Administration – JCL 2 + 3

Most respondents reported which team they belonged to, but we did not report back the results per team to avoid identification of individuals. First, it was not clear which team they were actually referring to in answering the questions: were they referring to their section or to the larger staff? And second, the number of respondents per team was rather small. Therefore, in the remainder of this section only aggregated results will be reported.

We computed the overall correlation between the magnitude and the impact scores for each item at T1, T2, and T3. The mean results were .57 (T1), .77 (T2), .78 (T3). These correlations are very high with the exception of Mission Framework items and Task items (for T1 .18 and .13 respectively, all others above .60; for T2 .36 and .35 respectively, all others .68 or above; for T3 -.02 and .22 respectively, all others above .82). Because of the high correlations for most of the items, we chose not to give feedback on both magnitude and impact.

We chose to present the impact scores, which represented the respondents' perception of the effect of a particular level of a condition or process on overall effectiveness. Since there is no norm on the meaning of the magnitude or level of an aspect, the impact question better taps into the respondent's model of what is good and what should be improved. Furthermore, team members might be more convinced to change an aspect of their team's functioning if they were given information that a relatively large number of the team members thought that team effectiveness was negatively impacted by that aspect. Therefore, the core of the presentations that were prepared consisted of an analysis of positive or negative impact scores. For each component of the questionnaire we presented those items for which at least 30% of the respondents reported (highly) negative or (highly) positive impact scores. By presenting this, the participants could easily see the perceived weak or strong points of the whole team. Figure 3-2 gives an example of a slide that was presented in the Commander and Staff review.

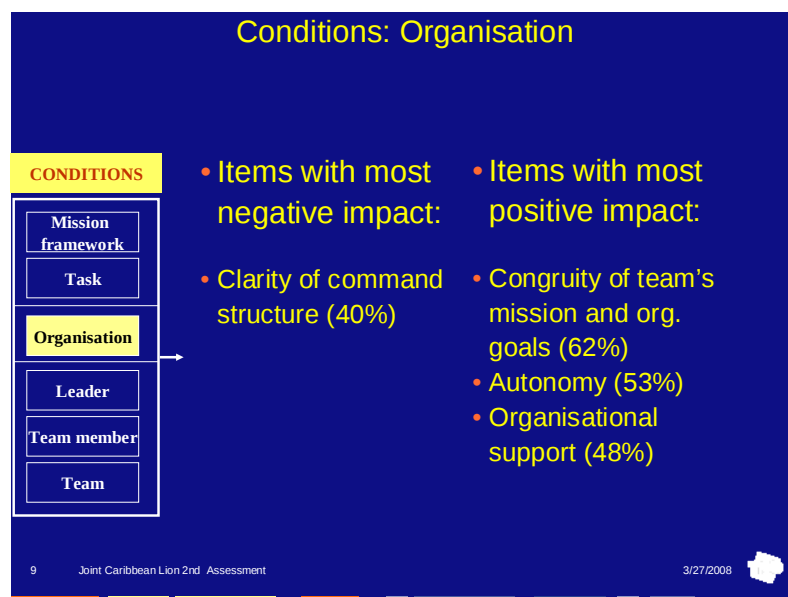


Figure 3-2: Sample of a Slide in the Feedback Presentations (from T2 Assessment).

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In Table 3-3 we summarize which items show consistent negative or consistent positive impact scores on team effectiveness. That is, at all points in time (T1, T2, and T3) more than 30% of the respondents indicated that the item had a negative or a positive impact on team effectiveness. Table 3-3 shows that the respondents consistently considered their situation as being so uncertain and their task having such a high workload that it negatively impacted effectiveness. It also shows that they considered their teams as having the right people, but they were negative about the maturity of the team as a whole. With respect to the processes, they saw information exchange as a problem, but decision making and backing-up as a strength. Finally, they considered the achievement of task goals of several stakeholders and the mutual trust and confidence as strengths.

Table 3-3: Items Rated as Either a Negative (-) or Positive (+) Impact on Team Effectiveness Consistent Over T1, T2, and T3 (>30% Criterion).

Conditions			
Mission Framework	Situation uncertainty (-)	Leader	Skills (+) Knowledge (+) Match personal to organisational goals (+)
Task	Workload (physical) (-) Unstable goals (-)	Team Member	Skills (+) Knowledge (+)
Organisation	Autonomy (+)	Team	Composition (+) Maturity (-)
Processes			
Task-Focused Behaviours	Managing information (exchanging) (-) Making decisions (+)	Team-Focused Behaviours	Adapting to changes (backing up) (+)
Outcomes (for intermediate or end goals)			
Task Outcomes	Goal achievement (+) Stakeholders' expectations (+)	Team Outcomes	Mutual trust (+) Morale (+) Collective confidence in success (+) Mutual respect (+)

In order to see if there was improvement in the impact-scores over time, we computed the percentage of positive and negative impact scores for all items within each component of the model (see Table 3-4).

**Table 3-4: Trends in Impact Scores During the Exercise
(Underlined the Highest Score of the Three Administrations).**

	Number of Impact Scores (%)					
	Negative Scores			Positive Scores		
	T1	T2	T3	T1	T2	T3
Mission Framework	28	<u>34</u>	30	<u>19</u>	11	17
Task	43	<u>48</u>	41	<u>20</u>	10	17
Organisation	<u>36</u>	26	27	35	<u>47</u>	39
Leader	<u>20</u>	14	18	44	<u>50</u>	48
Team Members	<u>21</u>	19	20	48	<u>51</u>	44
Team	26	32	<u>44</u>	<u>37</u>	<u>37</u>	28
Task-Focused Behaviours	30	22	<u>32</u>	34	<u>35</u>	25
Team-Focused Behaviours	25	22	<u>31</u>	30	<u>36</u>	25
Task Outcomes	<u>18</u>	9	8	35	38	<u>44</u>
Team Outcomes	23	<u>24</u>	<u>24</u>	<u>43</u>	37	33

Table 3-4 shows that the mission framework and the task had the worst consequences for team effectiveness at T2. For the task items almost half of the respondents (48%) estimated a negative impact at T2. At that point in time the emergency support in Surinam had its most significant impact on the exercise. On the other hand, the respondents thought that their organisation, their team leaders, and team members fulfilled the most positive role at that same point in time. At that point in time also the task-focused and team-focused behaviours played the most positive role for team effectiveness. A surprising effect was that the team, as well as the task-focused and team-focused behaviours, had their most negative effects at T3, the point in time where the team should have been the best, because of the growth as a team as a result of the exercise.

3.5.4 The Magnitude Scores

A separate analysis was done on the magnitude scores. We compared the differences between the three categories of respondents over time: leaders, team members, and observers at T1, T2, and T3. We computed the mean scores by averaging the responses to all items that belong to a certain component. Table 3-5 shows that in general the leaders gave the most positive scores, then the team members, and followed by the observers. The observers scored much lower than the other respondents on team members, team, task-focused behaviours, team-focused behaviours, task outcomes, and team outcomes. In other words, the observers assessed these components as more negative than the team members and leaders. The observers also scored the mission framework lower, which means that they perceived, e.g., less uncertainty in the mission than the teams themselves (as an example). Although they were rather negative in their assessments at the start of the exercise, the observers grew more positive in their assessments of task-focused behaviours, team-focused behaviours, and task outcomes during the exercise, whereas they became more negative about the organisation and the team outcomes. Contrary to the prevailing positive trends of the observers, is the negative trend of the team leaders with respect to the team. The team leaders perceived the team to have less positive characteristics at the end of the exercise than at the beginning.

Table 3-5: The Mean Scores of the Items per Component for Different Respondent Categories
(Bolded if the differences between the respondent categories are larger than 0.4;
Underlined if the respondents changed their assessments substantially (>0.4) over time).

	Average Scores (Scale 1 – 5)								
	T1			T2			T3		
	L*)	M	O	L	M	O	L	M	O
Mission Framework	<u>3.54</u>	2.80	2.56	<u>3.06</u>	2.82	2.31	<u>3.07</u>	3.03	2.38
Task	3.05	<u>3.10</u>	3.07	3.22	<u>2.43</u>	3.06	3.28	<u>3.39</u>	3.06
Organisation	3.32	2.96	<u>3.25</u>	3.56	3.23	<u>3.44</u>	3.15	3.10	<u>2.69</u>
Leader	3.53	3.25	3.58	3.54	3.36	3.67	3.37	3.38	3.58
Team Members	3.52	3.42	2.92	3.44	3.36	3.08	3.16	3.25	3.25
Team	<u>3.33</u>	3.12	2.90	<u>2.95</u>	3.13	2.80	<u>2.67</u>	2.90	2.90
Task-Focused Behaviours	3.34	3.06	<u>2.61</u>	3.32	3.08	<u>2.74</u>	2.92	2.82	<u>3.16</u>
Team-Focused Behaviours	3.18	2.90	<u>2.49</u>	3.06	3.14	<u>2.92</u>	2.84	2.84	<u>2.86</u>
Task Outcomes	3.64	3.11	<u>2.83</u>	3.29	3.34	<u>2.92</u>	3.47	3.28	<u>3.56</u>
Team Outcomes	3.27	3.34	<u>3.00</u>	3.09	3.29	<u>2.50</u>	3.04	3.12	<u>2.61</u>

*) L = Team Leader; M = Team Member; O = Observer.

3.5.5 Usability

The CTEF model was recognized by the commanders as a relevant set of items that should be addressed. The systematic review of factors enabled by the CTEF model and the results from the assessments were highly appreciated by the command. The result provided a basis for discussion with the crew on what the positive and negative issues were and what actions should be taken to repair the negative trends. As mentioned previously, in particular at the first administration the instrument was seen by the crew as too complex in wording and it was too long for operational conditions. Most agreed that the systematic review was supportive, but that it could also lead to too long review sessions. A subtle point was that some had a problem in revealing their judgments, despite the fact that data were collected anonymously.

Another, complicating but interesting, issue was that the definition of ‘which team do you belong to’ was not simple to answer for many of the crew, because they considered themselves often part of more than one team. And also, a team leader is mostly a member of a higher level team.

3.5.6 Conclusion and Discussion

The main objectives of the Joint Caribbean Lion application were to support the commanders to have better team reviews and improve team effectiveness. In particular: Do the CTEF model and the instrument work for commanders and the teams to address team effectiveness, and does that lead to team improvement? Feedback from the commanders revealed that the model was immediately recognized as militarily relevant and that the structure of the model helped to systematically address issues in discussing their staff’s performance.

One of the questions about the instrument that was addressed was whether the measurement of both magnitude and impact, which both seemed relevant, is necessary. A calculation of the correlations between magnitude and impact showed that they were almost all very high. This implies that either both scales seem to measure the same underlying construct or respondents were not able to distinguish between the two.

Application of the instrument in a process of assessment, reporting and discussion during team review sessions should lead to improved team effectiveness. During the exercise Joint Caribbean Lion the results did not show improved in team effectiveness. Only the observers saw some positive trends in team performance. At least three questions may be asked about this failure to show improvement. First, were the measures reliable? Perhaps, the team functioning may have improved, but the instrument was not able to measure it. In order to check this possible conclusion, we had a final evaluation with the commander of the exercise and the leader of the observers. They both confirmed the observation from the questionnaires that the teamwork had not improved during the exercise.

Second, did the relief operation in Surinam, which broke up the organisation, have a negative effect on team improvement? Especially at T2 this should have had effects on the data, because at that point in time, a number of the team members had been extracted from the exercise. The data show that at that point in time, especially the mission framework and the task had the most negative impact scores. That can be explained because the situation created extra uncertainty and pressure on the team. On the other hand, at that point in time a lot of other aspects showed their most positive impact scores. For example, the organisation, leaders, team members, and processes were perceived to have relatively high positive impact on team effectiveness. This may be explained by the positive feelings that were generated doing something to relieve people in Surinam from their problems. People may have felt they were doing a good job and working hard to solve the problems.

Third, were the feedback review sessions that were organized the best way to work on the improvement of the teamwork? In those meetings, the data were presented and discussed with all people that were present at the location (i.e., one of the ships). With such a large 'team' together and still a number of people not present, it may not have been clear who was responsible for dealing with the problems in team functioning that came up during the presentation. Furthermore, in hindsight it may not have been the right aggregation level to feed back the data. Perhaps, the teams that should have received specific feedback were the smaller teams that composed the larger team (e.g., the operations team, the intel team). The feedback should perhaps have been targeted at their level. On the other hand, involvement of the whole staff may raise shared awareness of the state and direction of effectiveness of the staff.

The question of who should fill out the instrument is still open. CTEF was intended to be used by command teams (commander – staff/section heads or commander – sub-commanders). The commander and the leader of the observers wanted to use it for the whole staff at operational functions. The results show that if the leader uses the instrument to assess own team performance, the results may be more positive than when the team members or observers fill out the questions. When observers fill out the questionnaire, the problem may be that the team members or team leaders may find them to be too disapproving of the team. At least one should be aware that different tendencies emerge if specific roles use the instrument. Limiting CTEF to be used in a staff only by the commander, chief of staff, and section heads could solve the issue of team definition and might generate more specific data. On the other hand, the power of having an instrument that spans the whole operational staff, with multiple teams and dynamic sub-groups, is appealing. This might require an additional development of CTEF which is beyond our objectives.

3.6 CONCLUSIONS

In this chapter we described the initial experiences with the instrument and a series of administrations of the instrument including a realistic operational exercise context (JCL). The results were used to learn from

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defence applications of the CTEF model and instrument. From this a number of conclusions have been drawn.

Based on the respondents' comments that the original CTEF version was too long, a medium-length version of the questionnaire was developed and has become the standard. Furthermore, the wording of the items was simplified to (US) grade nine level down from the original grade thirteen level. The resulting items all had a scale that measured the magnitude and a scale that measured the impact of that magnitude.

The JCL longitudinal administration of the questionnaire showed that the correlations between magnitude and impact were high, except for the aspects in the mission framework and the task. This suggests that for a large part, magnitude and impact are measuring the same concept. Interestingly, the items were scored differently by team leaders, team members, and observers – the observers being most critical – suggesting that the role affects the perceptions of magnitude and impact. Finally, most respondents seemed to be rather positive about the model and the instrument, apart from the length of the latter.

Chapter 4 – MULTI-NATIONAL CTEF SURVEY STUDY

4.1 INTRODUCTION

As discussed previously, NATO RTO HFM-087 developed a comprehensive theoretical framework of Command Team Effectiveness (CTEF) and an accompanying measurement instrument that can be applied in training and operational conditions. Following on the applications of the CTEF reviewed in Chapter 3, it was evident that two essential questions needed to be addressed by a more extensive data collection opportunity. First, we needed to provide empirical verification of the CTEF theoretical framework and instrument in operational settings. Second, we needed to confirm that CTEF provides an effective method of data collection that is also salient and usable for operational commanders. Accordingly, we concluded that a timely and important study to undertake was an extensive, multi-national survey study of commanders from various NATO countries in which the CTEF instrument is used as a method of capturing their experiences as leaders and members of command teams in deployed operations.

4.2 OBJECTIVES OF THE SURVEY STUDY

The survey study sought to provide an empirical verification of the CTEF model and instrument through extensive data collection involving military command team experiences in operations. The primary goals of the study included:

- 1) To examine the conceptual consistency of the model, model fit, and the psychometric properties of the instrument;
- 2) To determine the applicability of the model and the instrument for command teams in different NATO nations and diverse operational settings; and
- 3) To revise, consolidate, and update the model and instrument based on the findings of the study.

Objectives 1 and 2 will be the focus of the current chapter. Objective 3 will be addressed in Chapter 5 and include comparative analyses from previous applications of the instrument.

4.2.1 Model Verification

The first analysis to be conducted concerned a fundamental distinction between judgments of magnitude and judgments of impact. Since the early development of CTEF we have emphasized that the assessment of the magnitude or level of a particular item need not be correlated with assessments of impact. For example, high or low levels of situational uncertainty need not correspond with respectively positive or negative impact on the levels of the task or team outcomes. This is precisely why throughout our work with CTEF we have collected data on both magnitude¹ assessments and impact assessments. However, the results of Joint Caribbean Lion discussed in Chapter 3, together with more recent data collection opportunities using other versions of the CTEF instrument not reported here (e.g., NATO rapid response force (NRF) exercise; Canadian Optimized Battle Group (OBG) exercises), have shown consistently very high correlations between magnitude and impact assessments. Hence, despite the conceptual distinction between the two measures, perhaps in practice the requirement of impact assessments is unnecessary. As the assessments of task and team outcome are assessed only as magnitudes, it would be logical to preserve magnitude scores throughout. In sum, the first analysis that was conducted examined the correlations between assessments of magnitude and assessments of impact across all CTEF items. If the correlations are found to be significantly high throughout, then we can limit follow-on hypothesis tests in the present study to assessments of

¹ Throughout the text of this report we use the terms magnitude, level and quantity interchangeably to indicate the assessment of status on a given construct.

magnitude only. More generally, statistically high correlations between magnitude and impact assessments would permit the elimination of impact assessments in future versions of the CTEF instrument.

Assessment of the conceptual consistency of the CTEF model involved examination of a number of fundamental hypotheses (H_n) concerning the major structural variables and relationships that comprise command team effectiveness. Hypotheses 1 – 7 systematically examine relational component assumptions of the model. Hypothesis 8 examines the central theoretical assumption of a mediational role of the task- and team-focused behaviours, i.e., that the effects of the conditions on task and team outcomes are mediated by the task- and team-focused behaviours. Hypotheses 9 – 12 examine the role of feedback processes on task- and team-focused behaviours and outcomes. A summary of all *a priori* hypotheses is provided in Table 4-1.

Table 4-1: Summary of All *a priori* Hypotheses.

Hypothesis	Analysis Plan	Formal Hypothesis
H ₁	$r_{Lxx - Ltap} > 0$; $r_{Lxx - Ltep} > 0$ {xx = mf, ta, org, ldr, mbr, tm}	Levels of the condition factors will be correlated with the level of task-focused behaviours and the level of the team-focused behaviours
H ₂	$r_{Ltap - Ltao} > 0$	There will be a positive relationship between the level of task-focused behaviours and the level of task outcomes
H ₃	$r_{Ltep - Lteo} > 0$	There will be a positive relationship between the level of team-focused behaviours and the level of team outcomes
H ₄	$r_{Ltap - Lteo} > 0$	There will be a positive relationship between the level of task-focused behaviours and level of team outcomes
H ₅	$r_{Ltep - Ltao} > 0$	There will be a positive relationship between the level of team-focused behaviours and level of task outcomes
H ₆	$r_{Ltap - Ltao(+)} > r_{Ltep - Ltao(+)}$	Task- and team-focused behaviours will be positively correlated with task outcomes, but task-focused behaviours will be more highly correlated
H ₇	$r_{Ltep - Lteo(+)} > r_{Ltap - Lteo(+)}$	Task- and team-focused behaviours will be positively correlated with team outcomes, but team processes will be more highly correlated
H ₈	Conditions → Processes → Outcomes	The relationships between conditions and task and team outcomes will be mediated by task- and team-focused behaviours
H ₉	$r_{fdbk - Ltao} > 0$	Teams that used feedback processes will have higher task outcomes than teams that did not use feedback processes
H ₁₀	$r_{fdbk - Lteo} > 0$	Teams that used feedback processes will have higher team outcomes than teams that did not use feedback processes
H ₁₁	$r_{fdbk - Ltap} > 0$	Teams that used feedback processes will have higher levels of task-focused behaviours than teams that did not use feedback processes
H ₁₂	$r_{fdbk - Ltep} > 0$	Teams that used feedback processes will have higher levels of team-focused behaviours than teams that did not use feedback processes

The first hypothesis sought to examine the relationship between the level of the condition factors and the level of the task- and team-focused behaviours. We therefore hypothesized the following:

- H₁: Condition factors will be correlated with task-focused behaviours and team-focused behaviours.

Additional hypotheses concern the relation between the team- and task-focused behaviours and the team and task outcome factors. Research has shown that both task- and team-focused behaviours contribute to mission outcomes (see review in Essens et al., 2005). More specifically, these findings suggest a relationship between *levels* of the process variables and *levels* of the outcome variables. Accordingly, the following hypotheses will be examined:

- H₂: There will be a positive relationship between task-focused behaviours and task outcomes;
- H₃: There will be a positive relationship between team-focused behaviours and team outcomes;
- H₄: There will be a positive relationship between task-focused behaviours and team outcomes; and
- H₅: There will be a positive relationship between team-focused behaviours and task outcomes.

The next set of hypotheses focuses on the relative importance of team- vs. task-focused behaviours with respect to outcomes. Currently, the CTEF model does not view team- and task-focused behaviours as independent of each other. A similar view is held of the team and task outcomes. Thus, failure to find support for this assumption would necessitate a clearer articulation of that relation. We therefore hypothesized:

- H₆: Task- and team-focused behaviours will be positively correlated with task outcomes, but task-focused behaviours will be more highly correlated; and
- H₇: Task- and team-focused behaviours will be positively correlated with team outcomes, but team-focused behaviours will be more highly correlated.

Hypothesis 8 provides the critical assessment of the central assumption of a mediational role of team- and task-focused behaviours:

- H₈: The relationships between conditions and task and team outcomes will be mediated by task- and team-focused behaviours (i.e., conditions → processes (task, team) → outcomes (task, team)).

The final set of hypotheses that bear on the CTEF model will examine fundamental assumptions concerning the role of feedback. Indeed the CTEF model involves several key feedback loops and the role of feedback in task and team effectiveness is explicit (see Essens et al., 2005). Accordingly, we hypothesized that:

- H₉: Teams that used feedback processes will have higher scores on task outcomes than teams that did not use feedback processes;
- H₁₀: Teams that used feedback processes will have higher scores on team outcomes than teams that did not use feedback processes;
- H₁₁: Teams that used feedback processes will have higher scores on task-focused behaviours than teams that did not use feedback processes; and
- H₁₂: Teams that used feedback processes will have higher scores on team-focused behaviours than teams that did not use feedback processes.

