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## Collective Training and C3I

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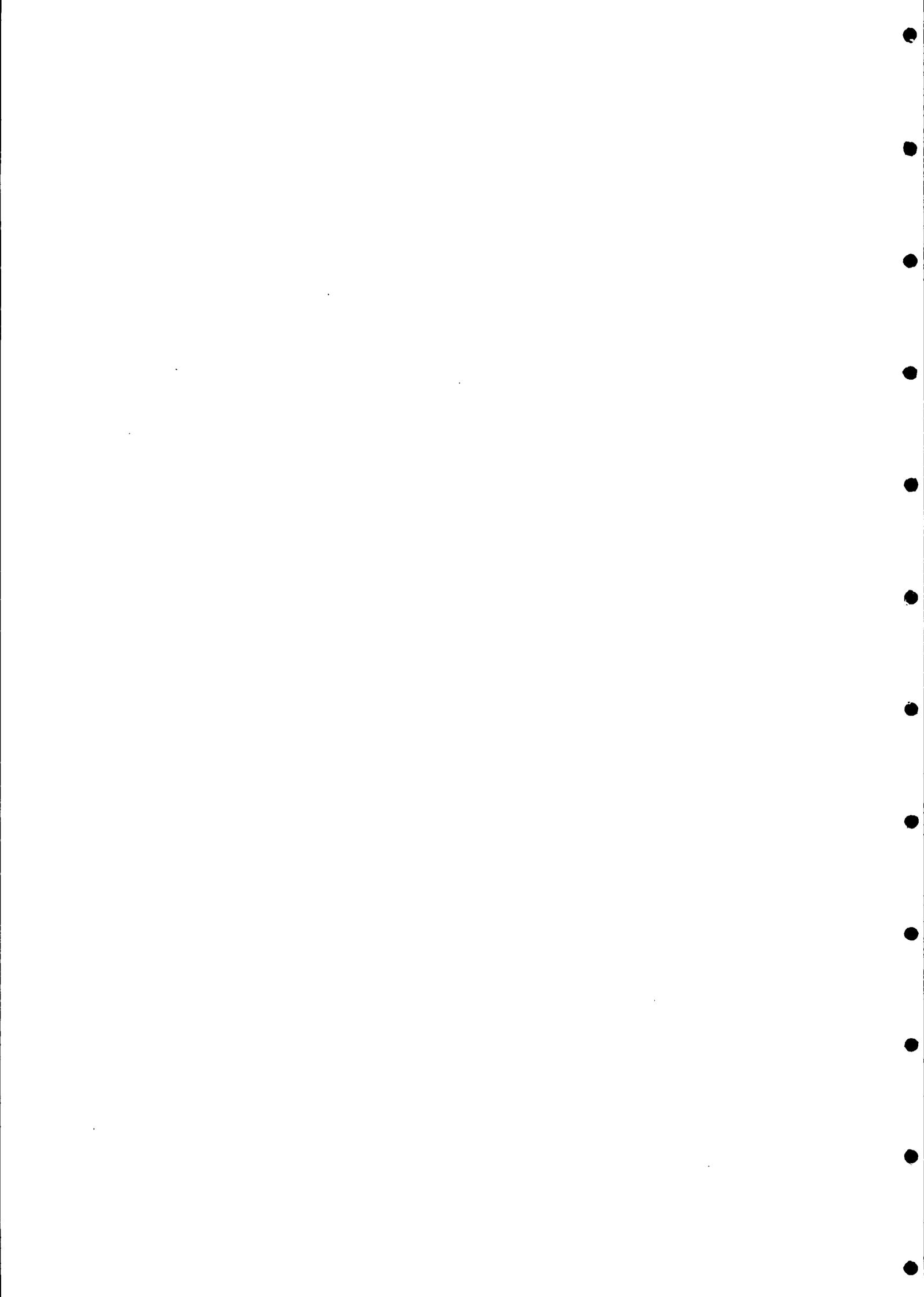
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## **Abstract**

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To underpin the justification for the considerable investment required in collective training for the British Army in the face of increasing financial and environmental pressures, it is necessary to establish the link between Collective Performance and Operational Effectiveness. A key objective of such collective training is the development of efficient command and control, including the management of critical information which is essential to commanders at all levels in all operations.

This paper describes a study CORDA is conducting for Field Studies Division at DOAC to establish the practicality of using combat models to represent the effects of different levels of Collective Performance on the Operational Effectiveness of a Battlegroup. The study included a military map exercise and after action review to aid elicitation of key skills and to identify the points in a specific battle at which key skills had a significant impact on subsequent events. The study supports perennial observations from field trails and actual operations that the efficient use of command and control and the timely dissemination of critical information are amongst the most important skill areas. The skills and their manifestations and effects were subsequently used as the basis for specifying a combat model, which will be used to assess the impact different levels of competence in these skills have on the battlegroup's overall effectiveness.

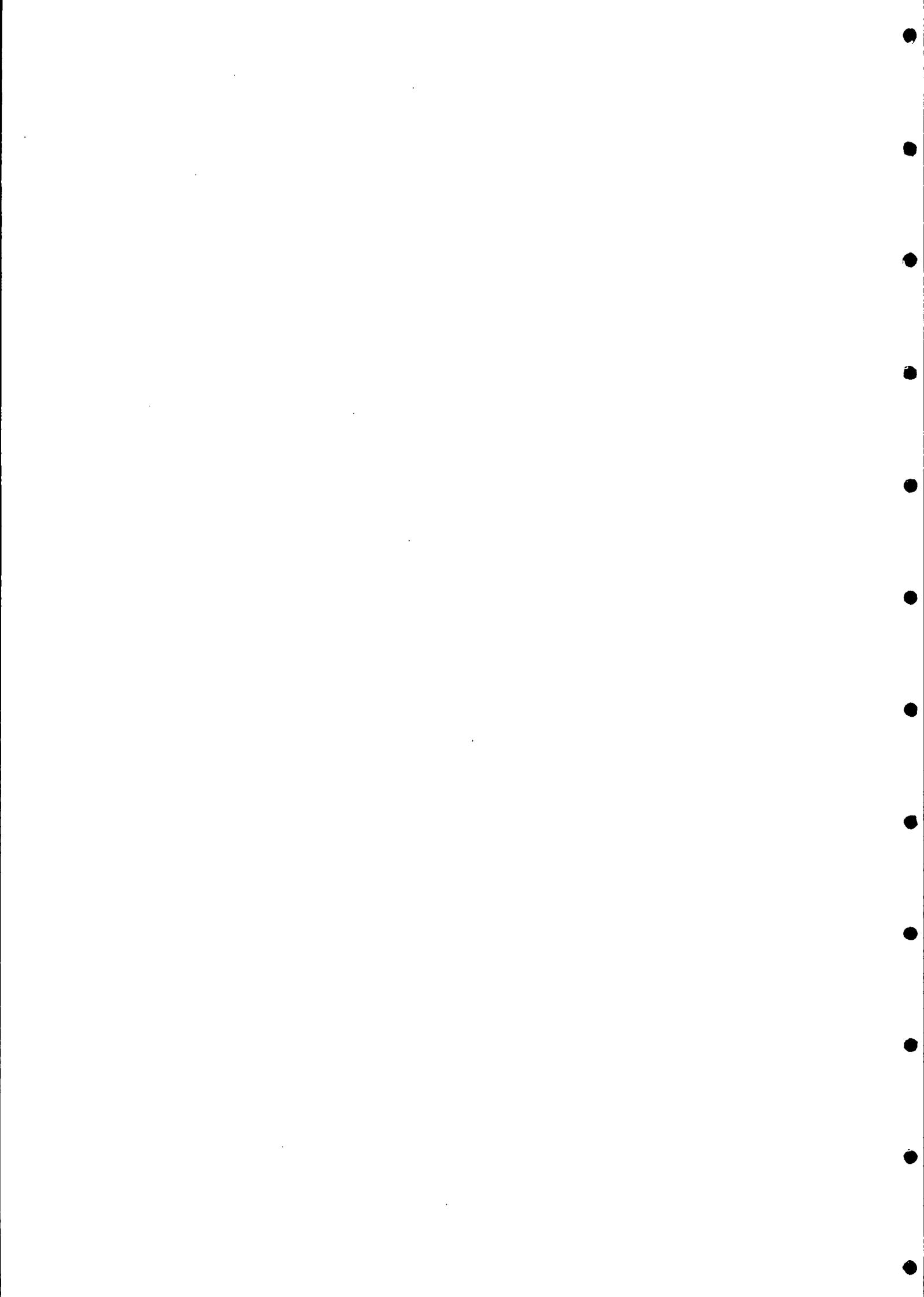
## **Distribution**

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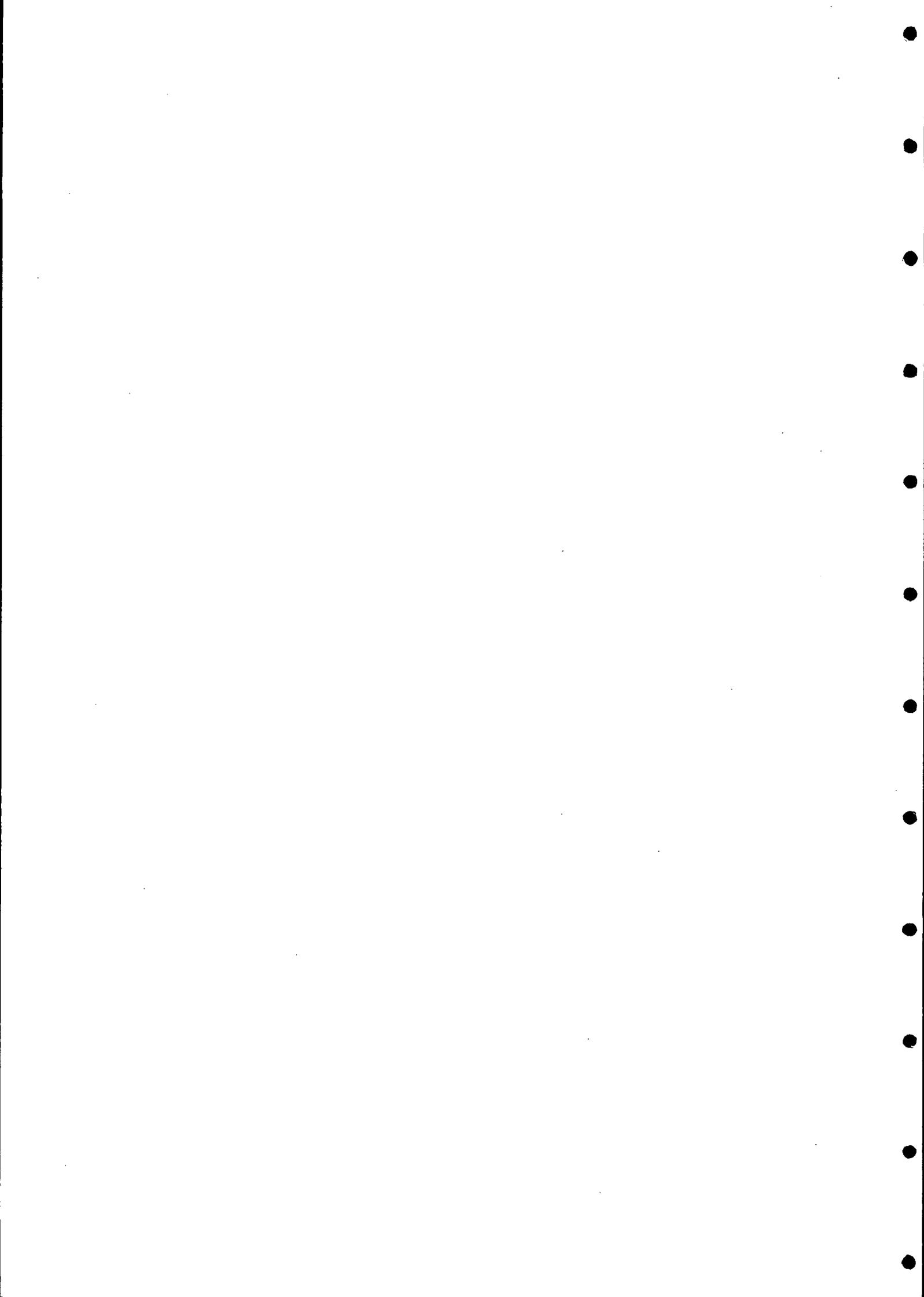
The work which is the subject of this report was initiated by the MoD, Defence Operational Analysis Centre, West Byfleet, Surrey and was carried out under the terms of contract NNR1/282