4.2.2 Instrument Validation

The survey study focused on three areas of instrument validation:

- General reactions of commanders concerning the usefulness, clarity, and coverage of the instrument;

- Correspondence between empirical examination of relationships between aspects of the CTEF model, as measured with the CTEF instrument, and relationships accepted in the broader psychological research literature; and
- Psychometric properties.

With regard to the first area, several questions were included in the survey collecting respondent's reactions to CTEF instrument. This information was collected using a mix of structured and unstructured response items. With regard to the second area, the hypotheses discussed in the section above were examined. In terms of the last area of focus, a major objective was to assess whether we can reduce the number of survey items. (i.e., is there redundancy within each of the major components of the model?). The issue was raised by the end-user communities in previous applications of the instrument in terms of length of time to complete and the sheer number of items. In the present study we will base our decisions concerning item reduction on traditional methods examining correlation patterns across items. For example, if we discover that certain items are very highly correlated with other items then they can be viewed as redundant and thus can be eliminated from the instrument. In addition, we examined the extent to which the features (Level 4) within the team- and task-focused behaviours are psychometrically sound. To the extent that these features are not contributing to the explanation of unique variance over and above that explained by the higher level item (Level 3), then they likewise can be eliminated.

4.3 METHOD

4.3.1 Participants

Participants were 718 military personnel from 14 NATO nations with operational experience as leaders or members of military command teams. The mean age of the sample was 42.5 yrs (Std. Dev. = 6.70; range 26 – 60 years). Overall, 49/718 (6.82%) of the participants were female. Participant's officer ranks ranged from Captain to Lt. General and also included senior non-commissioned officers who served as members of command teams in operations. Detailed breakdowns of the participants' age, nationality, rank, and echelon are provided in Tables C-1 – C-4 of Annex C.

Most participants were recruited by email, although direct requests for participation were used in some military educational institutions. The response rate for email requests was 558/7,848 (7.1% response rate). A total of 160 respondents completed the pencil and paper version of the survey. Participants were not compensated for completing the survey. The study was approved by the Human Research Ethics Boards of Canada (DRDC Toronto), US Army Research Institute, and US Naval Air Warfare Center-Training Systems Division. The study also was reviewed and received exempt status from the Belgian Defence Ethics Board, the TNO Ethics Committee (Soesterberg, Netherlands), and Linköping University (which represents FOI – Linköping, Sweden).

4.3.2 Apparatus

The primary form of data collection was a web-based survey. The panel representatives of Canada, US, and the Netherlands distributed the survey to military members of their respective countries by wide email distribution. Only participants that comprised the target population were solicited (i.e., operational experience as a leader or member of a command team). Participants who were recruited via email distribution were invited to complete a web-based version of the instrument housed at TNO Defence, Security, and Safety (Soesterberg, NL) or the U.S. Army Research Institute (Arlington, VA, USA) (part of this web-based version of the CTEF instrument employed in the present study is provided in Annex B). In cases where email data collection was not possible (e.g., no access to email distribution lists, local organizational constraints, or security concerns), members of the NATO panel solicited participation at various military installations (e.g., military academies, staff colleges, commands). In these cases,

participants completed comparable paper copy versions of the instrument. Obtaining signed informed consent from participants who completed the web-based survey was not feasible. However, the web-based version of the survey did provide an informed consent form and participants were required to indicate that they “Yes, I agree” or “No, I do not agree” to participate in the study by clicking a button next to their choice at the bottom of the electronic consent form. Respondents choosing “No, I do not agree” were thanked and excused from further participation. The same survey was used for all participants. The web-based version of the survey was available in both official NATO languages (English and French). In addition, English, French, Dutch, and Bulgarian hard-copy versions of the survey were also prepared in order to accommodate non-web administration and translation requests from Belgian and Bulgarian participants, respectively. For each translation, the scale items that comprise the CTEF underwent extensive discussion, verification, back translation, and revisions prior to administration.

4.3.3 Procedure

Participants took approximately 30 – 45 minutes to complete the survey. First, participants read an information page that provided a brief overview of the aims and scope of the study, and the informed consent form. Participants then filled out a variety of demographic questions (see Annex B). They were then asked to reflect on a command team they were part of in a recent deployment and to describe the team they were considering. Participants then completed the CTEF instrument in the context of their experiences as a member or leader of the team they were reflecting upon. The survey was then followed by a short feedback questionnaire on the perceived utility of the instrument. Results of this feedback are also discussed.

The overarching construct being assessed with the survey is command team effectiveness. To capture this, team effectiveness was broken down into the specific concepts in the CTEF model. Concepts being assessed via subjective ratings were mission framework, task characteristics, organisational characteristics, team leader characteristics and capabilities, team member characteristics and capabilities, overall team characteristics, task-focused behaviours, team-focused behaviours, task outcomes, team outcomes, and feedback behaviours. Each of these concepts was measured with between 3 and 19 items. Participants were asked to respond to each item using the two rating scales magnitude and impact. Both of these rating scales were used for all items representing the CTEF model, with the exception of the items task and team outcomes, which had only the magnitude scale. The web-based version of the survey showed the answer categories in a pull-down menu list, the text version used text boxes that could be marked.

4.4 RESULTS

Data were aggregated into a common format across national surveys. Item analyses, content analyses, and all verification analyses were conducted using professionally accepted statistical software (e.g., SPSS, AMOS). For the most part, analyses involved correlation, regression, Analyses of Variance (ANOVA), and Structural Equation Modeling (SEM).

4.4.1 Command Team Demographics: The Operational Environment

As mentioned previously, Tables C-1 – C-4 of Annex C provide detailed breakdowns of demographic data for age, rank, echelon, and nationality of the participants in the study. Overall, the data cover a very broad spectrum of backgrounds and thus provide effective representation of command team membership. In addition to the demographic data in Tables C-1 – C-4, Annex C also provides data on two demographic questions that provided information on the various services and nationalities of the command team members with whom they worked in operations. Tables C-5 and C-6 of Annex C provide the results of these questions. Table C-5 provides a broader perspective of the joint, and in some cases interagency, collaborative context within which modern command teams must operate. Table C-6 is particularly noteworthy in showing that participants in the current study participated with over 2,500 command team

leaders and members from over 85 Nations, highlighting the truly multi-national nature of contemporary operations.

Another demographic question probed the degree of interdependence among the command team members with which they participated on a 5-point scale: i.e., “Not at all”, “a little”, “somewhat”, “a lot”, and “very much”. A breakdown of the data is provided in Table 4-2. As is evident, approximately 90% of the participants felt their teams were at least “somewhat” interdependent; moreover, approximately 65% felt that their teams were highly interdependent (i.e., “a lot” or “very much”). These results serve to illustrate and foreshadow the potential significance of the team process factors in command team effectiveness.

Table 4-2: Distribution of Command Team Interdependence.

	Frequency	Percent
Not at all	9	1.25
A little	50	6.96
Somewhat	187	26.04
A lot	301	41.92
Very much	168	23.40
Total	715	99.58
Other	3	0.42

A final demographic question concerned the distributional nature of the environment within which the command team typically worked (i.e., exclusively or largely face-to-face teams versus exclusively or largely distributed teams). Overall, 471 (65.6%) of participants reported that their command teams were co-located, 222 (30.92%) were partially distributed, and only 25 (3.48%) reported working in a fully distributed team context. Evidently, operational command teams work in a highly face-to-face collaborative context.

4.4.2 Instrument Item Analyses

4.4.2.1 Level versus Impact Analyses

The first analysis concerns the relationship between judgments of level or magnitude and judgments of impact. As discussed previously, the 2005 version of CTEF made a clear distinction between magnitude and impact assessments: magnitude was to denote the extent to which a constituting aspect was evident in their command team (e.g., operational stress level), and impact was to denote the extent to which the aspect at that magnitude level influenced the effectiveness of the command team. In practice, however, we have found very high correlations between magnitude and impact assessments (e.g., Joint Caribbean Lion > 0.75). Hence, we are faced with the reality that commanders and team members might find the distinction useful but unclear (see the feedback from respondents below), or else the two assessments simply cannot be easily distinguished. As in the previous studies, the overall correlation between all magnitude and impact assessments was very high in the present study ($r = 0.719, p < .0001$). In addition, as is evident in Table 4-3, this relationship held when the data were broken down by team-focused behaviours ($r = 0.818, p < .0001$), task-focused behaviours ($r = 0.818, p < .0001$), team condition components (i.e., leader, member, team; $r = 0.773, p < .0001$), and task condition components (i.e., mission framework, task, and organization; $r = 0.379, p < .0001$).

Table 4-3: Distribution of Magnitude and Impact Responses Across Task Conditions (Mission Framework, Task, and Organization), Task-Focused Behaviours, Team Conditions (Leader, Member, Team), and Team-Focused Behaviours.

	Magnitude ²	Impact					Total
		Very Negative	Negative	Neutral	Positive	Very Positive	
Task Conditions	N/A	1	0	7	3	0	11
	Very Low	237	232	75	198	60	802
	Low	140	758	254	509	24	1685
	Moderate	41	922	994	728	24	2709
	High	28	208	726	1019	133	2114
	Very High	20	48	364	224	309	965
	Total	467	2168	2420	2681	550	8286
Task-Focused Behaviours	N/A	0	0	3	2	0	5
	Very Low	263	59	4	0	0	326
	Low	89	829	74	11	2	1005
	Moderate	4	748	1541	1300	24	3617
	High	2	44	362	5538	293	6239
	Very High	0	3	42	749	1478	2272
	Total	358	1683	2026	7600	1797	13464
Team Conditions	N/A	0	0	6	1	0	7
	Very Low	191	82	20	8	1	302
	Low	75	492	125	59	3	754
	Moderate	7	420	776	886	22	2111
	High	8	55	218	3263	424	3968
	Very High	11	15	15	330	1008	1379
	Total	292	1064	1160	4547	1458	8521
Team-Focused Behaviours	N/A	1	0	8	4	0	13
	Very Low	285	122	14	3	0	424
	Low	75	921	166	25	5	1192
	Moderate	15	574	1751	1382	33	3755
	High	1	40	310	4694	413	5458
	Very High	0	10	31	496	1398	1935
	Total	377	1667	2280	6604	1849	12777

² Some of the scale anchors had different labels. For ease of use we used the Very low – Very high labels in the data presentation representing the 1 – 5 Likert scale.

Based on the results of this preliminary analysis, all subsequent analyses will be conducted on magnitude assessments only. Again, we chose magnitude assessments over impact assessments because all of the outcome assessments are made on magnitude judgments only, thus providing consistency of comparison throughout.

4.4.2.2 Item and Scale Analyses

Each of the major concepts within the CTEF model was assessed by a number of items (3 to 19 items). Although in the creation of these items they were designed to tap into different and unique aspects of these concepts, they are also believed to be summative indicators of the overarching concept. As such, we would expect there to be moderate inter-item correlations and moderate reliability estimates as computed using the Cronbach α statistic. Table 4-4 reports item descriptive statistics, inter-item correlations, and Cronbach α for each concept.

Within the task condition components (i.e., mission framework, task, and organization), the descriptive and inter-item statistics generally supported the approach of summative measurement. Mission framework items exhibited an acceptable reliability ($\alpha = .59$) and relatively low inter-item correlations. Task characteristic items also exhibited an acceptable reliability ($\alpha = .55$), however the inter-item correlations indicated two clusters of items. Task complexity and workload correlated highly with each other ($r = .42$), as did goal ambiguity and goal instability ($r = .61$), however these two pairs of items did not correlate with each other very strongly at all. Organization items also exhibited an acceptable reliability ($\alpha = .62$) with fairly high inter-item correlations. Notably, the autonomy item appeared to correlate less strongly with the other items.

Within the team condition components (i.e., team leader characteristics, team member characteristics, and team characteristics), the descriptive and inter-item statistics generally indicated that the team leader and member factors were assessed with parallel items rather than summative items. For these factors, the reliability estimates were high ($\alpha = .87$ and $\alpha = .81$ respectively), and the inter-item correlations were correspondingly high. For the third factor, team characteristics, the descriptive and inter-item statistics generally indicate summative measurement with an acceptable but relatively high reliability ($\alpha = .68$) and moderate inter-item correlations with the exception of the team size item. This item did not correlate with team distribution, match of team goals to organizational goals, or team maturity.

Within the task- and team-focused behaviour components, the descriptive and inter-item statistics strongly indicated that these factors were assessed with parallel items rather than summative items. Inter-item correlations were quite high within each of the task- and team-focused behaviour components, with slightly higher inter-item correlations within specific aspects of each factor (see Table 4-4, task-focused behaviour sub-table, team-focused behaviour sub-table). Within each component, several aspects were assessed directly and with several items targeting sub-elements (features) of each aspect. For example, within task-focused behaviour, the aspect 'managing information' was assessed directly (Item 1) and with several items targeting features of 'managing information' (Items 2, 3 and 4). Feature items typically correlated slightly higher with each other than with items assessing other aspects. This pattern of inter-item correlations was consistent across both the task- and team-focused behaviour components. However, even across aspects, the inter-item correlations were quite high, indicating the possibility that these aspects are highly related to one another.

Table 4-4: Descriptive Statistics, Inter-Item Correlations, and Reliability Statistics of the Conditions, Outcomes, Feedback, and Processes Components.

PROCESSES – Task-Focused Behaviours

$\alpha = 0.953$; N = 642	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 – Managing Information	3.70	0.95	–																	
2 – Obtaining Information	3.61	0.96	0.63	–																
3 – Processing Information	3.71	0.85	0.64	0.60	–															
4 – Exchanging Information	3.57	0.99	0.66	0.51	0.58	–														
5 – Situational Understanding	3.65	0.96	0.56	0.53	0.62	0.61	–													
6 – Decision Making	3.76	0.88	0.59	0.49	0.60	0.58	0.64	–												
7 – Determining the Problem	3.58	0.91	0.56	0.49	0.55	0.57	0.62	0.71	–											
8 – Making Timely Decisions	3.81	0.91	0.51	0.49	0.52	0.53	0.53	0.63	0.59	–										
9 – Evaluating Options/Results	3.65	0.96	0.53	0.42	0.54	0.53	0.58	0.61	0.60	0.66	–									
10 – Planning	3.75	0.87	0.55	0.47	0.50	0.54	0.61	0.61	0.59	0.54	0.58	–								
11 – Identifying Future Tasks	3.52	0.91	0.46	0.43	0.44	0.47	0.56	0.54	0.52	0.47	0.54	0.66	–							
12 – Scheduling	3.57	0.92	0.46	0.42	0.46	0.50	0.51	0.49	0.49	0.48	0.50	0.62	0.61	–						
13 – Determining Resources	3.68	0.91	0.44	0.41	0.44	0.48	0.49	0.50	0.46	0.45	0.49	0.55	0.54	0.56	–					
14 – Mission Approach	3.58	0.93	0.47	0.42	0.48	0.50	0.55	0.56	0.51	0.51	0.55	0.56	0.54	0.59	0.56	–				
15 – Plan Execution	3.85	0.81	0.51	0.44	0.52	0.48	0.53	0.53	0.46	0.49	0.47	0.53	0.43	0.43	0.46	0.48	–			
16 – Organising	3.72	0.86	0.53	0.42	0.54	0.54	0.54	0.58	0.55	0.52	0.56	0.58	0.49	0.54	0.51	0.53	0.69	–		
17 – Managing	3.69	0.87	0.50	0.42	0.52	0.49	0.52	0.58	0.56	0.49	0.55	0.56	0.47	0.52	0.51	0.55	0.58	0.70	–	
18 – Monitoring Progress	3.61	0.96	0.48	0.40	0.50	0.48	0.53	0.55	0.53	0.47	0.54	0.54	0.48	0.51	0.47	0.53	0.58	0.62	0.62	–
19 – Interactions with Other Command Teams	3.70	1.05	0.44	0.40	0.40	0.40	0.43	0.41	0.40	0.39	0.38	0.44	0.41	0.36	0.31	0.38	0.42	0.42	0.39	0.41

Note: Highlighted rows indicate higher level items. Sub-elements of items are indented.

MULTI-NATIONAL CTEF SURVEY STUDY

PROCESSES – Team-Focused Behaviours

$\alpha = 0.945$; N = 657	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 – Providing/Maintaining Vision	3.59	0.91																	
2 – Maintaining Common Intent	3.65	0.92	0.69																
3 – Collaboration	3.73	0.95	0.49	0.52															
4 – Communication	3.74	0.97	0.45	0.47	0.69														
5 – Coordination	3.66	0.89	0.46	0.50	0.61	0.62													
6 – Providing Feedback	3.40	1.03	0.46	0.50	0.57	0.55	0.61												
7 – Motivating	3.55	0.99	0.51	0.54	0.49	0.47	0.49	0.52											
8 – Rewarding and Recognition	3.41	1.06	0.47	0.46	0.48	0.48	0.44	0.50	0.62										
9 – Pride in the Work	3.75	1.01	0.48	0.56	0.50	0.47	0.45	0.46	0.68	0.59									
10 – Adapting to Changes	3.70	0.87	0.43	0.47	0.42	0.39	0.40	0.41	0.45	0.40	0.46								
11 – Monitoring Performance	3.48	0.82	0.42	0.46	0.44	0.39	0.43	0.47	0.45	0.49	0.49	0.50							
12 – Correcting Team Members	3.44	0.91	0.36	0.38	0.40	0.38	0.39	0.43	0.40	0.41	0.42	0.43	0.52						
13 – Providing Back-up	3.69	1.02	0.39	0.46	0.45	0.41	0.47	0.43	0.48	0.44	0.53	0.49	0.44	0.50					
14 – Maintaining Team Synergy	3.54	0.92	0.54	0.57	0.54	0.54	0.54	0.47	0.55	0.51	0.54	0.47	0.45	0.41	0.54				
15 – Providing Social Support	3.65	0.98	0.40	0.44	0.44	0.46	0.44	0.42	0.47	0.52	0.45	0.41	0.41	0.32	0.44	0.65			
16 – Regulating Emotions	3.38	0.88	0.42	0.43	0.40	0.43	0.46	0.43	0.43	0.46	0.43	0.42	0.38	0.35	0.43	0.57	0.61		
17 – Maintaining Cohesion	3.65	1.00	0.51	0.55	0.51	0.54	0.52	0.48	0.55	0.53	0.56	0.48	0.44	0.44	0.49	0.69	0.63	0.62	
18 – Handling Conflicts	3.33	0.99	0.50	0.49	0.49	0.52	0.51	0.50	0.51	0.53	0.50	0.44	0.45	0.42	0.47	0.64	0.54	0.62	0.62

Note: Highlighted rows indicate higher level items. Sub-elements of items are indented.

CONDITIONS – Mission Framework

$\alpha = 0.594$; N = 653	Mean	SD	(1)	(2)	(3)	(4)
(1) Situational Uncertainty	2.69	1.08	–	0.228	0.290	0.132
(2) Operational Stress	3.14	1.05	0.228	–	0.336	0.353
(3) Constraints	3.25	1.06	0.290	0.336	–	0.265
(4) Mission Stakes	3.66	1.02	0.132	0.353	0.265	–

CONDITIONS – Task

$\alpha = 0.553$; N = 616	Mean	SD	(1)	(2)	(3)	(4)
(1) Task Complexity	3.38	0.90	–	0.417	0.106	0.138
(2) Workload	3.56	0.98	0.417	–	-0.003	0.092
(3) Goal Ambiguity	2.65	1.20	0.106	-0.003	–	0.606
(4) Goal Instability	2.67	1.17	0.138	0.092	0.606	–

CONDITIONS – Organisation

$\alpha = 0.618$; N = 684	Mean	SD	(1)	(2)	(3)	(4)
(1) Team Mission Match	3.74	0.98	–	0.429	0.216	0.309
(2) Clarity of Command	3.54	1.13	0.429	–	0.167	0.357
(3) Freedom of Action	3.41	1.07	0.216	0.167	–	0.285
(4) Organisation Support	3.35	1.03	0.309	0.357	0.285	–

CONDITIONS – Team Leader

$\alpha = 0.868$; N = 697	Mean	SD	(1)	(2)	(3)
(1) Skills	3.76	1.08	–	0.752	0.679
(2) Knowledge	3.79	1.03	0.752	–	0.639
(3) Org Match	3.68	1.07	0.679	0.639	–

CONDITIONS – Team Member

$\alpha = 0.814$; N = 695	Mean	SD	(1)	(2)	(3)
(1) Skills	3.75	0.81	–	0.730	0.531
(2) Knowledge	3.70	0.82	0.730	–	0.532
(3) Org Match	3.47	0.87	0.531	0.532	–

CONDITIONS – Team

$\alpha = 0.676$; N = 692	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)
(1) Mix of People	3.82	0.86	–	0.200	0.343	0.412	0.197	0.305
(2) Size	3.19	0.98	0.200	–	0.348	0.118	0.056	0.075
(3) Structure	3.46	1.02	0.343	0.348	–	0.301	0.237	0.325
(4) Maturity	3.38	1.06	0.412	0.118	0.301	–	0.275	0.333
(5) Face to Face	3.86	0.91	0.197	0.056	0.237	0.275	–	0.350
(6) Org Match	3.73	0.86	0.305	0.075	0.325	0.333	0.350	–

OUTCOMES – Task

$\alpha = 0.813$; N = 694	Mean	SD	(1)	(2)	(3)
(1) Cmdr/Org Goals	4.07	0.84	–	0.630	0.598
(2) Partner Expectations	3.96	0.85	0.630	–	0.538
(3) Mission Limits	4.17	0.84	0.598	0.538	–

OUTCOMES – Team

$\alpha = 0.927$; N = 712	Mean	SD	1	2	3	4	5	6
(1) Trust	3.79	0.96	–	0.721	0.759	0.631	0.606	0.693
(2) Morale	3.84	1.00	0.721	–	0.748	0.666	0.631	0.654
(3) Cohesion	3.73	1.04	0.759	0.748	–	0.692	0.666	0.728
(4) Confidence	3.89	0.97	0.631	0.666	0.692	–	0.719	0.610
(5) Shared Vision	3.67	0.97	0.606	0.631	0.666	0.719	–	0.615
(6) Respect	3.82	0.98	0.693	0.654	0.728	0.610	0.615	–

FEEDBACK – Task and Team

$\alpha = 0.954$; N = 694	Mean	SD	1	2	3	4	5	6
(1) Task Goal Achievement	4.32	1.20	–	0.781	0.735	0.837	0.736	0.731
(2) Improve Task Processes	4.44	1.17	0.781	–	0.802	0.758	0.796	0.721
(3) Improve Task Conditions	4.38	1.22	0.735	0.802	–	0.761	0.765	0.775
(4) Team Goal Achievement	4.29	1.20	0.837	0.758	0.761	–	0.793	0.791
(5) Improve Team Processes	4.34	1.17	0.736	0.796	0.765	0.793	–	0.805
(6) Improve Team Conditions	4.27	1.21	0.731	0.721	0.775	0.791	0.805	–

Within the task and team outcome factors, the descriptive and inter-item statistics strongly indicated that these factors were assessed with parallel items rather than summative items. Similar to the team- and task-focused behaviours, the inter-item correlations were quite high within each factor. Both the task and team outcome factors had high reliability estimates ($\alpha = .81$ and $\alpha = .93$ respectively). Although the items for each of these factors were designed to assess unique aspects of these factors, it appears that in practice the items are largely assessing unitary or highly interrelated concepts.

The feedback factor was originally intended to directly assess several feedback behaviours, distinguishing between reviewing performance and taking steps to improve behaviour in specific areas impacting team effectiveness. If these items functioned as intended, we should observe a moderate to low reliability estimate when considering these items as a single scale and low inter-item correlations. Converse to our expectations, these items exhibited very high inter-item correlations and very high reliability ($\alpha = .95$). As a result, these items were treated as a single scale for analysis purposes in this study. However, as will be discussed later, we also recommend further review of the assessment of feedback processes in military populations as we believe these items were demonstrated to be inadequate for full and accurate assessment of these processes.

4.4.3 Tests of Hypotheses

This section reviews the analytical tests of the 12 *a priori* hypotheses designed to assess the fundamental predictions of the CTEF model (see the overview in Table 4-1 above). **Hypothesis 1** predicted that the condition factors will be correlated with the task- and team-focused behaviours. This hypothesis was supported, with the exception of mission framework, which was not significantly correlated with the task- and team-focused behaviours (see Table 4-5).

Table 4-5: Correlations between Condition Factors and Task- and Team-Focused Behaviours.

	Task-Focused Behaviours	Team-Focused Behaviours
Mission Framework	-0.021	-0.021
Task	-0.136**	-0.086*
Organization	0.514**	0.478*
Team Leader	0.578**	0.567*
Team Member	0.505**	0.498*
Team	0.621**	0.597*

* $p < .05$, ** $p < .01$, and *** $p < .001$

Hypothesis 2 predicted that task-focused behaviours would be correlated with the task outcomes. **Hypothesis 3** predicted that team-focused behaviours would be correlated with the team outcomes. **Hypothesis 4** predicted that task-focused behaviours would be correlated with the team outcomes. **Hypothesis 5** predicted that team-focused behaviours would be correlated with the task outcomes. These hypotheses were all supported (see Table 4-6).

Table 4-6: Correlations between Processes and Outcomes.

	Task Outcomes	Team Outcomes
Task-Focused Behaviours	.706**	.748**
Team-Focused Behaviours	.653**	.867**

* $p < .05$, ** $p < .01$, *** $p < .001$

Hypothesis 6 predicted that task- and team-focused behaviours would be positively correlated with task outcomes, but task-focused behaviours would be more highly correlated. This prediction was supported. The correlation between task focussed behaviours and task outcomes ($r = .706$) was significantly higher ($Z = 1.86, p < .05$) than the correlation between team-focused behaviours and task outcomes ($r = .653$). Similarly, **Hypothesis 7** predicted that task- and team-focused behaviours would be positively correlated with team outcomes, but team-focused behaviours would be more highly correlated. This prediction was likewise supported. The correlation between team-focused behaviours and team outcomes ($r = .867$) was significantly higher ($Z = 6.66, p < .001$) than the correlation between task-focused behaviours and team outcomes ($r = .748$).

Formally stated, **Hypothesis 8** predicts a mediating effect of the task- and team-focused behaviours on the relationship between the conditions and the outcomes (cf. Mathieu, Heffner, Goodwin, Salas and Cannon-Bowers, 2000; Ilgen, Hollenbeck, Johnson, and Junt, 2005; Mathieu and Schultze, 2006). This prediction was tested using the *four-step* regression technique specified by Baron and Kenny (1986). In the first step, the relationship is assessed between the predictor and criterion (i.e., $X \rightarrow Y$). In the second step the relationship is assessed between the predictor and the mediator ($X \rightarrow Z$). In the third step, the relationship is assessed between the mediator and the criterion (i.e., $Z \rightarrow Y$). Those relationships are expected to be statistically significant. In the final step, the relationship between the predictor and the criterion should become zero in the presence of the mediator ($X \rightarrow Z \rightarrow Y$). From a practical standpoint, this process is executed with a series of four multiple regression analyses, with the final step utilizing a multi-step analysis entering the mediating variables in the first step and the predictor variables in the second step.

Each regression step is performed twice; i.e., once with respect to task variables and once with respect to team variables. Throughout this section, an * following a regression weight indicates that this value is significant at the $p \leq 0.05$ level. In the figures, significant regression weights are plotted in bold lines and non significant regression weights are plotted by a dotted line. Unless reported otherwise, the regression weights are the standardized regression weights (β).

Step 1: X (Conditions) $\rightarrow$ Y (Outcomes)

Using all six condition aspects (i.e., mission framework, task characteristics, organisation characteristics, team leader, team member, and team characteristics) as predictors for the regression with task outcomes as criteria results in a PVAF³ = 37% [$R^2 = .374, F(6, 710) = 70.813, p < 0.001$]. This means that 63% is measurement error or is to be explained by other factors that yet do not appear as predictors in the model.

The regression weights, shown in Figure 4-1, are all significant except for. This indicates that the conditions that have an impact on task outcomes are, in order of size: team leader, team characteristics, organisation characteristics, team member, and task characteristics. It is important to note that all significant predictors but one has a positive impact on the task outcomes; i.e., the negative value for task characteristics indicates that higher values on task characteristics result in lower task outcomes.

³ PVAF: Proportion Variance Accounted For. PVAF is a measure of how much of the total variance of the dependent variable (the criterion) is explained for by the independent variables (the predictors).

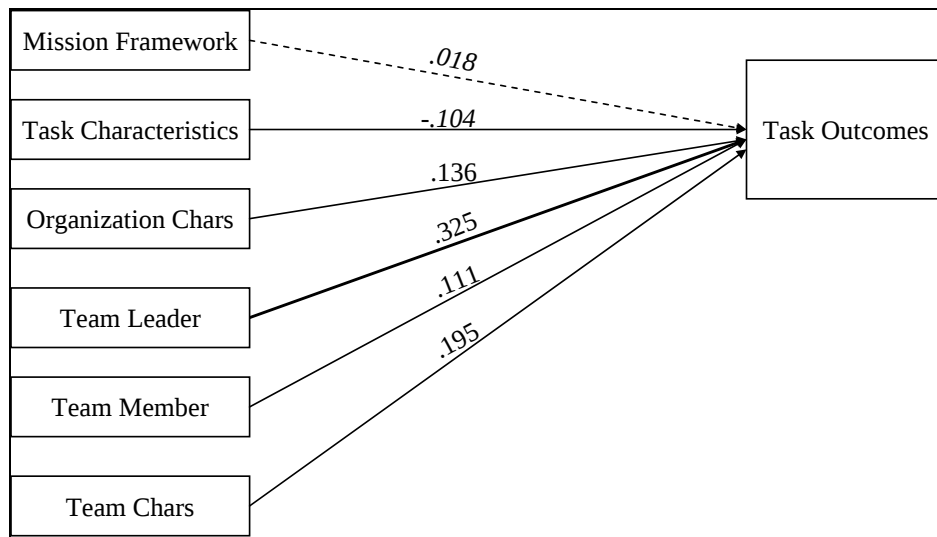


Figure 4-1: Regression Model for Task Outcomes using Conditions as Predictors.

Using all six condition aspects as predictors for the regression on team outcomes as criteria leads to a PVAF = 53% [$R^2 = .527$, $F(6, 710) = 131.728$, $p < 0.001$]. In other words, 47% of the variance is due to measurement error or variables that are not yet included in the model as predictors. The regression weights, shown in Figure 4-2, are all significant. The conditions that have a positive impact on team outcomes are, in order of size: team characteristics, team leader, team member, organisation characteristics. Task characteristics and mission framework have a negative impact on the outcomes.

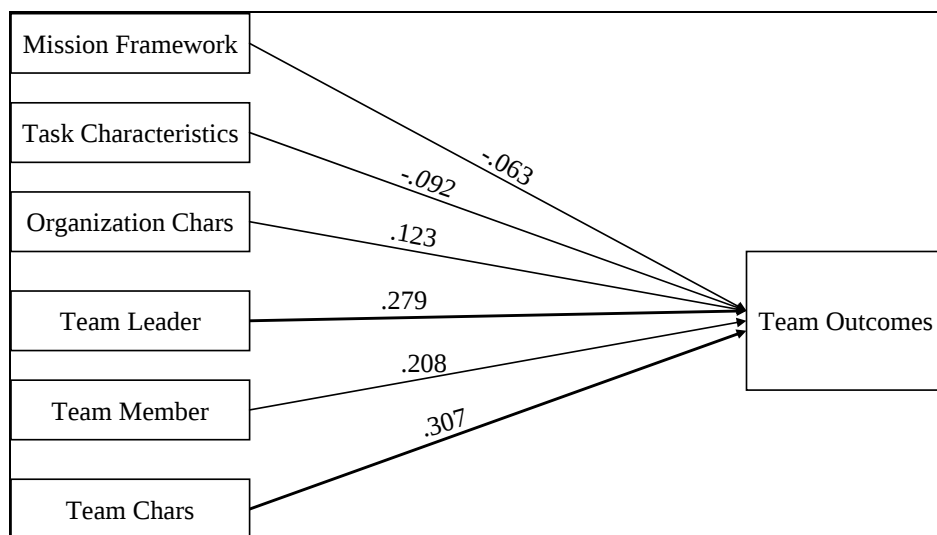


Figure 4-2: Regression Model for Team Outcomes using Conditions as Predictors.

Step 2: X (Conditions) $\rightarrow$ Z (Processes)

Using all six condition aspects as predictors for the regression on task-focused behaviours as criteria results in a PVAF = 55% [$R^2 = .551$, $F(6, 710) = 145.008$, $p < 0.000$]. In other words, 45% is due to measurement error or variables that are not yet included in the model as predictors. The regression weights (see Figure 4-3) are all significant except for mission framework. The condition aspects that have a positive impact on task-

focused behaviours are, in order of size: team leader, team characteristics, team member, organisation characteristics. Task characteristics have a negative effect on the task-focused behaviours.

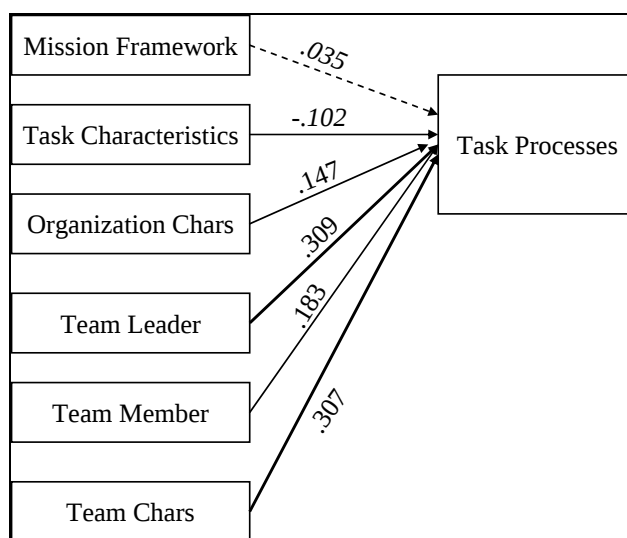


Figure 4-3: Regression Model for Task-Focused Behaviours using Conditions as Predictors.

Using all six conditions as predictors for the regression on team-focused behaviours as criterion leads to a PVAF = 51% [$R^2 = .510$, $F(6, 710) = 123.227$, $p < 0.000$]. The regression weights (see Figure 4-4) are all significant except for mission framework and task characteristics. The condition aspects that have a positive impact on team processes are, in order of size: team leader, team characteristics, team member, and organisation characteristics. No predictors have a negative impact.

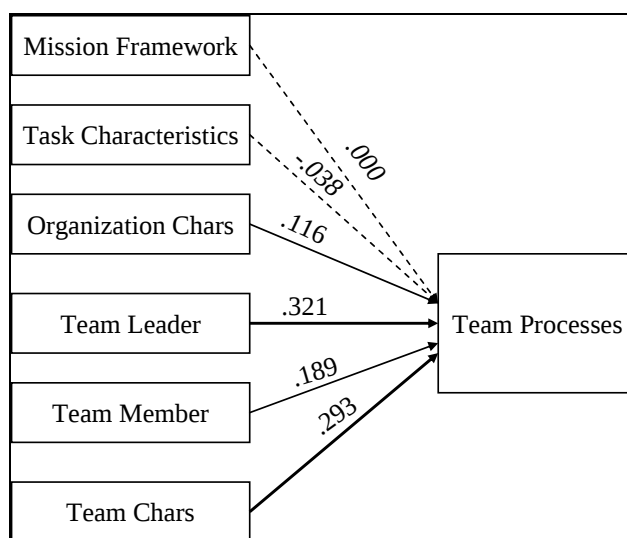


Figure 4-4: Regression Model for Team-Focused Behaviours using Conditions as Predictors.

Step 3: Z (Processes) → Y (Outcomes)

Using both the task- and team-focused behaviours as predictors for the regression on task outcomes as criteria gives a PVAF = 52% [$R^2 = .520$, $F(2, 714) = 387.503$, $p < 0.000$]. The regression weights

(see Figure 4-5) are both significant but are notably different; the impact of task-focused behaviours on the task outcomes is twice as large (.505) as the impact of the team-focused behaviours (.252).

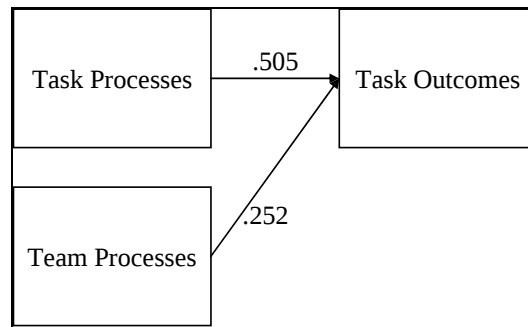


Figure 4-5: Regression Model for Task Outcomes using the Processes as Predictors.

Using both processes as predictors for the regression on team outcomes results in a PVAF = 76% [$R^2 = .761$, $F(2, 714) = 1135.349$, $p < 0.000$]. The regression weights (see Figure 4-6) are both significant. Again, it should be noted that the effect of team-focused behaviours on team outcomes is considerably larger than the effect of task-focused behaviours (.739 vs. .161).

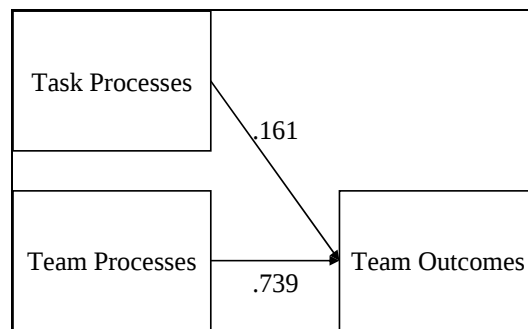


Figure 4-6: Regression Model for Team Outcomes using the Processes as Predictors.

Step 4: X (Conditions) → Z (Processes) → Y (Outcomes)

If the task- and team-focused behaviours fully mediate the relationship between conditions and task outcomes, then the regression weights of conditions on the task outcomes, in the presence of the mediational variables task- and team-focused behaviours, should be zero or approach zero. For this analysis the PVAF = 54% [$R^2 = .535$, $F(8, 708) = 101.980$, $p < 0.000$], an increase of approximately 2% PVAF ($\Delta R^2 = .015$, $F(6, 708) = 3.784$, $p < .01$). All regression weights originating in the conditions are now non-significant except for team leader ($\beta = 0.120^*$) which was expected to be non-significant. In our model, we observe indeed a mediating effect of the processes, but there is still some direct effect present of team leader characteristics (see Figure 4-7).

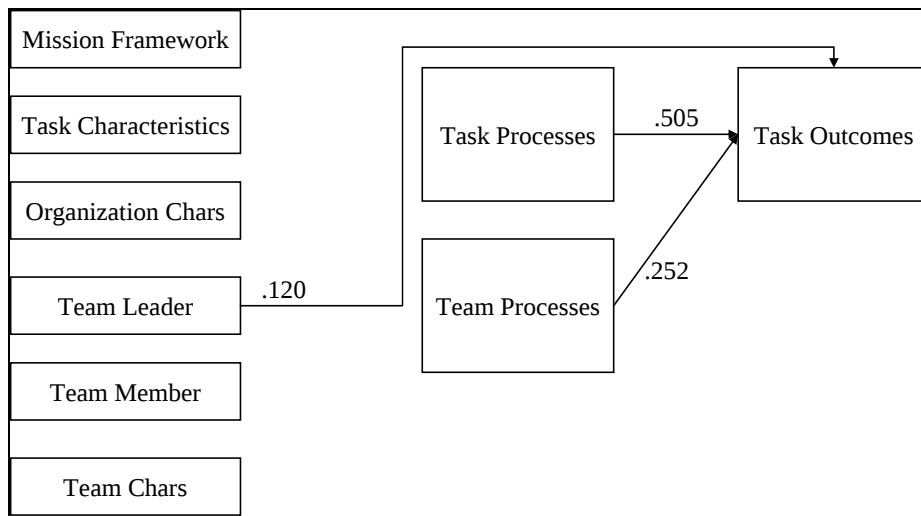


Figure 4-7: Full Mediating Regression Model using Task Outcomes as Criterion.

If the task- and team-focused behaviours are fully mediating between condition aspects and team outcomes, the regression weights from the conditions to the team outcomes should be zero or near zero. For this analysis, $PVAF = 78\%$ [$R^2 = .784$, $F(8, 708) = 322.098$, $p < 0.000$], which is extremely high. This is an increase of approximately 2% $PVAF$ ($\Delta R^2 = .024$, $F(6, 708) = 12.964$, $p < .001$). Only two regression weights (out of the six) originating from the conditions were non-significant (i.e., organisation characteristics and team leader). hence, in our model, there is a limited mediating effect of the task- and team processes. The remaining condition aspects have a significant direct effect on team outcomes over and above the mediating effect. In order of size they are: team characteristics, mission framework, team member, and task characteristics. It should be noticed that both mission framework and task characteristics still have negative regression weights (see Figure 4-8).

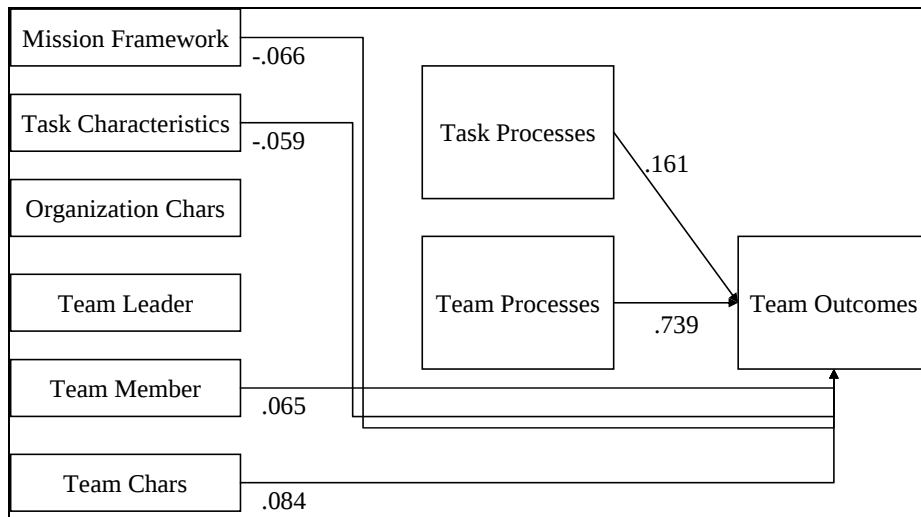


Figure 4-8: Full Mediating Regression Model using Team Outcomes as Criterion.

In conclusion, the task and team processes act as mediators on the relationship between the condition components and the task and team outcomes respectively, but there remain a number of direct effects over and above the mediating effects. The mediation effects are strongest from task processes to task outcomes

and from team-focused behaviours to team outcomes. The direct effects from condition to outcomes over and above the effect of task- and team-focused behaviours are rather weak (magnitude < .10) and are primarily effects of the conditions on the team outcomes.

Hypotheses 9 – 12 were concerned with the role of feedback on task- and team-focused behaviours and outcomes. All four of the hypotheses were supported, providing general support for the utility of feedback as specified in the CTEF model:

$$H_9: r_{\text{fdbk} - L_{\text{tao}}} > 0, r = 0.563, p < .0001.$$

$$H_{10}: r_{\text{fdbk} - L_{\text{teo}}} > 0, r = 0.652, p < .0001.$$

$$H_{11}: r_{\text{fdbk} - L_{\text{tap}}} > 0, r = 0.663, p < .0001.$$

$$H_{12}: r_{\text{fdbk} - L_{\text{tep}}} > 0, r = 0.676, p < .0001.$$

4.4.4 Structural Equation Modelling (SEM)

In the previous analysis it was established that the processes as specified in the CTEF model mediate the conditions and the outcomes. The next step was to build on these analyses and specify in more detail the relationship between the aspects of the CTEF model and test the fit of that model against the data. For this analysis we used the Structural Equation Modelling (SEM) approach which allows for testing not only stepwise, but simultaneously the “added value” of specific relationships in a complex model with several independent variables, a number of mediating variables and one or more dependent variables. It allows us to determine if the covariance structure in the data of a set of variables is consistent with hypotheses about causal association between those variables, and compute the total effect on a given variable by “summing up” the effects of the preceding variables that are linked with the variable under consideration. Furthermore, SEM allows for finding a model that is at the same time precise enough (i.e., close enough to the data) and parsimonious enough (i.e., highlighting the most important relationships). For the analyses we used the statistical software AMOS 7 (together with SPSS17) (Arbuckle, 2006).

We started our analysis with a very constrained model (described below) – i.e., a model with fewer paths than in the hypothesized model – and relaxed stepwise the constraints by allowing more paths. The hypothesized relationships are shown in Figure 4-9. We assumed that the condition components can be clustered in two independent clusters: task related conditions (TAC) cluster with mission framework (MF), task (TA), and organisation (OR), and a cluster with team related conditions (TEC), comprising team leader (TL), team member (TM), and team (TE). These two clusters load independently on task-focused behaviours (short: ‘task processes’ TAP) and team-focused behaviours (short: ‘team processes’ TEP) respectively. The task-focused behaviours load on task outcomes (TAO) and partly on team outcomes (TEO); the team-focused behaviours load on team outcomes and partly on task outcomes.

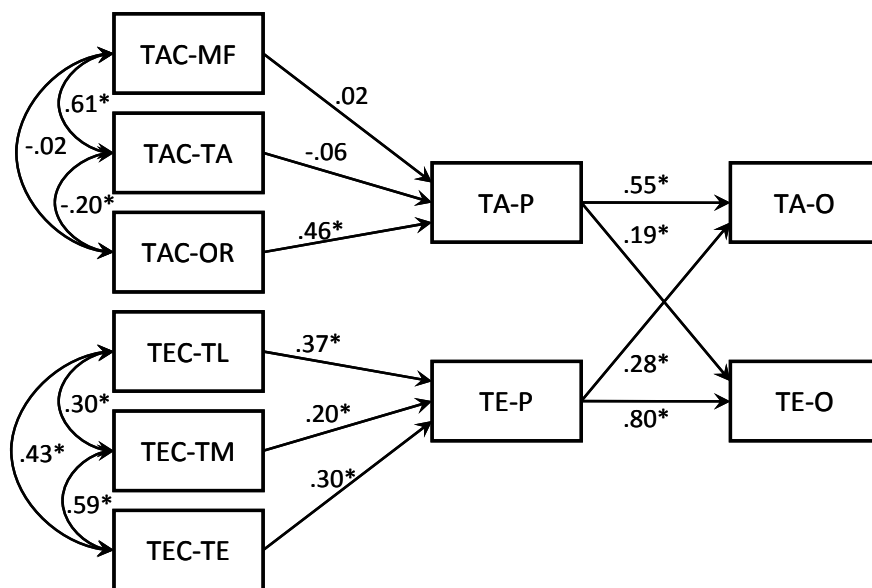


Figure 4-9: Model 1: Constrained, Starting Model for Best Fit.

The relationships between variables are expressed in *path coefficients* which are partial correlations, showing the direct effect between the two variables under consideration in the context of the other effects. As is shown in Figure 4-9, all co-variances (two-headed arrows) between condition aspects are significant but one; i.e., the covariance of mission framework and organisation. Especially the strong covariance of mission framework and task characteristics is noteworthy (.61). All path coefficients are significant except for two, mission framework (TAC-MF) and task characteristics (TAC-TA) to task-focused behaviours (TAP). This is consistent with the analysis described in the preceding sections. The overall goodness of fit of the model is expressed in a set of measures: the chi-square test (χ^2), the root-mean-square residual (RMR), the Incremental Fit Index (IFI), the Root Mean-Square Error of Approximation (RMSEA) and the Akaike's Information Criterion (AIC). Reference values in the search for a model with sufficient goodness of fit on the one hand, and being sufficiently parsimonious on the other hand, are the following: regarding the chi-square test we strive for non significance, RMR should be lower than .10, IFI greater than .90 and RMSEA smaller than .08. AIC can only be used in a comparative way according to the rule "lower is better" (Arbuckle, 2006). We keep as an overall level of significance for the path coefficients $p \leq .05$ which is marked in the figures with an asterisk (*). This starting model did not show a sufficient goodness of fit (RMR = .148, IFI = .734, RMSEA = .114 and AIC = 1195.787).

The next step was to search for a path which would best improve the model: the *modification index* in the SEM software suggested the highest reduction in chi-square value by freeing a particular constraint in the tested model. The modification indices suggested introducing a path from TEP to TAP, but not the converse. This means that there is now an additional mediated effect of the team conditions over the team-focused behaviours through task-focused behaviours on both task outcomes and team outcomes as shown in Figure 4-10 below. It also highlights that team-focused behaviours may have a notable impact on task-focused behaviours but not necessarily the converse.

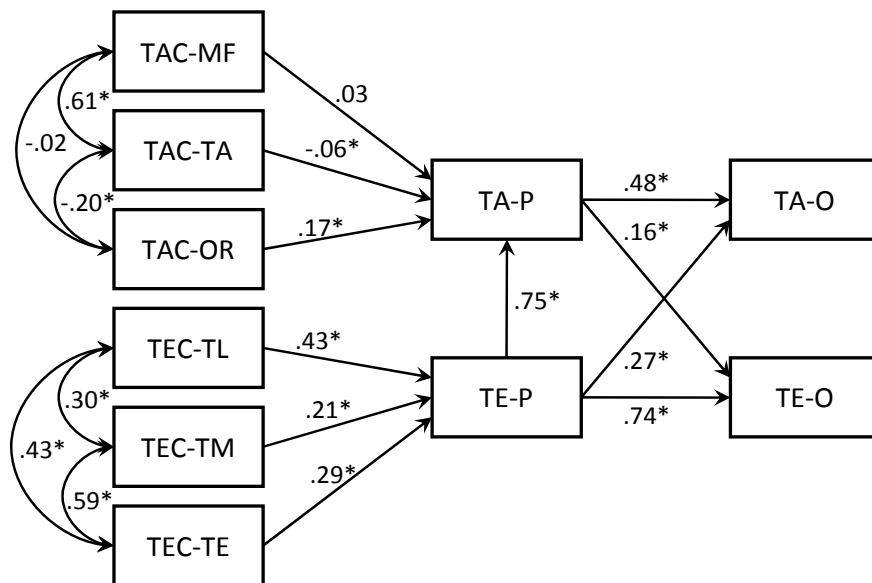


Figure 4-10: Model 2: Improved Model for Best Fit, Incorporating a Causal Effect of Team-Focused Behaviours on Task-Focused Behaviours.

The overall goodness of fit increased by introducing the suggested path. χ^2 dropped from 1075.787 to 566.426 ($df = 104$) which is a significant decrease ($\chi^2(3) = 509.361$). The total χ^2 remained nevertheless significant which means that there is still room for improvement of the model. In addition, RMR = .10, IFI = .873, and RMSEA = .079, which are borderline satisfactory values, also indicating additional room for improvement. AIC decreased from 1195.787 to 688.426; which is a change indicating better fit of the model to the data. In Model 2 (see Figure 4-10), all path coefficients were significant except for mission framework; task characteristics barely achieved significance. The high value (.75) of the added path from TEP to TAP is noteworthy because our original hypotheses did not specify any direction for the relationship between TAP and TEP. The observed, strong, directional path from TEP to TAP may be interpreted as TEP providing extra support to TAP in achieving TAO (and TEO to a lesser extent).

In a next step (Model 3; see Figure 4-11), the modification indices suggested introducing a relationship between TAC and TEP on the one hand, and between TEC and TAP on the other hand. This means that:

- 1) The task-focused behaviours (TAP) acted now as a mediator between team related conditions (TEC) and task outcomes (TAO); and
- 2) That team-focused behaviours (TEP) acted as a mediator between task-related conditions (TAC) and team outcomes (TEO).

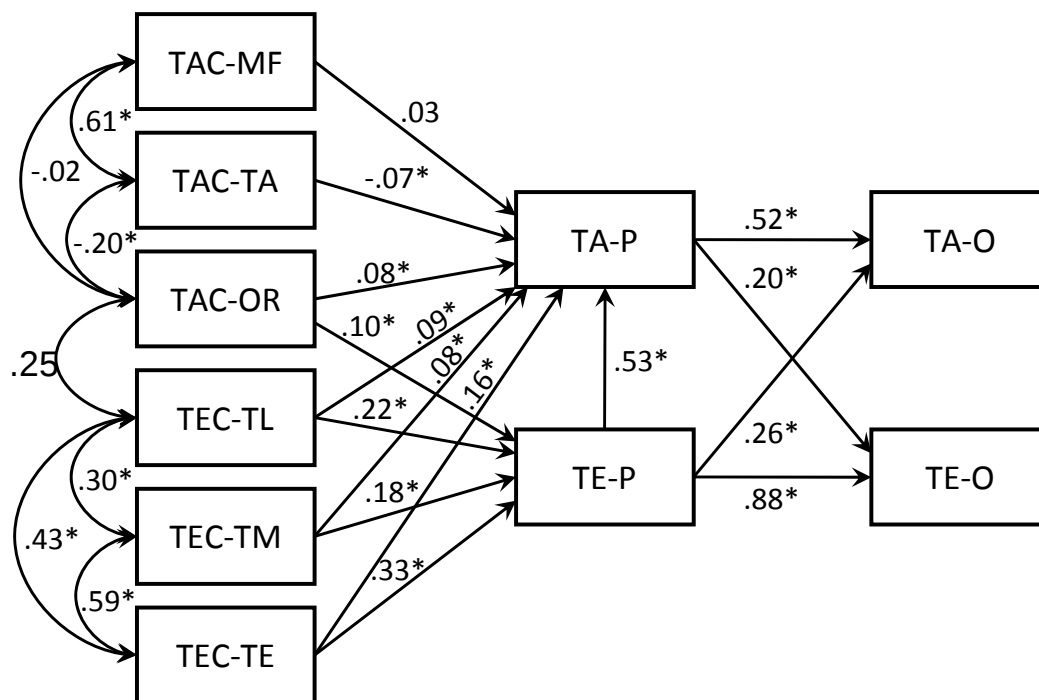


Figure 4-11: Model 3: Further Improved Model for Best Fit, Incorporating Cross Effects of Conditions Components Selectively on Task- and Team-Focused Behaviours.

In the latter case, however, only the relationship between organisation and TEP were added as there was no incremental value of adding paths from mission framework and task characteristics to TEP. Similarly, only a covariance path between organisation and team leader characteristics was suggested.

All added paths have significant, but relatively weak coefficients. However, the result of this modification is a significant increase in model fit (change in χ^2 (21) = 73.825; χ^2 (125) = 492.601), however the overall χ^2 is still highly significant, indicating a less than perfect fit to the data⁴. Overall, the model fit indices indicate improved fit to the data, with the exception of RMR (RMR = .126, IFI = .899; RMSEA = .065; AIC = 572.601). RMR increased slightly from .10 to .126. Notably, the AIC decrease, from 688.423 to 572.601, is once more a change indicating better fit.

Model 3 represents the best fit to the data. Further improvements, however, with weaker effects are possible bringing in more detailed relationships. Such analyses would go beyond the main purpose of our analyses at this stage which was to confirm a best fit model based on strong relationships. An argument might be given to remove the mission framework component from the model: the relationship with processes is non-significant, and a high correlation is present with task. However, conceptually this component is an essential part of the CTEF model capturing the environmental characteristics. This issue will be discussed in detail below.

4.4.5 Differences between Groups

The survey data stem from military personnel with different backgrounds: i.e., surveys were filled out by respondents from fourteen countries; they worked in different services; they identified themselves as either leader or member of the team they belonged to; and they described diverging types of missions in which they took part.

⁴ A model that would fit the data nearly perfectly is called a saturated model because it takes into account the correlations between all variables, or graphically spoken, there is an arrow between each pair of boxes.

A number of observations made during preliminary analyses led us to the idea that different groups may have a different perception on the impact of a given component on team effectiveness and/or a different perception on the dynamics of the model as whole.

In this section we analyse these differences first by using ANOVA to describe differences in means of the components of CTEF between the identified categories of respondents, and second by describing the differences in relations between the components of CTEF. For this latter analyses we used structural equation modelling (SEM, see Section 4.4.4). Analyses were performed once with the grouping categories constrained to be equal, and once with a relaxed criterion; i.e., the grouping categories allowed to vary to see if there were differences in path weights and, eventually, in the path structures (i.e., non significant relations between the variables in the specified model) for a given category. The analyses were conducted to search for differences between countries, services, team leader vs. team member, and types of missions.

4.4.5.1 Differences between Country Groups

Respondents originated from 14 countries but were unequally distributed over countries. To compensate for that, we identified three large categories, called “country groups” in the remainder, i.e., United States (US) with 188 respondents, Canada (CA) with 338 respondents, and European Union (EU) with 173 respondents. The respondents from the EU thus belonged to twelve countries (see Annex C, Table C-2). Most of the respondents came from Belgium (113), the Netherlands (30), and Bulgaria (21).

An ANOVA at the level of the components revealed differences in perceptions between the three country groups as shown in Table 4-7. The scores reflect the mean scores per country group for each component. A higher score (1 – 5) reflects a higher magnitude (with the exception of mission framework and task).

Table 4-7: Effects of Country Groups on the CTEF Variables.

	US	CA	EU	<i>F</i> (2,706)	<i>p</i>
Mission Framework	3.29 ^a	3.17 ^a	2.91 ^b	13.94	.000
Task	3.25 ^a	2.96 ^b	2.98 ^b	13.34	.000
Organisation	3.29 ^a	3.54 ^b	3.59 ^b	10.13	.000
Team Leader	3.43 ^a	3.86 ^b	3.81 ^b	13.78	.000
Team Members	3.49 ^a	3.69 ^b	3.68 ^b	5.69	.004
Team	3.39 ^a	3.64 ^b	3.63 ^b	13.41	.000
Task-Focused Behaviours	3.37 ^a	3.81 ^b	3.75 ^b	29.33	.000
Team-Focused Behaviours	3.28 ^a	3.69 ^b	3.63 ^b	26.03	.000
Task Outcomes	3.81 ^a	4.25 ^c	4.02 ^b	24.84	.000
Team Outcomes	3.39 ^a	3.95 ^b	3.93 ^b	32.82	.000
Feedback	4.03 ^a	4.41 ^b	4.53 ^b	11.90	.000

^{a b c} Point to post hoc differences between two or three categories, as tested with a Scheffé analysis ($p < .05$).

Table 4-7 shows that, for most of the components in the survey, the respondents from the US perceived the assessed components in a less positive way than the respondents from Canada and the EU. In particular, the respondents from the US reported less task – and team-focused behaviours than the other respondents. They also reported the team leader, the team members, and the team to be less well equipped for the task. Furthermore, there was a large difference in team outcomes. Canada and the EU differed from each other only with respect to mission framework and task outcomes.

The results can be seen in Figure 4-12. For each arrow, the first coefficient (green) represents Canada, the second (red) the EU, and the third (blue) the US.

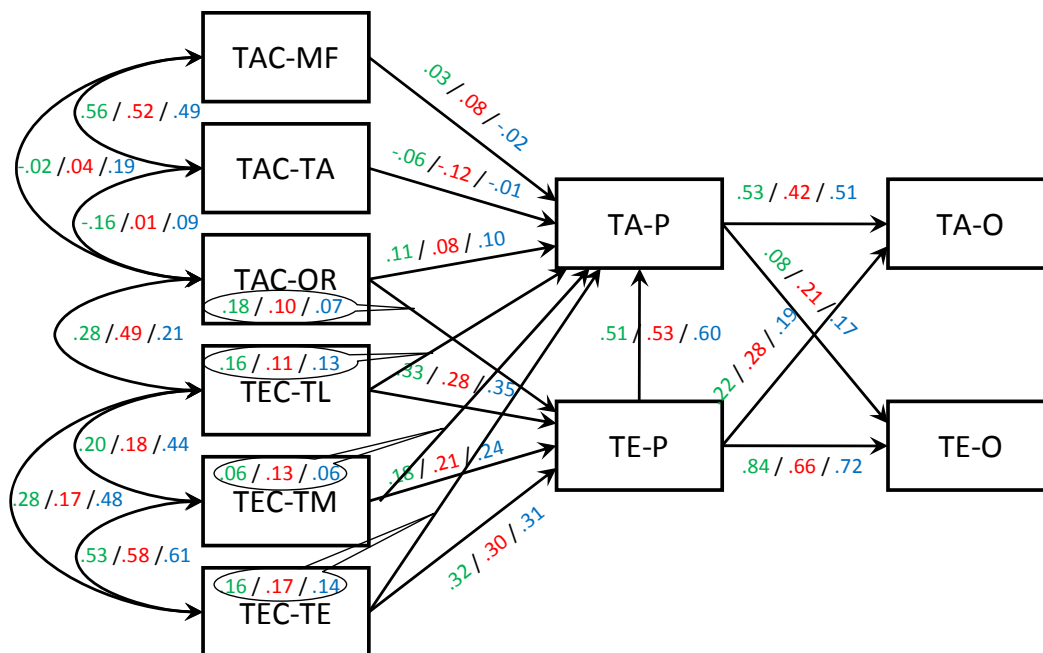


Figure 4-12: Model 3 with Path Coefficients Per Country Group (CA/EU/US).

The results show only slight differences between the country groups in the paths from the conditions (on the left side of the figure) to the task- and team-focused behaviours, in the middle of the figure, with the exception of organisation to team-focused behaviours, and team leader and team members to task-focused behaviours. The association between organisation and team-focused behaviours is much stronger for CA (.18) than it is for EU (.10) and US (.10). The effect of the team leader on task-focused behaviours is also stronger for CA than for the EU and the US (.16 vs. .11 and .13), whereas for the EU the team members seem to be more important for task-focused behaviours (.13 vs. .06 and .06).

The team-focused behaviours have a larger effect on task-focused behaviours for the US (.60) than for both other groups (.51 and .53).

The effect of task-focused behaviours on task outcomes is lowest for the EU (.42) as opposed to CA and US (.53 and .51); and of team-focused behaviours on team outcomes (.66 vs. .84 and .72).

In summary, there are differences between countries but there is no consistent pattern throughout the model. The analyses confirm, however, that it is important, especially in a multi-national environment, to be aware of the differences in perception about the dynamics in command team effectiveness.

4.4.5.2 Differences between Services

The respondents were clustered in three categories of services: Army (N = 495); Air Force (N = 134); and Navy (N = 77). The Army is clearly overrepresented in the sample. Moreover, a quick analysis of the socio-demographics showed that all respondents from the US but one was from the Army.

The main differences between the three services are shown in Table 4-8. The scores reflect the mean scores per service for each component. A higher score (1 – 5) reflects a higher magnitude (with the exception of mission framework and task).

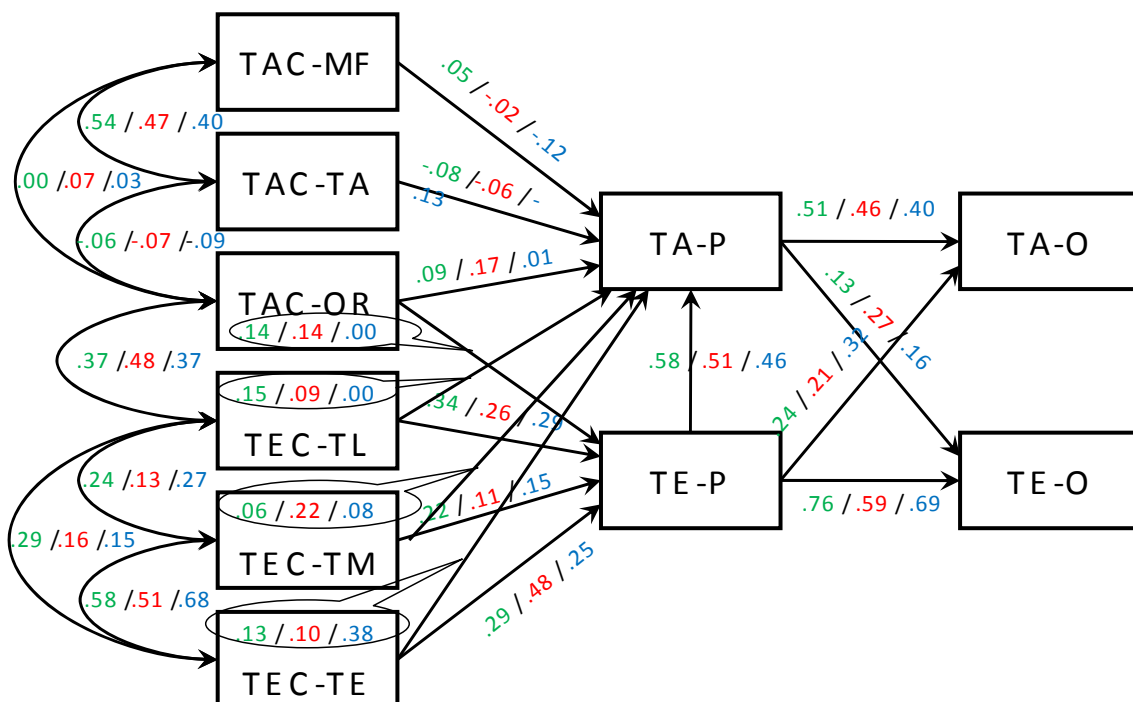
Table 4-8: Effects of Service on the CTEF Variables.

	Army	Air Force	Navy	<i>F</i> (2,703)	<i>p</i>
Mission Framework	3.21 ^a	3.06	2.89 ^b	7.50	.001
Task	3.13 ^a	2.87 ^b	2.85 ^b	11.76	.000
Organisation	3.45	3.57	3.60	2.36	.095
Team Leader	3.68 ^a	3.78	4.00 ^b	3.83	.022
Team Members	3.61	3.71	3.63	1.08	.342
Team	3.53 ^a	3.63	3.71 ^b	4.18	.016
Task-Focused Behaviours	3.63 ^a	3.80 ^b	3.80	5.14	.006
Team-Focused Behaviours	3.54	3.68	3.59	2.32	.099
Task Outcomes	4.03	4.16	4.19	2.89	.056
Team Outcomes	3.75	3.90	3.88	2.03	.133
Feedback	4.29	4.48	4.44	2.01	.135

^{a,b} Point to post hoc differences between two categories, as tested with a Scheffé analysis ($p < .05$).

Table 4-8 shows a few differences between services. Respondents from the Army were less satisfied about their team leader than the respondents from the Navy. Furthermore, the respondents from the Army were less positive about the team characteristics and the task-focused behaviours in their team.

The SEM analyses with the three services as separate groups resulted in the coefficients shown in Figure 4-13. For each arrow, the first coefficient (green) represents Army, the second (red) Air Force, and the third (blue) Navy.


Figure 4-13: Model 3 with Path Coefficients for Services as Groups (Army/Air Force/Navy).

Concerning the impact of the task conditions, for the Navy, mission framework and task have a negative impact on the task-focused behaviours (-.12 resp. -.13), while the other services do not show a relationship or a very weak one. All three services have a different perception of the impact of organisation on task-focused behaviours, ranging from .17 for Air Force to .01 for Navy.

Regarding the impact of team conditions on team-focused behaviours, however, the Army respondents perceived a stronger impact of the team leader on task-focused behaviours (.34 vs. .26 and .29) and on team-focused behaviours (.15 vs. .09 and .00). Remarkable is the relatively high impact of the team on team-focused behaviours for the Air Force (.48 vs. .29 and .25) and of the team on task-focused behaviours for the Navy (.38 vs. .13 and .10).

The Army showed the strongest effects from team-focused behaviours on task-focused behaviours (.58 vs. .51 and .46) and from task-focused behaviours on task outcomes (.51 vs. .46 and .40) and of team-focused behaviours on team outcomes (.76 vs. .59 and .69).

In summary, the respondents from the Army perceived stronger effects from the team leader than the other services, whereas the other services saw more beneficial effects from the team. Also, both task and team outcomes were better explained by task- and team-focused behaviours in the Army sample than for the other services.

4.4.5.3 Differences between Team Leaders and Team Members

Of all respondents 265 identified themselves as the leader of the team they were referring to and 452 stated they were a member of the team. The differences in perception between the two categories are shown in Table 4-9. The scores reflect the mean scores for either leader or member position in the team for each component. A higher score (1 – 5) reflects a higher magnitude (with the exception of mission framework and task).

Table 4-9: Effects of Position in the Team on the CTEF Variables.

	Leader	Member	<i>F</i> (1,715)	<i>p</i>
Mission Framework	3.16	3.13	.29	.591
Task	3.04	3.06	.12	.730
Organisation	3.56	3.44	4.46	.035
Team Leader	3.97	3.59	27.80	.000
Team Members	3.69	3.60	2.71	.100
Team	3.62	3.54	2.68	.102
Task-Focused Behaviours	3.85	3.57	29.08	.000
Team-Focused Behaviours	3.77	3.45	38.12	.000
Task Outcomes	4.24	3.97	23.14	.000
Team Outcomes	4.01	3.67	27.81	.000
Feedback	4.67	4.15	42.33	.000

Table 4-9 shows that team leaders were far more positive than team members with respect to both the task and team-focused behaviours, the task and team outcomes, and the feedback in their teams. In the conditions, there are only two components for which team leaders differed from team members. The leaders were more

positive about the qualities of the team leaders (being themselves) than the team members, and also more positive about the organisation.

The SEM analyses revealed the following paths coefficients as shown in Figure 4-14. The first coefficient (red) represents the leader and the second coefficient (blue) the team member.

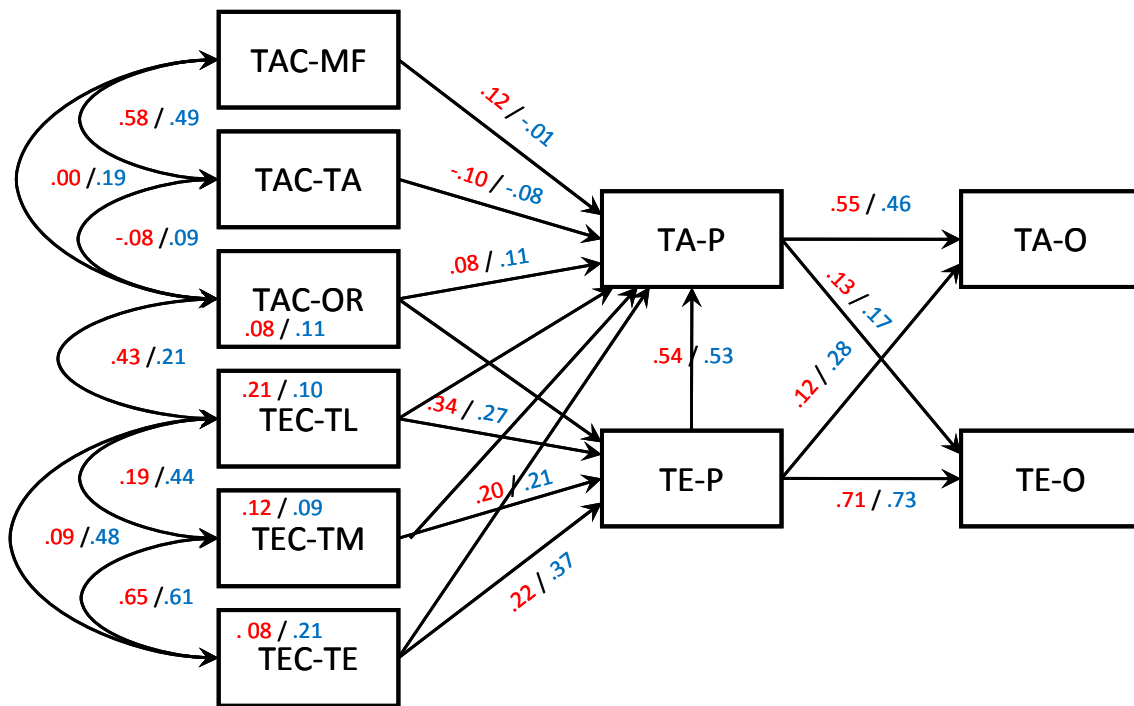


Figure 4-14: Model 3 with Path Coefficients for Team Leader and Team Member as Groups.

Among the impacts of task conditions on task-focused behaviours, we observe only one noteworthy difference; i.e., for team leaders, mission framework has an impact on the task-focused behaviours while team members do not see any association at all (.12 vs. .01).

Among the impacts of team conditions on task- and team-focused behaviours, we observe a divergence between team leaders and team members with respect to two relationships: team leaders believe to have a stronger impact on task-focused behaviours (.21 vs. .10) and on team-focused behaviours (.34 vs. .27), and team members believe that team characteristics have more impact on task-focused behaviours (.21 vs. .08) and on team-focused behaviours (.37 vs. .22).

As a partial conclusion, we can say that team leaders believe that their qualities are most important for the quality of the task- and team-focused behaviours, whereas the team members think the team is more important for the quality of both task- and team-focused behaviours.

4.4.5.4 Differences between Task Types

Formulated as an open ended question, respondents reported the kind of mission their team took part in. Based on the descriptions of the respondents, we classified their answers in one of four categories: battle/ combat missions (N = 283), training missions (N = 110); peacekeeping/stability missions (N = 67), and support missions (N = 245).

Table 4-10 shows the differences in perception of respondents depending on the kind of missions considered. The scores reflect the mean scores per mission type for each component. A higher score (1 – 5) reflects a higher magnitude (with the exception of mission framework and task).

Table 4-10: Effects of Mission Type on the CTEF Variables.

	Battle/Combat	Training	PK/Stability	Support	<i>F</i> (3,714)	<i>p</i>
Mission Framework	3.15 ^a	3.35 ^b	3.14 ^a	3.06 ^a	3.48	0.008
Task	3.00 ^a	3.44 ^b	2.93 ^a	2.96 ^a	11.41	0.000
Organisation	3.60 ^a	3.14 ^b	3.38 ^c	3.54 ^{abc}	9.13	0.000
Team Leader	3.87 ^a	3.24 ^b	3.74 ^a	3.82 ^a	11.20	0.000
Team Members	3.63 ^{ab}	3.53 ^a	3.54 ^{ab}	3.70 ^b	1.52	0.195
Team	3.63 ^a	3.38 ^b	3.44 ^b	3.63 ^a	5.06	0.001
Task-Focused Behaviours	3.74 ^a	3.37 ^b	3.62 ^a	3.76 ^a	7.95	0.000
Team-Focused Behaviours	3.62 ^{ac}	3.16 ^b	3.50 ^a	3.71 ^c	14.30	0.000
Task Outcomes	4.15 ^a	3.75 ^b	4.05 ^a	4.14 ^a	7.64	0.000
Team Outcomes	3.89 ^{ac}	3.21 ^b	3.74 ^a	3.96 ^c	18.02	0.000
Feedback	4.38 ^a	4.02 ^b	4.34 ^a	4.48 ^a	5.11	0.000

^{a b c} Point to post hoc differences between two or three categories, as tested with a Scheffé analysis ($p < .05$).

Table 4-10 highlights differences between the four types of missions, with the training missions often standing alone as differing from the combat, stability, and support mission types. Respondents describing training missions viewed the mission framework, task characteristics as more difficult and generally with less organisational support than the other three mission types. These respondents also consistently evaluated task-related and team-related process behaviours and outcomes lower than the other mission types. This generally reflects a view that the training types of mission are consistently more difficult than other mission types. Also of note is that respondents describing support missions evaluated their team-related behaviours and outcomes more favourably than peacekeeping/stability missions (in addition to training missions). This may reflect the premium and focus on coordination for support and logistics types of missions.

The SEM analysis with the four types of missions as separate groups shows the following results (see Figure 4-15). For each arrow, the first coefficient (green) represents battle/command, the second (red) training, the third (blue) peacekeeping/stability, and the fourth (yellow) support.

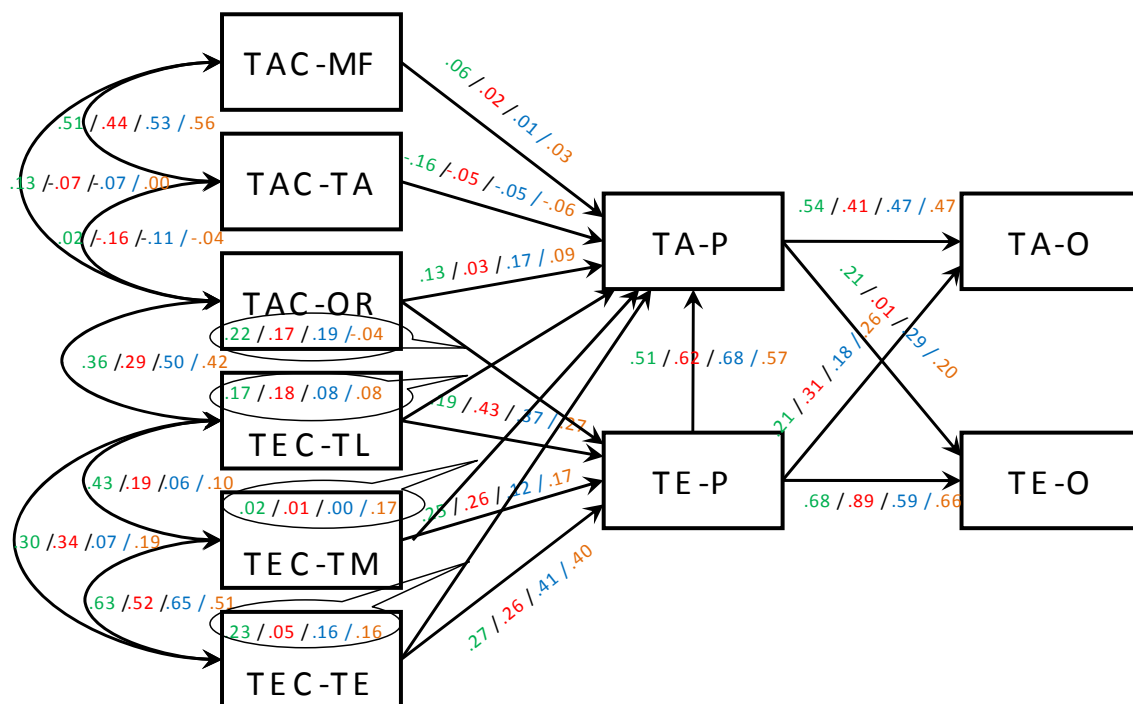


Figure 4-15: Model 3 with Path Coefficients for Task Types as Groups.

The impact of the team leader on the team-focused behaviours is highest in training (.43) while it is lowest in combat (.19). Similarly, team members impact most in training (.26) and combat (.25) and least in peace operations (.12). Conversely, the team as a whole is most important in peace operations (.41) and in support (.40) as opposed to combat (.27) and training (.26).

The organisation characteristics contribute positively to team-focused behaviours in all missions, except for Support missions (-.04).

The impact of people's competencies on the task-focused behaviours depends on the focus. The team leader contributes most in combat (.17) and training (.18) and least in both other mission types (.08), whereas team members have only a significant contribution in support (.17 vs. .00 to .02). The impact of the team characteristics is highest in combat (.23) and least in training (.05).

The impact of team-focused behaviours on task-focused behaviours is very strong and highest for peace operations (.68) but lowest although quite significant in combat (.51).

The direct impact of task-focused behaviours on both task outcomes and team outcomes is relatively low for training missions (.41 resp. .01) as compared to other types of missions (.54, .47, .47, resp. .21, .29, .20). On the other hand, in training missions the direct effects of team-focused behaviours on task outcomes and team outcomes are higher than for the other types of missions (.31 vs. .21, .18, .26, resp. .89 vs. .68, .59, .66).

It can be concluded that the outcomes of training missions are affected by different factors than other missions. Furthermore, the role of the leader and the team members is most important in these missions.

4.4.6 Participants' Feedback on the CTEF Instrument

Upon completion of the CTEF survey, participants were provided with a number of questions addressing the utility and usability of the CTEF instrument. Specifically, we were interested in whether respondents believed that the CTEF instrument addressed key aspects of team effectiveness as viewed by military

personnel in command teams. Additionally, we wished to ensure that the questions and rating scales were clear and useful. Moreover, one of the goals of the CTEF instrument was to lead respondents to learn more about the components of team effectiveness. The responses to these questions are summarized in Table 4-11.

Table 4-11: Respondent Feedback on the Utility and Usability of CTEF Instrument.

Questions in Survey	Completely Disagree	Disagree	Neutral	Agree	Completely Agree
The right aspects of team effectiveness are being addressed	8	47	158	462	39
The questions are clear	3	72	120	468	51
The distinction between level and impact is clear	5	70	161	434	44
The distinction between level and impact is useful	3	40	187	431	53
I learned about improving team effectiveness	35	153	269	221	36

Note: N = 714, Missing = 4.

Encouragingly, approximately 70% of respondents either “agreed” or “completely agreed” that the instrument addresses the important aspects of command teams; very few participants either “disagreed” or “completely disagreed” (N = 55; 7.66%). In addition, 519 (72.3%) of respondents either “agreed” or “completely agreed” that the questions were clear. Many respondents found the distinction between level and impact to be useful but a sufficient number of respondents did not find the distinction to be clear. Taken together, these findings provide some insight into why, perhaps, the distinction between magnitude (i.e., level or degree) and impact, while conceptually clear to researchers, may not be clear to and practically useful for the end-user population. Finally, an encouraging percentage (35%) of command team members and leaders felt that simply working through the survey made them more aware of team effectiveness than they were before conducting the survey.

From early feedback in operational exercises, we learned that the originally proposed CTEF instrument was viewed as being too long. In subsequent revisions we attempted to address this issue, and as a result we also included a question to gauge the extent to which the length of the instrument used in the survey was acceptable to respondents. The results are provided in Table 4-12. Overall, 576 (80%) of participants who completed the survey found the length to be “acceptable” or better. Of course, some proportion of respondents who initiated the survey may have not completed it because it was longer than they expected.

Table 4-12: Respondents on the Length of the Questionnaire.

	Frequency	Percent
Much too long	20	2.8
A little too long	118	16.4
Acceptable	464	64.6
A little too short	93	13.0
Much too short	19	2.6
Total	714	99.4
System Missing	4	0.6

The final feedback question was important in establishing if our respondents would be willing to actually use the CTEF in educational establishments (e.g., staff colleges, military academies), training or exercise environments, or operational settings. For this item, participants checked any of the three settings they would consider (which is why the data sum to more than the 718 participants), or else responded “not at all”. The results are presented in Table 4-13 where we provide a breakdown of the data by nationality of the respondent. Encouragingly, an overwhelming proportion of respondents thought that they would indeed use the CTEF in educational, training, and even operational settings. Thus, the results of this question, together with the responses provided above, provide confidence that CTEF is an instrument that resonates well with command team leaders and members, and is of practical utility for a range of military applications.

Table 4-13: Respondents on Willingness to Use CTEF.

Country	Educational Settings	Training Settings	Operational Settings	Not at All	Total
Belgium	13	24	37	39	113
Bulgaria	9	2	16		27
Canada	144	199	136	55	534
Czech Republic		1			1
Denmark	1				1
France	1	1	1		3
Germany			1		1
Netherlands	9	13	13	5	40
Poland				1	1
Russia				1	1
Spain				1	1
United Kingdom			1		1
United States	86	113	72	43	314
Total	263	353	277	145	1038

4.5 DISCUSSION

In this chapter we sought to address the first two goals of the survey study; i.e.,:

- 1) To examine the conceptual consistency of the framework and the psychometric properties of the instrument; and
- 2) To determine the applicability of the framework and the instrument for command teams in different NATO nations and diverse operational settings.

Through extensive analyses, we found the psychometric properties of the CTEF instrument to be generally acceptable. The items of the CTEF instrument were intended to be summative measures of the aspects of the CTEF model. Although the items associated with the condition components generally exhibited these properties, the processes and outcome items did not exhibit these properties in all cases. This is discussed in more detail in Chapter 5.

Through the hypotheses proposed and their associated results, we found that the CTEF instrument exhibits conceptual consistency with existing theory and empirical research on team effectiveness. The observed pattern of relationships reproduces the mediational role of processes, as well as the distinction between task-focused behaviours and team-focused behaviours as posited by McIntyre and Salas (1995). team related condition components (team leader, team members, team) were more strongly associated with team-focused behaviours as well as team outcomes. A similar pattern of relationships was observed with task related components (mission framework, task characteristics, organisation), although the relationships between task-related components and task-focused behaviours were notably weaker than expected. Revisions of the CTEF instrument with regard to the task related condition components factors should substantially address this weakness.

In order to address the second goal of the survey study, we analysed the data by several backgrounds. We found notable differences between categories of the grouping variables. First, there were differences between countries. The respondents from the US in general showed lower magnitude judgments on the components of the model than respondents from Canada and the EU. There were also slight differences in the paths in the model. The results show only slight differences between the countries in the paths from the conditions to the task- and team-focused behaviours, with the exception of organisation to team-focused behaviours, and team leader and team members to task-focused behaviours. These differential effects suggest that for Canada the organisation seems to be more important, for the US the team leader, and for the EU the team members. Second, there were differences between services. The respondents from the Army were less positive about their team leaders and team characteristics than the respondents from the Navy. There were also differential effects of the paths in the CTEF model. The Army respondents saw a stronger impact of the leader on the processes, whereas the Air Force and the Navy accentuated the influence of the team. Third, there were differences between team leaders and team members in their perceptions. In general, team leaders were more positive about the processes, the outcomes, and the feedback than team members.

Finally, we collected considerable feedback from respondents about the CTEF instrument. We collected responses from military leaders and members of command teams in a variety of settings and countries. Responses to the feedback questions were consistent across countries and settings. Respondents generally found the CTEF instrument to be clear, easy to understand, and useful. Approximately 80% of respondents also indicated that they would be willing to use the CTEF instrument in educational, training, or operational settings.

Chapter 5 – DISCUSSION

5.1 OVERVIEW OF RESULTS

The primary goals of the study included:

- To examine the conceptual consistency of the model and the psychometric properties of the instrument;
- To determine the applicability of the model and the instrument for command teams in different NATO nations and diverse operational settings; and
- To revise, consolidate, and update the model and instrument based on the findings of the study.

In Chapter 4 we examined the conceptual consistency of the CTEF model with a model fit test, and we explored the psychometric properties of the instrument based on the survey. The size of the inter-item correlations and also the correlations between the scales that represented the magnitude, on the one hand, and the impact, on the other, is generally large. These are indications that we could possibly reduce the number of items and scales in the survey.

From the analyses for each of the aspects or components we can draw the following conclusions:

- The correlations among the items in mission framework did not exceed .35, indicating that the respondents were able to distinguish between items that were conceptually different.
- For the task characteristics, most items did not correlate very highly, with the exception of task ambiguity and task instability (.61). In the latter case it is not clear if this correlation reflects a mere co-occurrence or a causal relation; e.g., instability leads to ambiguity.
- All inter-correlations for the organisation characteristics items were in the range of .17 to .43. Hence the various aspects should be retained.
- The three items measuring the team leader correlated highly. In particular, the items team leader skills and team leader knowledge were hard to distinguish. These items could be replaced with one: the leader's competencies.
- The three items representing the team members also correlated highly. Here also the items of team member skills and team member knowledge may be replaced with one: team member's competencies.
- The items representing the team did not correlate very highly. Hence, these items should be retained, except for team size.
- The items representing task-focused behaviours did correlate highly. In a number of cases the correlations were larger than .70, suggesting that we could reduce the number of items (i.e., retain the Level 2 items, such as managing, planning, etc.).
- The same applies to the team-focused behaviours. They also correlated very highly for a number of items. Here also, it can be recommended to look for clusters of items that can be aggregated.
- The items representing the task outcomes correlated higher than .50, although the items clearly try to measure separate concepts. Hence, we keep them as such.
- The team outcome items all correlated higher than .60, suggesting that we may be able to reduce the number of items to one or two.
- The feedback items all correlated above .70, suggesting the number of items here could be reduced to one or two "overarching" items.

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The overall correlation between the magnitude and the impact scales was .72, suggesting considerable overlap. Further inspection of the data showed that the high correlation between scales was predominant in the task- and team-focused behaviours and in the conditions representing the team, the leader, and the members. The correlations were lower for the mission framework, task characteristics, and organisation characteristics. Nevertheless, the results taken together suggest that it is not necessary to retain both the magnitude and the impact scales.

On the basis of the high inter-item correlations and the high correlations between the magnitude and the impact scales, we will provide recommendations for reducing the number of items in the CTEF instrument (see Section 5.3). But before that, it is important to verify that the high correlations evident in the survey study are also evident when data are collected during an actual operation. The principle concern here is that the correlations evident in the survey study could have been susceptible to a form of hindsight bias¹. We will discuss this phenomenon in more detail in Section 5.2, where we re-analyze the data collected in exercise Joint Caribbean Lion (i.e., JCL2 and JCL3).

We also tested an extensive set of hypotheses that could be derived from the CTEF model. In general, most hypotheses held. First, four of the conditions correlated positively with the task-focused behaviours and the team-focused behaviours: Organisation, team, team leader, and team members all had positive effects on task-focused and team-focused behaviours. However, contrary to what we originally expected, we found no correlations between the mission framework and task- and team-focused behaviours and even a slightly negative relationship between task characteristics and task- and team-focused behaviours. These latter results mean that more complex, ambiguous, or difficult tasks result in better task and team activities. A further analysis showed that there is a notable difference between English and non-English questionnaires with respect to this relationship. The negative relationships held only for the English questionnaires and not for non-English respondents (i.e., beta-values of -.18 vs. .05 with task-focused behaviours as the dependent variable and beta-values of -.12 vs. .05 with team-focused behaviours as the dependent variable).

Second, task-focused behaviours and team-focused behaviours had positive effects on both task outcomes and team outcomes, although task-focused behaviours were more important for task outcomes than team-focused behaviours, and team-focused behaviours had a larger effect on team outcomes than task-focused behaviours. These effects and differences in the size of the effects were all as hypothesized. One concern, however, was the magnitude of the effects; the correlations were all in the range of .65 or higher. The size of the correlations suggests that the concepts may have been subject to a halo² effect and thus again related to the retrospective nature of the survey study. This possibility will also be addressed in Section 5.2 when we re-examine the data from Joint Caribbean Lion.

Third, the feedback was positively correlated both with the task and team outcomes, and with the task- and team-focused behaviours. This means that a better review process leads to better processes and better outcomes. We saw no confirmation of the more dynamic correcting function of the feedback loops. According to this idea the feedback loops should show a negative relationship with team and task outcomes: e.g., the worse the outcomes the more attention for the improvement of the conditions and/or the processes. However, if we would have liked to test that we should have used a more dynamic approach in testing. From the survey data, the only thing that we can conclude is that having better feedback loops helps the team to improve their processes and their outcomes.

¹ Hindsight bias means that people, when looking backward, see a stronger “consistent” relationship between aspects than there was objectively present at the very moment of the events.

² Halo effect means that the “value” of one characteristic is erroneously seen “in the light of” the value of another one. This leads to inflated associations or correlations, e.g., it has repeatedly been proven that physically attractive people are believed to be more intelligent than less attractive people.

Fourth, the model as a whole was tested with path model analysis and with structural equation modelling. A closer look with path analysis also showed that the task- and team-focused behaviours mediated to a large extent the relationship between the conditions and task and team outcomes. However, there were a few additional direct relationships between the conditions and the outcomes. The structural equation Model 3 showed a reasonable fit to the data; therefore we can conclude that our model holds conceptually throughout all applications.

In order to address the second goal of the survey study, we analysed the data from several perspectives (backgrounds of respondents) in order to see if there were differences. Although we found many interesting differences, we can conclude that the model holds for all categories of respondents that we distinguished. Furthermore, we collected responses from military leaders and members of command teams about the model and the instrument. Respondents generally found the CTEF instrument to be clear, easy to understand, and useful. Approximately 80% of all respondents also indicated that they would be willing to use the CTEF instrument in educational, training, or operational settings.

5.2 COMPARISON OF SURVEY DATA WITH JOINT CARIBBEAN LION

As discussed previously, the size of both the inter-item correlations and the correlations between different aspects or components in the survey could have been influenced by the fact that the respondents had to refer to a mission or exercise which they had been part of some time ago. Therefore, the size of the correlations could have been biased by both halo-effects and by leniency effects (e.g., Cooper, 1981; Harris and Schaubroeck, 1988). A halo effect implies that one general underlying factor accounts for high correlations. A potential candidate for such an underlying factor is the general feeling that remains after the mission. Leniency implies that in hindsight respondents may see the events in a more positive light than might have been justified by their real experiences during the operation. Although both effects have been known to be a problem of surveys in general (mono-method bias and response tendencies), we assume that these effects would be reduced when respondents fill out a questionnaire about a mission or exercise that is going on at present.

In order to test our assumptions, we compared the survey-data with the data from the second and third administrations of Joint Caribbean Lion. We did not use the first administration of Joint Caribbean Lion, because in that administration we used the long version of the instrument and prior to changing the reading level of the items. We merged the data from both administrations two and three into one dataset in order to have enough respondents to test the relationships in the model. First, we left out the four observers of the exercise in order to have only team leaders and team members. Second, we checked if there was not too much overlap in respondents. Only 8 respondents out of 58 had filled out the questionnaire at both points in time. Because of the relatively little amount of overlap we decided to proceed with all remaining entries.

In Table 5-1 we compared the sizes of the inter-item correlations in the survey with those in Joint Caribbean Lion. For each component in the model we noted the minimum, the maximum, and the median of all inter-item correlations. Table 5-1 shows that the medians of the inter-item correlations of the Joint Caribbean Lion data were considerably lower for most of the aspects. The largest reductions in median inter-item correlations were found in the aspects organisation, team leader, team members, task-focused behaviours, and task outcomes. The inter-item correlations within the aspect task characteristics were in a narrower range in the Joint Caribbean Lion data. The inter-item correlations for the team-focused behaviours and for the team outcomes were slightly lower for the Joint Caribbean Lion data than for the survey data. There is only one component in which the inter-item correlations were larger for the Joint Caribbean Lion data than for the survey data: the aspect team. Therefore, we can conclude that overall the survey data may have been affected by halo effects that result from hindsight bias, and that this effect is larger for the task-focused behaviours and task outcomes than for the team-focused behaviours and the

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team outcomes. However, the inter-item correlations for Joint Caribbean Lion still were quite high. This suggests that it is justified to strive for a reduction in the number of items in the survey.

Table 5-1: A Comparison of the Inter-Item Correlation Coefficients of the Survey with the Data from Joint Caribbean Lion.

	Survey			Joint Caribbean Lion		
	Minimum	Maximum	Median	Minimum	Maximum	Median
Mission Framework	.13	.35	.28	.11	.34	.24
Task	-.00	.61	.12	.19	.41	.27
Organisation	.17	.43	.30	.10	.34	.17
Team Leader	.64	.75	.68	.51	.66	.57
Team Members	.53	.73	.53	.41	.49	.45
Team	.06	.41	.28	.19	.50	.42
Task-Focused Behaviours	.31	.71	.52	.17	.70	.41
Team-Focused Behaviours	.32	.69	.47	.15	.71	.44
Task Outcomes	.54	.63	.60	.46	.58	.50
Team Outcomes	.61	.76	.67	.53	.71	.62

We hypothesized that not only the inter-item correlations would have been affected by the halo effects, but also the correlations between the aspects in the model. In order to test this, we compared the standardised regression coefficients (beta-values in the table) of the survey data with the data from Joint Caribbean Lion (see Table 5-2).

Table 5-2: Beta Coefficients and R² Values for the Data from the Survey and Joint Caribbean Lion.

		Survey Beta- Values	Survey R ²	JCL Beta- Values	JCL R ²
Conditions -> Task Outcomes	Mission Framework	.02	.37	.10	.16
	Task	-.10		-.02	
	Organisation	.14		.34	
	Team Leader	.33		-.03	
	Team Member	.11		-.07	
	Team	.20		.14	
Conditions -> Team Outcomes	Mission Framework	-.06	.53	.10	.45
	Task	-.09		-.07	
	Organisation	.12		.09	
	Team Leader	.28		.22	
	Team Member	.21		.05	
	Team	.31		.45	
Conditions -> Task-Focused Behaviours	Mission Framework	.04	.55	-.00	.57
	Task	-.10		-.03	
	Organisation	.15		.20	
	Team Leader	.31		.21	
	Team Member	.18		.10	
	Team	.31		.45	
Conditions -> Team-Focused Behaviours	Mission Framework	.00	.51	.05	.51
	Task	-.04		.00	
	Organisation	.12		.13	
	Team Leader	.32		.26	
	Team Member	.19		.07	
	Team	.29		.43	
Behaviours -> Task Outcomes	Task-Focused Behaviours	.51	.52	.46	.19
	Team-Focused Behaviours	.25		-.03	
Behaviours -> Team Outcomes	Task-Focused Behaviours	.16	.76	.06	.61
	Team-Focused Behaviours	.74		.73	

Table 5-2 shows some notable differences between the data sets:

- First, contrary to the survey data, the task outcomes in Joint Caribbean Lion were not well explained, neither by the conditions nor by the behaviours. In Joint Caribbean Lion, only the organisation characteristics and the task-focused behaviours had some effect on the task outcomes.
- Second, the explained variance (PVAF) of the team outcomes in Joint Caribbean Lion was somewhat lower than the explained variance of the team outcomes in the survey. However, the explained variance of the task- and team-focused behaviours by the conditions was about the same for both datasets.
- Third, team showed larger beta-values in Joint Caribbean Lion than in the survey, whereas in the survey the leader was the dominant factor for the explained variance of task- and team-focused

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behaviours as well as task and team outcomes. This suggests that, in hindsight, the leader may have been the most dominant factor in the success of a mission, whereas during the mission the team seems to be more important.

- Fourth, in Joint Caribbean Lion task-focused behaviours had a significant contribution to task outcomes, but not to team outcomes, whereas team-focused behaviours only had a significant contribution to team outcomes and not to task outcomes. It means that the distinction between the concepts task and team may have been better preserved in the responses to an ongoing mission.

Finally, we tested if the responses to the survey were less lenient than the responses to the Joint Caribbean Lion Survey (see Table 5-3).

Table 5-3: Comparison of the Mean Values of the Aspects/Components that Were Measured in the Survey and Joint Caribbean Lion.

	Survey Mean	Survey SD	JCL Mean	JCL SD	<i>t</i>	<i>p</i>
Mission Framework	3.14	0.72	2.96	0.57	2.73	.003
Task	3.05	0.69	3.36	0.63	-4.87	.000
Organisation	3.49	0.73	3.22	0.58	4.13	.000
Leader	3.73	0.96	3.40	0.72	3.13	.001
Team Members	3.63	0.72	3.29	0.67	4.54	.000
Team	3.57	0.59	2.93	0.69	8.50	.000
Task-Focused Behaviours	3.67	0.67	3.00	0.58	10.08	.000
Team-Focused Behaviours	3.57	0.69	2.97	0.62	9.18	.000
Task Outcomes	4.07	0.72	3.36	0.56	10.65	.000
Team Outcomes	3.79	0.85	3.15	0.73	8.15	.000

Table 5-3 shows that the values of the survey were significantly and substantially higher than the values of Joint Caribbean Lion. The differences were largest for the task- and team-focused behaviours and outcomes. The only exception is task characteristics. These differences in mean values suggest that respondents were far more positive in hindsight than they were during a real exercise.

In sum, we can conclude that the responses in the survey showed effects that could be attributed to hindsight bias. The inter-item correlations for most aspects and components in the survey were higher than in the Joint Caribbean Lion data. The higher correlations in the survey data compared with those of Joint Caribbean Lion suggest that when the items are filled out during an exercise or a mission, respondents are better able to distinguish between the several items than when respondents fill out the survey (long) after the exercise or mission.

5.3 FURTHER DEVELOPMENT OF MODEL AND INSTRUMENT: CTEF 2.0

The analyses in Chapter 4 showed that the length of the instrument could be reduced because the inter-item correlations were high in the survey and in Joint Caribbean Lion. In this section we describe our decisions working toward the next version of the instrument.

5.3.1 Remove Impact Scale

The first reduction of the questionnaire required the removal of either the magnitude scale or the impact scale. On the basis of the high inter-correlations between both scales we decided that it is not necessary to use both scales. We decided to keep the magnitude scale because this scale refers to the extent to which an item is present in the team and because it appears throughout the questionnaire; that is, there is no impact scale for the outcome measures.

5.3.2 Remodel the Components Mission Framework and Task

The regression analyses showed that the aspects mission framework and task consistently did not show significant effects on task- and team-focused behaviours and outcomes. Further exploration of the effects of the items within both aspects showed that the features within each of these aspects cancelled each other out; i.e., they had contrary effects on the task- and team-focused behaviours and outcomes.

The correlations in Table 5-4 show a number of interesting aspects. First, some of the items of mission framework were highly correlated with the items of task characteristics: operational uncertainty was highly correlated with goal ambiguity and goal instability; operational stress was also highly correlated – although somewhat lower – with complexity and workload. Second, items within both mission framework and task characteristics had conflicting correlation structures with task- and team-focused behaviours and task and team outcomes. Whereas situational uncertainty correlated negatively with the behaviour and outcome items, mission stakes correlated positively with them. For task characteristics the correlations of workload and complexity, on the one hand, and goal ambiguity and goal instability, on the other hand, contradicted each other. These contradicting correlations could be the reason why the overall concepts mission framework and task did not have an effect on the task- and team-focused behaviours and task and team outcomes.

Table 5-4: Correlation Coefficients between the Features of Mission Framework and Task, and the Aspects of Task and Team-Focused Behaviours, and Task and Team Outcomes.

	1	2	3	4	5	6	7	8	9	10	11	12
Mission Framework												
Situational Uncertainty	1	.23	.29	.13	.10	.10	<u>.50</u>	.37	-.25	-.22	-.25	-.27
Operational Stress	2		.34	.35	.36	<u>.50</u>	.19	.20	.05	.02	-.00	-.06
Constraints	3			.27	.25	.20	.20	.21	-.02	-.04	-.01	-.13
Mission Stakes	4				.29	.39	.01	.08	.17	.17	.13	.13
Task Characteristics												
Complexity	5					<u>.42</u>	.11	.14	.12	.12	.06	.08
Workload	6						-.00	.09	.19	.22	.20	.14
Goal Ambiguity	7							.61	-.38	-.33	-.35	-.38
Goal Instability	8								-.27	-.23	-.25	-.28
Task-Focused Behaviours												
Task-Focused Behaviours	9									.80	.71	.75
Team-Focused Behaviours	10										.65	.89
Task Outcomes	11											.64
Team Outcomes	12											

DISCUSSION

However, the three features situational uncertainty (mission framework), and goal ambiguity, and goal instability (task) all had the same consistent effects. They showed strong negative relationships with both the task- and team-focused behaviours as well as with the task and team outcomes. A comparable merge of the items workload and complexity can be suggested. These items also have comparable correlation structures.

On the basis of this analysis we suggest to redefine the existing components mission framework and task into mission context and task characteristics. Mission context is oriented on the environment and the mission goals. The constituting aspects are situational uncertainty and goal instability. Goal ambiguity was not used because it had a relatively high correlation with Situation uncertainty, becoming a too similar construct. Task characteristics are focused on the work itself. Its aspects are now workload and complexity. The remaining items for CTEF 2.0 are:

- Situational uncertainty; and
- Goal instability.

5.3.3 Organisation

The component organisation impacted the mediating and dependent variables in the model. Therefore, the aspect should be maintained as such. A further analysis showed that the item freedom of action (autonomy) correlated lower with the other items than the other three items that comprised this component. Therefore, we chose not to include freedom of action in the CTEF 2.0. The remaining items for CTEF 2.0 are:

- Clarity of command structure;
- Support provided by the organisation; and
- Match between the team mission and organisational goals.

5.3.4 Team Leader

In the survey, the component team leader had a large effect on task- and team-focused behaviours and outcomes. However, the aspects team leader skill and team leader knowledge correlated very highly, suggesting that respondents were not able to assess the subtle differences between both. Therefore, we decided to combine both aspects into the item team leader competence. The items for CTEF 2.0 are now:

- Team leader competencies; and
- Match between leader's personal goals and organisational goals.

5.3.5 Team Members

Just as in the component team leader, the aspects team members' skill and team members' knowledge correlated very highly, suggesting that respondents were not able to assess the subtle differences between both. Therefore, we also decided to combine both features in the item team members' competence. The items for CTEF2.0 are now:

- Team members' competence; and
- Match between members' personal goals and organisational goals.

5.3.6 Team

The aspect team had high beta values in the regression equations. Therefore, this aspect is considered important in the model. A further analysis shows that the inter-item correlations of team size and face-to-face interaction with the other items were considerably lower than the inter-item correlations of the other items.

Furthermore, the item team size is not specific about the quality of the team. Therefore, we decided to leave this feature team size out. The face-to-face interaction item was skewed: only five percent of the respondents were actually working totally distributed. Therefore, we did not include face-to-face interaction in the CTEF 2.0. It is important to consider that mix of people and team structure only can be scored in a positive or negative way if an anchor such as “appropriateness” is used. The items for CTEF 2.0 are:

- Mix of people;
- Team structure;
- Team maturity; and
- Match between team goals and organisational goals.

5.3.7 Task-Focused Behaviours

The inter-item correlations of the 19 items were high. Moreover, at feature level (Level 4) within each aspect they were higher as compared to the inter-item correlations between the different aspects (Level 3). Therefore, we decided to compress the number of items and not use the Level 4 (the features) in CTEF 2.0. The items that are now in CTEF 2.0 are:

- Managing information;
- Decision making;
- Planning;
- Executing plans; and
- Interacting with other command teams.

5.3.8 Team-Focused Behaviours

The inter-item correlations between the 18 items that make up the team-focused behaviours were also high. Therefore, in general we decided to compress the number of items and use the aspects level (Level 3). However, the first two aspects (providing and maintaining vision and maintaining common intent) correlated very highly. Therefore, we combined them into ‘providing vision and intent’. Another change was suggested for the aspect “adapting to changes”. Based on what we really want to measure and what is not already in other aspects, we concluded that the features monitoring team members’ performance and providing back-up are in fact more central to what we are trying to assess. Also a small change in the wording of monitoring team members’ behaviours was introduced in order to convey that we are assessing social aspects. Hence, the aspect “adapting to changes” was changed into “monitoring team members’ behaviours” and “providing back-up”. Also, we decided to rephrase the aspect “maintaining team synergy” into “maintaining team cohesion”, because the item was hard to understand for the respondents. In conclusion, the aspects that we measure in CTEF 2.0 are:

- Providing vision and intent;
- Collaborating between team members;
- Motivating;
- Monitoring team members’ behaviour;
- Providing back-up; and
- Maintaining team cohesion.

DISCUSSION

5.3.9 Task Outcomes

The inter-item correlations between the three items were high, especially between the items meeting goals of the commander and meeting expectations of other partners. We decided to merge these two items because of this high correlation and because of the argument that for the military the expectations of other partners are generally covered by the goals of the commander. The remaining two items that we measure in CTEF2.0 are then:

- Meeting the goals of the commander and higher echelons; and
- Staying within limits and intentions of the mission.

5.3.10 Team Outcomes

The inter-item correlations were very high. Therefore, we decided to reduce the number of items from six to two items. The remaining items should reflect an internal dimension and an external dimension. We decided to keep:

- Trust between team members (internal); and
- Collective confidence in achieving goals (external).

5.3.11 Feedback

The inter-item correlations were extremely high, suggesting that the respondents could not differentiate between the items or, if they use one form of feedback, they use the other forms as well. Also, there was a concern in the research group that the wording was not clear enough. Given that the processes are the core of the model, we decided to select one item for task processes and one item for team processes. The items are:

- Did your team take measures to improve task processes when needed (managing information, decision making, planning, executing plans, interacting with other command teams);
- Did your team take measures to improve team processes when needed (providing vision and intent, collaboration among team members, motivating, monitoring team members' behaviour, providing back-up, maintaining team cohesion).

5.3.12 Conclusion

The above reductions resulted in a CTEF 2.0 instrument of 32 items that ask for the magnitude or level or appropriateness of certain aspects. The answer categories that are used for the items are the same that were used for the administrations of the survey.

5.4 USE OF THE MODEL AND THE INSTRUMENT

The primary use of the instrument is to discuss the results by the commander and his or her team. The commander needs to specify which collectives are the 'teams' to be considered. For staffs, it is suggested to specify a team comprising the commander, the chief of staff, and the section heads. The other teams in a staff can be sections or sub-sections to the extent that they work closely together to achieve specific common goals.

The instrument can be used in different ways (see Annex F). For example, in exercise Joint Caribbean Lion, we grouped items in order to arrive at global 'negative' and 'positive' items. We used a simple criterion whereby the item should be flagged for discussion if more than 40% of the team agreed that it was a significant issue. By doing so, the staff briefing can focus exclusively on the critical issuers. During the

briefing, the team should try to uncover and understand why these aspects or features have these scores 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, then development or improvement can be tracked.

The CTEF instrument can be used 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 are 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 instrument can be used in different roles: by observers, leaders and team members. In general observers score most severely, and leaders score most positively. These differences are "natural" and provide a solid basis for discussion: not *who* is right, but *what* are the issues behind the scores, items, concepts of the instrument and model. In summary, the emphasis of this tool is not to provide a definitive or final judgment on the team. It is meant rather to discover ways to improve the team and to sensitise the team to important issues.

DISCUSSION



Chapter 6 – RECOMMENDATIONS AND FURTHER RESEARCH

We developed a comprehensive model for Command Team Effectiveness (CTEF) and a corresponding assessment instrument based on an extensive literature review on team effectiveness and analysis of operational command teams, meant to support operational commanders and teams. This development started out with large set of elements that was judged to be critically relevant for operational performance. Through applications in practice and analysis of experiences of 718 surveyed military officers. This process allowed us to reduce the number of elements in the model – from 75 to 32 items – on the basis of inter-item correlations, advanced modelling techniques and operational relevance. This resulted in an improved version of the command team effectiveness instrument, the CTEF 2.0.

It is important to realise that the basic structure of the CTEF model and its constituting components were not changed substantially; rather, to assess these components fewer detailed aspects and features are needed according to our extensive analysis. CTEF 2.0 is now the basis for further application and data gathering in operational, exercise, and training contexts.

Commanders and leaders always have to decide themselves what level of detail is needed to build their teams, and they can add more detailed items from the model in order to tap deeper in the performance of their team.

It is recommended that commanders learn to work with the effectiveness concepts proposed by the CTEF model and apply it regularly, possibly selecting those elements they want to work on to improve. For instance, the NATO schools could use it in their training courses and academies and staff colleges in their leadership courses as well.

We recommend that a simple support system is developed for easy data collecting, processing data, and reporting.

Finally, we recommend that follow-up development of CTEF be initiated, specifically directed to more complex organisations, such as international staffs and multi-team organisations in a comprehensive context of military-civil alliances.

RECOMMENDATIONS AND FURTHER RESEARCH



Chapter 7 – REFERENCES

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REFERENCES



Annex A – THE CTEF INSTRUMENT BASED ON CTEF 2005 MODEL AS ADMINSTRATED IN JOINT CARIBBEAN LION

Quality/Magnitude				
Please evaluate the quality or magnitude of the aspect being rated using the following scale:				
Very Low		Moderate		Very High
1	2	3	4	5

Impact on Team Effectiveness				
Please evaluate the direction and strength of impact on overall team effectiveness due to the present level of an item's quality or magnitude:				
Very Negative		No Impact		Very Positive
-2	-1	0	+1	+2

	Quality/Magnitude					Impact				
	Very Low				Very High	Very Negative				Very Positive
MISSION FRAMEWORK										
Level of situational uncertainty <i>The lack of information and lack of understanding of the operation</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of operational stress <i>The state of mental or emotional strain during the operation</i>	1	2	3	4	5	-2	-1	0	+1	+2
Amount of limitations <i>External factors that restrict the range of the team's actions or independence</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of risk of damaging interests <i>The implications of the success or failure of the mission</i>	1	2	3	4	5	-2	-1	0	+1	+2
TASK										
Level of task complexity <i>Tasks that have many related or difficult subtasks</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of workload <i>Refers to the mental and physical demands of the task</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of goal uncertainty <i>The degree to which the mission goals, objectives, and priorities are unknown, vague, or unclear</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of goal instability <i>The degree to which goals change significantly over time</i>	1	2	3	4	5	-2	-1	0	+1	+2
ORGANISATION										
Match between the team's mission and organisational goals <i>The degree to which team's mission is similar to the organisation's goals</i>	1	2	3	4	5	-2	-1	0	+1	+2
Clarity of command structure <i>Understanding the command structure and ability to prioritize when given orders from multiple chains of command (e.g., staff and line versus matrix structure)</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of autonomy <i>Freedom of action allowed by the organisation</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of organisational support <i>Degree to which the organisation assists and sustains the team</i>	1	2	3	4	5	-2	-1	0	+1	+2
TEAM LEADER										
Level of leader skills <i>Essential leader capabilities as they relate to the military task at hand</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of leader knowledge <i>Essential knowledge, wisdom and experience of the leader</i>	1	2	3	4	5	-2	-1	0	+1	+2
Consistency between the leader's goals and the organisational goals <i>The degree to which the leader's goals are similar to the organisation's goals</i>	1	2	3	4	5	-2	-1	0	+1	+2

ANNEX A – THE CTEF INSTRUMENT BASED ON CTEF 2005 MODEL AS ADMINSTRATED IN JOINT CARIBBEAN LION



TEAM MEMBERS	Quality/Magnitude					Impact				
	Very Low		Very High			Very Negative		Very Positive		
Level of team member skills <i>Abilities held by individual team members which enable them to complete their tasks within a team setting</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of team member knowledge <i>Knowledge, wisdom and experience of the team members</i>	1	2	3	4	5	-2	-1	0	+1	+2
Consistency of team member's goals to organisational goals <i>The degree to which team members' goals are similar to the organisation's goals</i>	1	2	3	4	5	-2	-1	0	+1	+2

TEAM	Quality/Magnitude					Impact				
	Very Low		Very High			Very Negative		Very Positive		
Appropriateness of team composition <i>Degree to which the mix of team member's skills and personalities match the needs of the mission requirements</i>	1	2	3	4	5	-2	-1	0	+1	+2
Appropriateness of team size <i>Degree to which the team is sufficiently staffed to accomplish the task</i>	1	2	3	4	5	-2	-1	0	+1	+2
Appropriateness of team architecture <i>Distribution and relation of subtasks and roles between team members</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of team maturity <i>Degree to which team members have worked together and developed as intact team</i>	1	2	3	4	5	-2	-1	0	+1	+2
Consistency of team goals to organisational goals <i>The degree to which the team goals are similar to the organisational goals</i>	1	2	3	4	5	-2	-1	0	+1	+2

TASK FOCUSED BEHAVIOURS	Quality/Magnitude					Impact				
	Very Low		Very High			Very Negative		Very Positive		
Quality of managing information <i>How well the team obtains, uses, coordinates and exchanges information in order to understand the situation</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of obtaining information <i>i.e., actively searching to compensate for the lack of information</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of processing information <i>e.g., using, integrating information; maintain focus</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of exchanging information <i>e.g., timeliness, clarity, brevity, correctness, completeness of comms.</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of assessing the situation <i>e.g., noticing, recognising, anticipating events</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of making decisions <i>How well the team creates multiple solutions, chooses among solutions, and implements the chosen solution</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of defining the problem space <i>e.g., sampling environmental cues and team members' expertise</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of managing time for decision-making <i>e.g., adapting to available time</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of evaluating options and results <i>e.g., process of continually thinking, acting, evaluating outcomes</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of planning <i>How well the team outlines actions required for a task and identifies & schedule available resources</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of anticipating <i>e.g., identifying future tasks and possible outcomes</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of scheduling <i>e.g., personnel and resources in time</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of specifying resources needed <i>e.g. personnel, time, tools</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of defining strategies <i>defining an approach to accomplish the mission</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of directing and controlling <i>Processes that occur between planning and attaining a goal</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of organising <i>to implement the plan specifying resources, procedures, roles</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of managing <i>managing time, schedules, and expectations in executing decisions</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of monitoring progress <i>assessing advancement toward milestones, goals, and objectives</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of interactions with other command teams <i>Developing and maintaining communication with other command teams</i>	1	2	3	4	5	-2	-1	0	+1	+2

ANNEX A – THE CTEF INSTRUMENT BASED ON CTEF 2005 MODEL AS ADMINSTRATED IN JOINT CARIBBEAN LION

TEAM-FOCUSED BEHAVIOURS	Quality/Magnitude					Impact				
	Very Low				Very High	Very Negative				Very Positive
Quality of providing and maintaining vision <i>Communicating the team's direction and purpose</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of maintaining common intent <i>Creating a shared sense of goals, objectives, and action</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of interacting within the team <i>Communication and coordination within the team and providing feedback</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of communicating <i>e.g. openness, style, expressing feelings and thoughts</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of coordinating <i>Combining/acting in a harmonious, supportive manner to achieve goals</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of providing feedback <i>Offering advice to one other about how to improve performance</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of Motivating <i>Influencing the amount of effort exerted toward achieving the team's goals</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of Motivating Externally <i>Using tangible/intangible incentives to reward good performance</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of Motivating Internally <i>Inspiring its members to develop internal interest in work</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of Adapting <i>Monitoring task and team status and adjusting strategies when needed</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of monitoring <i>Observing and assessing own and each other's performance</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of correcting <i>Offering feedback or guidance to improve team mates' performance</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of backing-up <i>Supporting another team member when s/he is busy</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of providing team maintenance <i>Team building activities that keep the team together</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of providing social support and integration <i>e.g., respect and companionship</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of regulating emotions (e.g., composure, morale) <i>Maintaining emotional balance among team members, considering emotional display norms</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of developing and maintaining cohesion <i>Promoting unity, solidarity, or esprit de corps among themselves</i>	1	2	3	4	5	-2	-1	0	+1	+2
Quality of managing conflict <i>Conflict, argument or friction is eliminated or reduced</i>	1	2	3	4	5	-2	-1	0	+1	+2

TASK OUTCOMES	Very Low				Very High	Very Negative				Very Positive
Degree to which the primary stakeholder's criteria are met (stakeholder's can include superior commanders) <i>e.g. timeliness, completeness</i>	1	2	3	4	5	-2	-1	0	+1	+2
Degree to which other stakeholders' expectations are met (stakeholder's can include superior commanders) <i>Achievement of expectancies of parties involved</i>	1	2	3	4	5	-2	-1	0	+1	+2
Degree to which the team stays within the limits/ intentions <i>Obedying rules and limits set</i>	1	2	3	4	5	-2	-1	0	+1	+2

TEAM OUTCOMES	Very Low				Very High	Very Negative				Very Positive
Level of mutual trust <i>Team members believe in each other's competence, loyalty, and dedication</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of morale <i>Degree to which team members have a positive attitude toward the team</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of cohesion <i>The team members act as a team instead of as individuals, they feel attracted towards the team</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of collective confidence in achieving the goal <i>Team members have a strong belief in the effectiveness of the team</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of shared vision <i>In general, team members view the task that they have to accomplish in the same way</i>	1	2	3	4	5	-2	-1	0	+1	+2
Level of mutual respect <i>Despite differences, the team members try to understand each other</i>	1	2	3	4	5	-2	-1	0	+1	+2



Annex B – THE CTEF INSTRUMENT BASED ON CTEF 2005 MODEL AS EMPLOYED IN THE NATO HFM TG-127 MULTI-NATIONAL SURVEY STUDY

Command Team Effectiveness Instrument

A tool for assessment & improvement

(NATO RTO HFM TG127)

Version 19 Nov 2007

Foreword and recommendation

Effective teamwork in command teams is a critical mission success factor. Therefore, commanders need to gain and maintain insight into the effectiveness of their teams. They need to understand how to foster and develop the teamwork within the command staff, as well as with their sub-commanders. As a Commander first of Submarine operations, and later of Amphibious operations, I highly valued the importance of the collective expertise, commitment, and motivation of my sub-commanders and staffs.

When I came across the NATO Command Team Effectiveness model (CTEF), I immediately recognized its value and decided to apply it in a live exercise ('Joint Caribbean Lion' May 2006). During this live exercise, CTEF data was gathered at three different points in time. Each time the same night the data was sent over to the CTEF development team, who, working as a real distributed team on two continents, analysed the data and returned the results the day after. In this way I had timely, structured and well founded information to prepare debriefs and discuss with the staff the (relative) state of the conditions, the processes and the outcomes, enabling a comprehensive approach to continuous improvement of team effectiveness.

I can fully recommend this survey, as an effort to further develop and validate the CTEF model. This will lead to effective support for operational commanders in the essence of his or her job – guiding and fostering effective command teams.

Commodore Pieter Bindt.
Commander Netherlands Maritime Force.
Den Helder, August 15, 2007

Command Team Effectiveness Survey

Questions on the following pages will ask you to reflect on the performance and effectiveness of a command team you have been a part of, as leader or member.

Please consider one command team that you have been part of, in a recent deployment or other operational context. Remember that this team will be the reference of ALL the upcoming questions.

First, we will ask you to describe this command team. Then, we will ask you to evaluate the team with a number of teamwork related factors. Finally, we will ask you for feedback on the usefulness of the survey.

Please answer openly and honestly. You are responding **anonymously** and your answers will be treated **confidentially**. Your responses will only be seen by the researchers - not your commanders or other military personnel. Individual responses will not be released; all results will be reported at the group level.



**ANNEX B – THE CTEF INSTRUMENT
BASED ON CTEF 2005 MODEL AS EMPLOYED
IN THE NATO HFM TG-127 MULTI-NATIONAL SURVEY STUDY**

Please describe the main tasks performed by this team:

How many team members (including yourself) were on the team? _____

Please indicate in months how long most people on this team (including yourself) have worked together as a team.

What nationalities (by citizenship) were on this team (check all that apply)?

☐ Albania	☐ Czech Republic	☐ Ireland	☐ Norway	☐ Sweden
☐ Armenia	☐ Denmark	☐ Italy	☐ Poland	☐ Switzerland
☐ Austria	☐ Estonia	☐ Kazakhstan	☐ Portugal	☐ Tajikistan
☐ Azerbaijan	☐ Finland	☐ Kyrgyz Republic	☐ Republic of Macedonia	☐ Turkey
☐ Belarus	☐ France	☐ Latvia	☐ Romania	☐ Turkmenistan
☐ Belgium	☐ Georgia	☐ Lithuania	☐ Russia	☐ Ukraine
☐ Bosnia & Herzegovina	☐ Germany	☐ Luxembourg	☐ Serbia	☐ United Kingdom
☐ Bulgaria	☐ Greece	☐ Moldova	☐ Slovakia	☐ United States
☐ Canada	☐ Hungary	☐ Montenegro	☐ Slovenia	☐ Uzbekistan
☐ Croatia	☐ Iceland	☐ Netherlands	☐ Spain	

What services were on this team (check all that apply)?

☐ Army	☐ Navy	☐ Air Force	☐ Marine Corps	☐ Other
-------------------------------	-------------------------------	------------------------------------	---------------------------------------	--------------------------------

If other, please specify: _____

How was the team typically distributed?

☐ All located in the same place	☐ Several groups of people in two or more locations	☐ Everyone located in different places
--	--	---

How did the team typically communicate?

☐ Face-to-face	☐ Telephone	☐ E-mail	☐ Chat	☐ Other
---------------------------------------	------------------------------------	---------------------------------	-------------------------------	--------------------------------

If other, please specify: _____

How much did the members of your team have to rely on each other to perform the assigned tasks?

☐ Not at all	☐ A little	☐ Somewhat	☐ A lot	☐ Very Much
-------------------------------------	-----------------------------------	-----------------------------------	--------------------------------	------------------------------------

INSTRUCTIONS

For each item, you are first asked:

1. to assess the level or degree (i.e. 'very low' to 'very high') of a teamwork related factor for your team, then
2. you will be asked to assess the impact (i.e. positive, negative, no impact) of that level or degree of the factor on the effectiveness of your command team. If you feel a factor is not applicable or relevant to the situation and team you are describing, please indicate this by selecting 'Not Applicable' for the factor.

Example:

b. Operational stress

Mental and emotional pressure, as well as physical risks due to the operation

Level or Degree		Impact on Overall Team Effectiveness	
Not Applicable	☐	Not Applicable	☐
Very Low	☐	Very Negative	☐
Low	☐	Negative	☐
Moderate	☐	No Impact	☐
High	☐	Positive	☐
Very High	☐	Very Positive	☐

First: *What was the level or degree of operational stress?*

If you think the most characteristic part of the mission can be described by low level of stress, please indicate 'very low' or 'low', depending on your estimate. If you think the most characteristic part of the mission can be described by high level of stress, please indicate 'very high' or 'high', also depending on your estimate. If you think the level or degree of stress is between high or low, please indicate 'moderate'. If you feel that this item is not applicable to the team you are describing, please indicate 'Not Applicable'. Then you continue to the next item.

Second: *What was the impact of this level on overall team effectiveness?*

For the question 'Impact on overall team effectiveness?', **base your answer on your response to the level or degree**. If, for example, you have answered that the level of stress was very high, you have to consider the impact of this very high level of stress. If you think that this very high level of stress has positive consequences for team performance, please indicate 'very positive' or 'positive', depending on your estimate. If you think that this very high level of stress has negative consequences for team performance, please indicate 'very negative' or 'negative', depending on your estimate. If you think the very high level of stress has no impact, please indicate this answer.

22. MISSION FRAMEWORK

a. Situational uncertainty

Lack of information about and insight in the different aspects of the operation

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Operational stress

Mental and emotional pressure, as well as physical risks due to the operation

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. External factors constraining the team's actions

Politics, culture, environment, weather, media and other factors

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

d. Mission stakes

Consequences of success or failure of the mission on (inter)national interests

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

23. TASK

a. Task complexity

Task difficulty, (inter)dependence and/or interference with other tasks

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

Note: Questions 1 to 21 covered the demographic questions. The two questions labelled '36' (see Page B-14) resulted from a typing error, which was corrected in the data processing.

b. Workload

Mental, physical or emotional effort caused by time pressure, fatigue, and other factors

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Vagueness of goals

Unknown and unclear goals and priorities

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

d. Instability of goals

Repeated changes and modifications of goals during the mission

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

24. ORGANISATION

a. Match between the team mission and organizational goals

Team mission fits within the goals of the organisation

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Clarity of the command structure

Reporting structure is clear despite multiple chains of command

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Freedom of action permitted by the organisation

Freedom to make immediate decisions in unanticipated situations

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

d. Support provided by the organisation

Recognition, resources, and technical support provided by the organization

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

25. TEAM LEADER

a. Team leader skills

Tactical, technical, interpersonal, and reasoning skills

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Team leader knowledge

Knowledge and experience about tasks, team, and organization

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Match between leader's personal goals and organisational goals

Leader's goals fit within the goals of the organisation

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

26. TEAM MEMBERS

a. Team members' skills

Tactical, technical, interpersonal, and reasoning skills

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Team members' knowledge

Knowledge and experience about tasks, team, and organization

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Match between member's personal goals and organisational goals

Individual team member's goals fit within the goals of the organisation

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

27. TEAM CHARACTERISTICS

a. Mix of people

Mix of skills, experience, and personal characteristics

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Team size

Number of people to perform the tasks

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Team structure

Distribution of tasks and roles between the team members

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

28. TEAM CHARACTERISTICS

a. Team maturity

Factors related to experience in working together as a team

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Face-to-face interaction

Time spent working face-to-face as a team

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Match between team goals and organisational goals

Team goals fit within the goals of the organisation

Level or Degree	
Not Applicable	☐
Very Low	☐
Low	☐
Moderate	☐
High	☐
Very High	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

29. MANAGING INFORMATION

Obtaining, processing, and exchanging information

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Obtaining information

Actively searching to compensate for lack of information

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Processing information

Identifying relevant information and integrating it with existing knowledge

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Exchanging information

Timely, clear, concise, correct, complete communication

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

d. Assessing the situation

Perceiving and understanding the situation, and anticipating events

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

30. DECISION MAKING

Understanding the problem, evaluation options and estimating effects in a timely manner

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Determining the exact problem

Analysing the critical information with the right expertise

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Making decisions in the time available

Staying aware of time limits and adapting appropriately

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Evaluating options and results

Considering different options and results, and changing decisions if necessary

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

31. PLANNING

Determining actions necessary to achieve the goals

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Identifying future tasks and events

Anticipating upcoming tasks and possible events

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Scheduling

Developing a logical timeline of the operation

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Determining the required resources

Identifying the required personnel, equipment, and preparation time for the operation

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

d. Defining the approach to accomplish the mission

Developing operational policies and procedures

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

32. CARRYING OUT THE PLANNED TASKS

Organising, managing, and monitoring the execution of the plans

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Organising

Structuring and assigning tasks, and coordinating team activities

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Managing

Prioritising and adjusting tasks and resources

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Monitoring progress

Ensuring the team is on the right path to achieving the goals

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

33. INTERACTIONS WITH OTHER COMMAND TEAMS

Building relationships and interacting with other teams

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

34. PROVIDING AND MAINTAINING VISION

Communication of the team's direction and purpose

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

35. MAINTAINING COMMON INTENT

Preserving a shared sense of what should happen and how

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

36. COLLABORATION AMONG TEAM MEMBERS

Communicating, coordinating, and giving feedback to each other

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Team communication

Open communication and expression of thoughts

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Team coordination

Coordination of each others activities and way of working

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Providing feedback

Providing advice to each other to improve performance

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

36. MOTIVATING

Being inspired to put forth greater effort to reach the goals

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Rewarding and recognizing in your team

Praising and rewarding each others contributions

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Developing interest and pride in the work

Caring about the work itself

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

37. ADAPTING TO CHANGES

Circumstances outside and inside the team

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Monitoring team members' performance

Observing and assessing your own and other's actions

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Correcting each other

Informing team members when they make a mistake

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Providing back-up

Supporting team members when they are busy

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

38. MAINTAINING TEAM SYNERGY

Improving or maintaining team coherence

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

a. Providing social support and respect

Providing encouragement, compliments, and companionship

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

b. Regulating emotions

Preserving emotional balance and composure

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

c. Maintaining cohesion

Maintaining unity, solidarity, and team spirit

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

d. Handling conflicts

Solving and decreasing arguments and friction

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

Impact on Overall Team Effectiveness	
Not Applicable	☐
Very Negative	☐
Negative	☐
No Impact	☐
Positive	☐
Very Positive	☐

39. TASK OUTCOMES

a. Meeting the goals of the commander or of higher echelons

Timeliness and completeness of objectives and goals

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

b. Meeting the expectations of other partners

Expectations of local authorities, local population, coalition partners, the home front

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

c. Staying within limits and intentions of the mission

Remaining in line with intentions, orders, rules-of-engagement, ethical standards

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

40. TEAM OUTCOMES

a. Trust among team members

Belief in each others capacities, loyalty and dedication

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

b. Morale

*Positive attitude towards team and assignment,
and willing to put effort in achieving goals*

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

c. Cohesion

*Feeling attracted towards the team and acting
as a team as opposed to a group of individuals*

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

**d. Confidence that the team will successfully
achieve its goals**

Team members believe that the team is effective

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

e. Shared vision on the goals

*Team members have a similar vision on the
goals the team has to achieve*

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

f. Respect among team members

*Team members try to understand each other,
despite their differences*

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

41. TASK OUTCOMES: REVIEWS AND ADJUSTMENTS

**a. Reviewing progress and achievement of
task milestones and goals**

*(In)formal assessment with the team to assure
task goals are achieved*

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

b. Taking measures to improve task processes when needed

Improving managing information, decision making, planning and execution of tasks

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

c. Taking measures to improve task conditions when needed

Improving workload, goal clarity, command structure, organisational support

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

42. TEAM OUTCOMES: REVIEWS AND ADJUSTMENTS

a. Reviewing progress and achievement of team milestones and goals

(In)formal assessment with the team to assure task goals are achieved

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

b. Taking measures to improve team processes when needed

Improving maintaining vision and intent, motivation, working together, team synergy

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

c. Taking measures to improve team conditions when needed

Improving personnel and leader skills, expertise, team characteristics

How did the team perform?	
Not Applicable	☐
Very poorly	☐
Poorly	☐
Moderate	☐
Well	☐
Very well	☐

You have now completed the CTEF questionnaire. The following questions ask your opinion about the questionnaire itself. Please indicate to what extent you agree with the following statements.

43. I think that the right aspects of team effectiveness are being addressed:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

44. I did not notice an important aspect, namely...

45. I think that the questions are clear:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

46. I think that the distinction between level and impact is clear:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

47. I think that the distinction between level and impact is useful:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

48. I think that the length of the questionnaire is:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

49. I learned something about improving team effectiveness:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

50. I would be willing to use the instrument in practice:

Completely Disagree O	Disagree O	Neutral O	Agree O	Completely Agree O
--------------------------	---------------	--------------	------------	-----------------------

51. Do you have any additional comments or questions?

Thanks for filling in this questionnaire!

Annex C – DEMOGRAPHIC FREQUENCIES FOR PARTICIPANTS IN THE CTEF SURVEY STUDY

Table C-1: Age Distribution of Participants in the CTEF Survey Study

Age	Frequency	Percent		Age	Frequency	Percent
26	5	0.70		41	31	4.32
27	4	0.56		42	41	5.71
28	7	0.97		46	31	4.32
29	12	1.67		47	32	4.46
30	5	0.70		48	34	4.74
31	13	1.81		49	35	4.87
32	6	0.84		50	34	4.74
33	17	2.37		51	13	1.81
34	19	2.65		52	13	1.81
35	25	3.48		53	13	1.81
36	19	2.65		54	12	1.67
37	40	5.57		55	9	1.25
38	30	4.18		56	4	0.56
39	36	5.01		57	3	0.42
40	31	4.32		58	3	0.42
43	40	5.57		59	1	0.14
44	58	8.08		60	2	0.28
45	40	5.57		Total	718	100.00

Table C-2: Nationality Distribution of Participants in the CTEF Survey Study

Country	Frequency	Percent
Belgium	113	15.74
Bulgaria	21	2.92
Canada	338	47.08
Czech Republic	1	0.14
Denmark	1	0.14
France	2	0.28
Germany	1	0.14
Netherlands	30	4.18
Poland	1	0.14
Russia	1	0.14
Spain	1	0.14
Switzerland	1	0.14
United Kingdom	1	0.14
United States	198	27.58
Total	710	98.89
System	8	1.11

Table C-3: NATO Equivalent Rank Distribution of Participants in the CTEF Survey Study

Rank	Frequency	Percent
OF-8 (LGen)	1	0.14
OF-6 (BGen)	1	.014
OF-5 (Col)	64	8.91
OF-4 (LCol)	141	19.64
OF-3 (Maj)	297	41.36
OF-2 (Capt)	97	13.51
OF-1 (Lt)	5	.70
OR-9 (MWO)	37	5.15
OR-8 (CWO)	73	10.17
OR-7 (WO)	1	.014
Total	717	99.99
System	1	.01

Table C-4: Echelon Distribution of Participants in the CTEF Survey Study

Echelon	Frequency	Percent
CJTF – JFC – DJTF	157	21.87
Corps – Fleet – Numbered Air Force	36	5.01
Army Division – Battle Group	60	8.36
Brigade – Ship CO – Wing	128	17.83
Battalion – Department – Squadron	204	28.41
Company – Navy Division – Flight	130	18.11
Total	715	99.58
System	3	0.42

Table C-5: Services of Other Command Teams Members

	Frequency	Percent of Responses	Percent of Cases
Army	606	42.20	84.52
Air Force	365	25.42	50.91
Navy	306	21.31	42.68
Marine Corps	89	6.20	12.41
Coast Guard	2	0.14	0.28
Federal Civilian	44	3.06	6.14
Medical Service	11	0.77	1.53
Special Operations Force	5	0.35	0.70
State / Local / Other Government	8	0.56	1.12
Total	1436	100.00	200.28

Table C-6: Nationalities of Other Command Teams Members

All Nations	N	Percent	% of Cases
Albania	11	0.43	1.54
Armenia	7	0.27	0.98
Austria	21	0.81	2.93
Azerbaijan	3	0.12	0.42
Belgium	162	6.27	22.63
Bosnia and Herzegovina	21	0.81	2.93
Bulgaria	35	1.35	4.89
Croatia	48	1.86	6.70
Czech Republic	44	1.70	6.15
Denmark	71	2.75	9.92
Estonia	23	0.89	3.21
Finland	23	0.89	3.21
France	98	3.79	13.69
Georgia	8	0.31	1.12
Germany	114	4.41	15.92
Greece	49	1.90	6.84
Hungary	34	1.32	4.75
Iceland	7	0.27	0.98
Ireland	15	0.58	2.09
Italy	85	3.29	11.87
Kazakhstan	7	0.27	0.98
Latvia	14	0.54	1.96
Lithuania	18	0.70	2.51
Luxembourg	17	0.66	2.37
Moldova	1	0.04	0.14
Montenegro	2	0.08	0.28
Netherlands	141	5.46	19.69
Poland	66	2.55	9.22
Norway	69	2.67	9.64
Portugal	48	1.86	6.70
Republic of Macedonia	10	0.39	1.40
Romania	44	1.70	6.15

ANNEX C – DEMOGRAPHIC FREQUENCIES FOR PARTICIPANTS IN THE CTEF SURVEY STUDY

All Nations	N	Percent	% of Cases
Russia	10	0.39	1.40
Serbia	4	0.15	0.56
Slovakia	26	1.01	3.63
Slovenia	20	0.77	2.79
Spain	54	2.09	7.54
Sweden	26	1.01	3.63
Switzerland	11	0.43	1.54
Tajikistan	2	0.08	0.28
Turkey	53	2.05	7.40
Turkmenistan	3	0.12	0.42
Ukraine	14	0.54	1.96
United Kingdom	181	7.00	25.28
Uzbekistan	2	0.08	0.28
Canada	393	15.21	54.89
United States	327	12.65	45.67
Afghanistan	7	0.27	0.98
Argentina	2	0.08	0.28
Australia	28	1.08	3.91
Bahrain	1	0.04	0.14
Bangladesh	3	0.12	0.42
Bolivia	3	0.12	0.42
Brazil	3	0.12	0.42
Burundi	2	0.08	0.28
Cameroon	1	0.04	0.14
Chile	4	0.15	0.56
China	1	0.04	0.14
Colombia	1	0.04	0.14
Ecuador	1	0.04	0.14
Egypt	4	0.15	0.56
El Salvador	1	0.04	0.14
Fiji	1	0.04	0.14
Ghana	3	0.12	0.42
India	6	0.23	0.84

**ANNEX C – DEMOGRAPHIC FREQUENCIES
FOR PARTICIPANTS IN THE CTEF SURVEY STUDY**



All Nations	N	Percent	% of Cases
Iraq	9	0.35	1.26
Jamaica	1	0.04	0.14
Japan	6	0.23	0.84
Jordan	3	0.12	0.42
Kenya	3	0.12	0.42
Kuwait	1	0.04	0.14
Nepal	2	0.08	0.28
New Zealand	8	0.31	1.12
Oman	1	0.04	0.14
Pakistan	9	0.35	1.26
Paraguay	2	0.08	0.28
Peru	2	0.08	0.28
Philippines	2	0.08	0.28
Qatar	1	0.04	0.14
Republic of Korea	7	0.27	0.98
Rwanda	3	0.12	0.42
Saudi Arabia	1	0.04	0.14
Sri Lanka	1	0.04	0.14
United Arab Emirates	1	0.04	0.14
Uruguay	3	0.12	0.42
Zambia	2	0.08	0.28
Unknown Country	2	0.08	0.28
Totals	2584	100.00	360.89

Annex D – CTEF 2.0 CONCEPTS

CONDITIONS	
Mission Context Situational uncertainty Lack of goal stability	Task Characteristics Task complexity Workload
Organisation Clarity of command structure Organisational support Match of team's mission and organisational goal	Team Leader Team leader competencies Match of personal goals to organisational goals
Team Member Team member competencies Match of personal goals to organisational goals	Team Mix of people Team structure Team maturity Match of team goals to organisational goals
PROCESSES	
Task-Focused Behaviours Managing information Decision making Planning Executing plans Interacting with other command teams	Team-Focused Behaviours Providing vision and intent Collaborating between team members Motivating Monitoring team member's behaviours Providing back-up Maintaining team cohesion
OUTCOMES	
Task Outcomes Meeting the goals of the commander and higher echelons Staying within the limits and intentions of the mission	Team Outcomes Trust between team members Collective confidence in achieving goals
FEEDBACK	
Did your team take measures to improve task processes when needed? Did your team take measures to improve team processes when needed?	



Annex E – CTEF 2.0 INSTRUMENT

E.1 SECTION 1 – THE CONDITIONS

MISSION CONTEXT					
<i>Characteristics of the operational environment</i>					
Situation uncertainty is ...	Very Low	Low	Moderate	High	Very High
Goal instability is ...	Very Low	Low	Moderate	High	Very High

TASK CHARACTERISTICS					
<i>Characteristics of the team's tasks</i>					
Task complexity is ...	Very Low	Low	Moderate	High	Very High
Workload is ...	Very Low	Low	Moderate	High	Very High

ORGANISATION					
<i>Characteristics of the organisation</i>					
Match of the organizational goal and the team's mission is ...	Very low	Low	Moderate	High	Very High
Clarity of command structure is ...	Very low	Low	Moderate	High	Very High
The support by the organisation is ...	Very low	Low	Moderate	High	Very High

TEAM					
<i>Characteristics of the group of people you work with directly</i>					
Mix of people is ...	Very Inappropriate	Inappropriate	Moderate	Appropriate	Very Appropriate
Distribution of tasks and roles is ...	Very Inappropriate	Inappropriate	Moderate	Appropriate	Very Appropriate
Team maturity is ...	Very Low	Low	Moderate	High	Very High
Match of the team's own goals to the organizational goals is ...	Very Low	Low	Moderate	High	Very High

TEAM LEADER					
<i>Characteristics of the leader you work with directly</i>					
Team leader competencies are ...	Very Low	Low	Moderate	High	Very High
Match of the team leader personal goals to the organizational goals is ...	Very Low	Low	Moderate	High	Very High

TEAM MEMBER					
<i>Characteristics of the team members you work with directly</i>					
Team member competencies are ...	Very Low	Low	Moderate	High	Very High
Match of team member's personal goals to the organizational goals is ...	Very Low	Low	Moderate	High	Very High

E.2 SECTION 2 – THE PROCESSES

TASK-FOCUSED BEHAVIOURS					
<i>Characteristics of the task behaviours</i>					
Managing information is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Decision making is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Planning is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Executing plans is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Interacting with other command teams is done ...	Very Poorly	Poorly	Moderate	Well	Very Well

TEAM-FOCUSED BEHAVIOURS					
<i>Characteristics of the team behaviours</i>					
Providing vision and intent is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Collaborating between team members is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Motivating is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Monitoring team member's behaviours is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Providing back-up is done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Maintaining team cohesion is done ...	Very Poorly	Poorly	Moderate	Well	Very Well

E.3 SECTION 3 – THE OUTCOMES

TASK OUTCOMES					
<i>Intermediate or final task achievements</i>					
Meeting the goals of the commander and higher echelons is achieved ...	Very poorly	Poorly	Moderate	Well	Very Well
Staying within the limits and intentions of the mission is achieved ...	Very poorly	Poorly	Moderate	Well	Very Well

TEAM OUTCOMES

Intermediate or final team achievements

Trust between team members is achieved ...	Very Poorly	Poorly	Moderate	Well	Very Well
Collective confidence in reaching goals is achieved ...	Very Poorly	Poorly	Moderate	Well	Very Well

E.4 SECTION 4 – FEEDBACK

FEEDBACK

Review of achievement may need measures to improve task and team behaviours

Taking measures to improve task processes was done ...	Very Poorly	Poorly	Moderate	Well	Very Well
Taking measures to improve team processes was done ...	Very Poorly	Poorly	Moderate	Well	Very Well



Annex F – PRACTICAL GUIDELINES

Practical guidelines for successful use of the questionnaire will be described in the following paragraphs. The following subjects will be described:

- What teams are suitable for assessment?
- What preparations are needed before using the questionnaire?
- How results can be analyzed and interpreted.

Section 1.01 Teams Suitable for Assessment

The instrument is developed for use by military commanders and their staff, and by commanders and his/her sub-commanders at different levels (for example battalion level and brigade level, ships). With some adjustments the instrument can also be used for civilian teams, like emergency teams. Team effectiveness can be measured when teams perform different types of tasks, for example planning, command and control, and staff processes. Small and large teams can be assessed with this questionnaire. It is possible that people can be a member of more than one team. For example, the head of a section is a member of the section team, but is also a member of the staff team. The team that will be assessed has to be defined prior to assessment, so that it is clear for the respondents regarding which team the questions have to be answered.

Section 1.02 Preparations Prior to Assessment

Before distributing the questionnaire some preparations have to be made. These are described here:

1) Adjustments of the Questionnaire:

- Replace for each item the word ‘team’ with the specific name of the team, for example battle group staff. By doing so it is clear for the team members regarding which team the questions have to be answered.
- Check if all the items are appropriate for the (educational/training/mission) situation and the team that is assessed. What are the goals of the training, the tasks of the team and what is the scenario? Items can be adjusted for the specific operational context and team.
- Terms that are used in the questionnaire have to be univocal and clearly understood. Make sure that all terms are understood in the same way by all team members.

2) Computer-Based Questionnaire:

Assess the feasibility of computer-based administration of the questionnaire. The advantage is that data can be collected easily and that results can be analyzed more quickly. Pre-test the questionnaire to confirm that the automated data collection works properly, especially if changes are made to the questionnaire. If the computer-based questionnaire does not work properly it will frustrate respondents and reduce the number of valid cases.

3) Moment of Assessment:

Select carefully the moment of assessment. The selected time influences not only the number of responses but also the quality. Use the training schedule to select an appropriate moment.

4) Guarantee Anonymity:

Make sure that anonymity of the team members who fill in the questionnaire is guaranteed. Think about how this can be achieved, because it influences both the response rate and the quality of the answers that people give.

ANNEX F – PRACTICAL GUIDELINES

5) Analysis of Results:

Determine in advance what criteria will be used to interpret the results of the questionnaires (see Section 1.04 below).

6) Timing of Feedback/Discussion:

Plan in advance a suitable time to present the results of the questionnaire and who has to be present. Discussion of the results and feedback can be a part of the after action review. But also a different moment can be selected.

• Preparations prior to assessment
• Define team for assessment.
• Check if all items and terms are appropriately formulated and correctly understood.
• Test-run computer-based questionnaire.
• Determine criteria for analysis.
• Guarantee anonymity!
• Determine timing of assessment.
• Determine timing of feedback/discussion.
• Stress purpose and importance of assessment.

Section 1.03 Assessment

As example see the questionnaire used for the survey in Annex B. Stress the following points to the team that has to fill in the questionnaire:

- Purpose of the questionnaire;
- The assessment is not an individual assessment, but measures effectiveness of the team as a whole;
- The data will be analyzed anonymously;
- No individual results will be presented;
- Instruction how to fill out the questionnaire; and
- Filling out the questionnaire takes approximately 10 – 15 minutes.

Section 1.04 Analysis of Results

It is important to decide in advance what the level of performance of the team must be. Depending on the ambition level of the commander a certain percentage can be chosen as a criterion, see Table F-1. For a more experienced team, for example, a high criterion might be chosen (i.e., lower percentages in the low categories). When the questionnaire is filled out, for each item the percentages of the respondents that chose a certain category can be calculated. If a category exceeds the chosen level, the content of this item needs action for improvement. Positive results can also be used to stimulate good performance of the team.

Table F-1: Setting a Criterion Level for the Team.

Level of Ambition	Total % of Respondents of Two Lowest Categories	Action
High: 20% level	Higher than 20%	Improve performance
	Lower than 20%	Maintain performance
Moderate: 30% level	Higher than 30%	Improve performance
	Lower than 30%	Maintain performance
Low: 40% level	Higher than 40%	Improve performance
	Lower than 40%	Maintain performance

As can be seen in Table F-1, depending on the criterion chosen, different items will be marked as insufficient. In this example two different criteria are used for the same data. In general, a higher criterion will not necessarily lead to more items that are unsatisfactory, because a higher criterion will be chosen for a team that is expected to perform well. Most of the conditions and processes will be judged satisfactory, and therefore a higher criterion is needed to identify what aspects still can be improved.

Table F-2: High Level of Ambition: 20% Level.

	Very Low	Low	High	Very High
Item A	5%	15%	60%	20%
Item B	3%	5%	20%	72%
Item C	12%	20%	50%	18%
Item D	2%	3%	3%	92%
Item E	20%	40%	35%	5%

Table F-3: Low Level of Ambition: 40% Level.

	Very Low	Low	High	Very High
Item A	5%	15%	60%	20%
Item B	3%	5%	20%	72%
Item C	12%	20%	50%	18%
Item D	2%	3%	3%	92%
Item E	20%	40%	35%	5%

The criterion helps to determine which factors are satisfactory and which ones need improvement. However, to be able to interpret the results it is important to discuss the results with the team members. This will give more insight in why certain processes, conditions or outcomes were not satisfactory. If there is disagreement on certain factors, than a discussion helps also to gain more understanding of each others' point of view. More understanding will be gained about what is used as a frame of reference to judge the conditions, processes and outcomes and how the questions are interpreted by the different team members.



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13. Keywords/Descriptors	<table border="0"> <tr> <td>Command and control</td> <td>Field study</td> <td>Operations research</td> </tr> <tr> <td>Comparative study</td> <td>International cooperation</td> <td>Organisational effectiveness</td> </tr> <tr> <td>Complex organisations</td> <td>International survey</td> <td>Resource management</td> </tr> <tr> <td>Command Team Effectiveness (CTEF)</td> <td>Leadership</td> <td>Staff effectiveness</td> </tr> <tr> <td>Decision making</td> <td>Operational requirements</td> <td>Team effectiveness</td> </tr> </table>			Command and control	Field study	Operations research	Comparative study	International cooperation	Organisational effectiveness	Complex organisations	International survey	Resource management	Command Team Effectiveness (CTEF)	Leadership	Staff effectiveness	Decision making	Operational requirements	Team effectiveness
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Command Team Effectiveness (CTEF)	Leadership	Staff effectiveness																
Decision making	Operational requirements	Team effectiveness																
14. Abstract	Effective teamwork is a critical mission success factor. The objective of this study is to support leaders and their teams or staffs in achieving effective team performance (commander-staff and commander-sub-commander teams at operational and tactical command levels). The CTEF 2.0 model represents the scientific, empirical and theoretical consensus that effective teamwork is the result of Conditions, Processes, Outcomes and Feedback factors. Based on this model, an assessment instrument for commander and staff teams was constructed in the form of a questionnaire, which can then be used to discuss low and high performance during team evaluations ('CTEF 2.0'). CTEF 2.0 was developed from an earlier study (RTO AC/323(HFM-087)TP/59), from several operational assessments, and from a survey version of the instrument administered in several NATO countries. The survey showed that operational usability of the model and the instrument was considered by 718 military commanders from 14 nations as high: 70% of respondents either "agreed" or "completely agreed" that the instrument addresses the important aspects of command teams; approximately 80% of respondents also indicated that they would be willing to use the CTEF instrument in educational, training, or operational settings. We recommend that commanders learn to work with the effectiveness concepts proposed by the CTEF 2.0 model and apply the CTEF instrument regularly for continuous improvement of their team's effectiveness.																	





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