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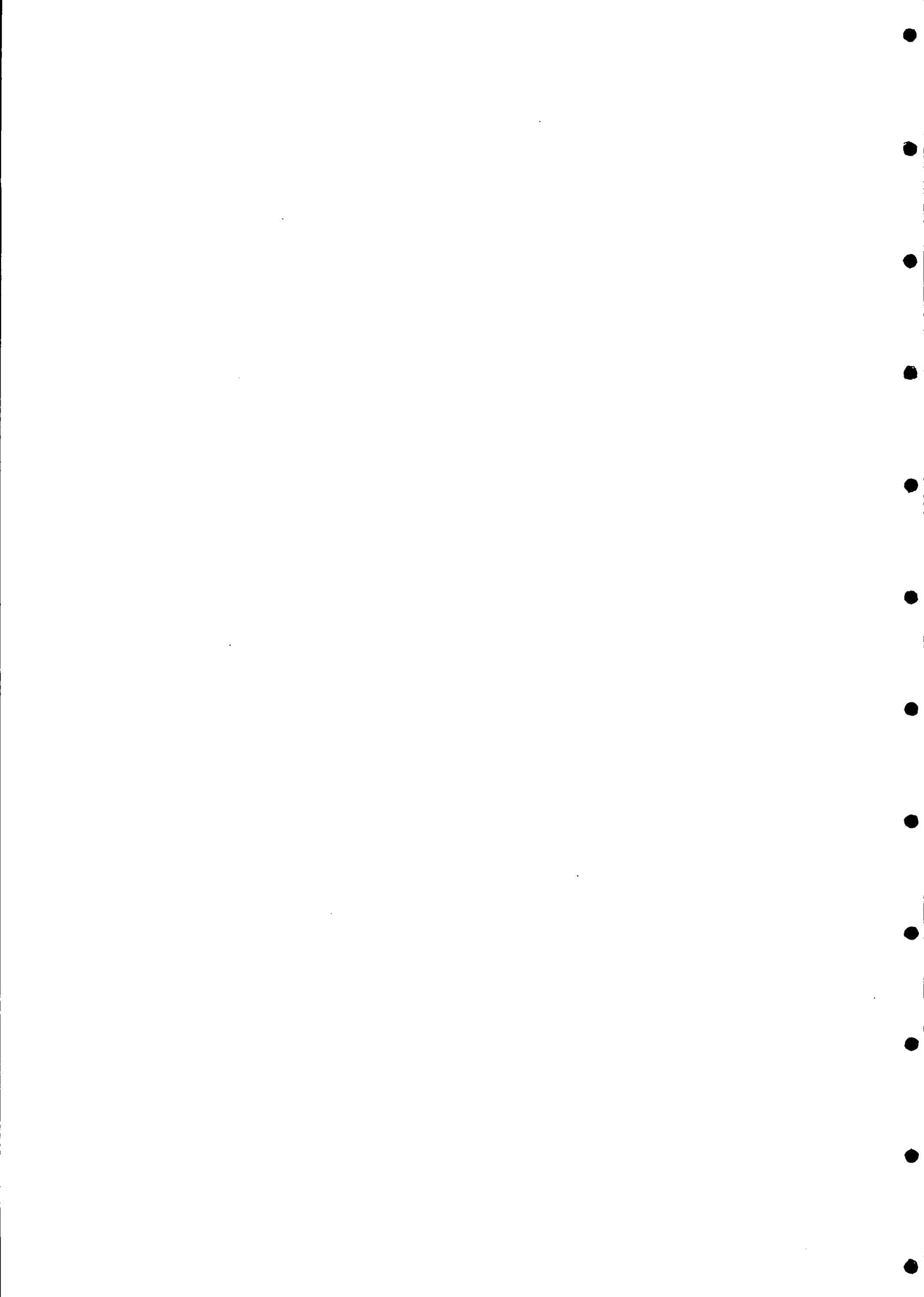
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**“ He who wishes to be obeyed must know how to command”**

Machiavelli



# 1 Introduction

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## Aim

The aim of this paper is to outline a conceptual framework for quantifying the effect different levels of competence in collective skills have on the operational effectiveness of a land force. The method is intended to be used to help justify investment in the collective training of C<sup>3</sup>I.

It describes work undertaken by CORDA Ltd on behalf of DOAC to investigate the incorporation of aspects of Collective Performance and C<sup>3</sup>I into combat models, as a method for comparing different training investment strategies. It is a component part of assessing the impact of training on operational effectiveness.

## Scope

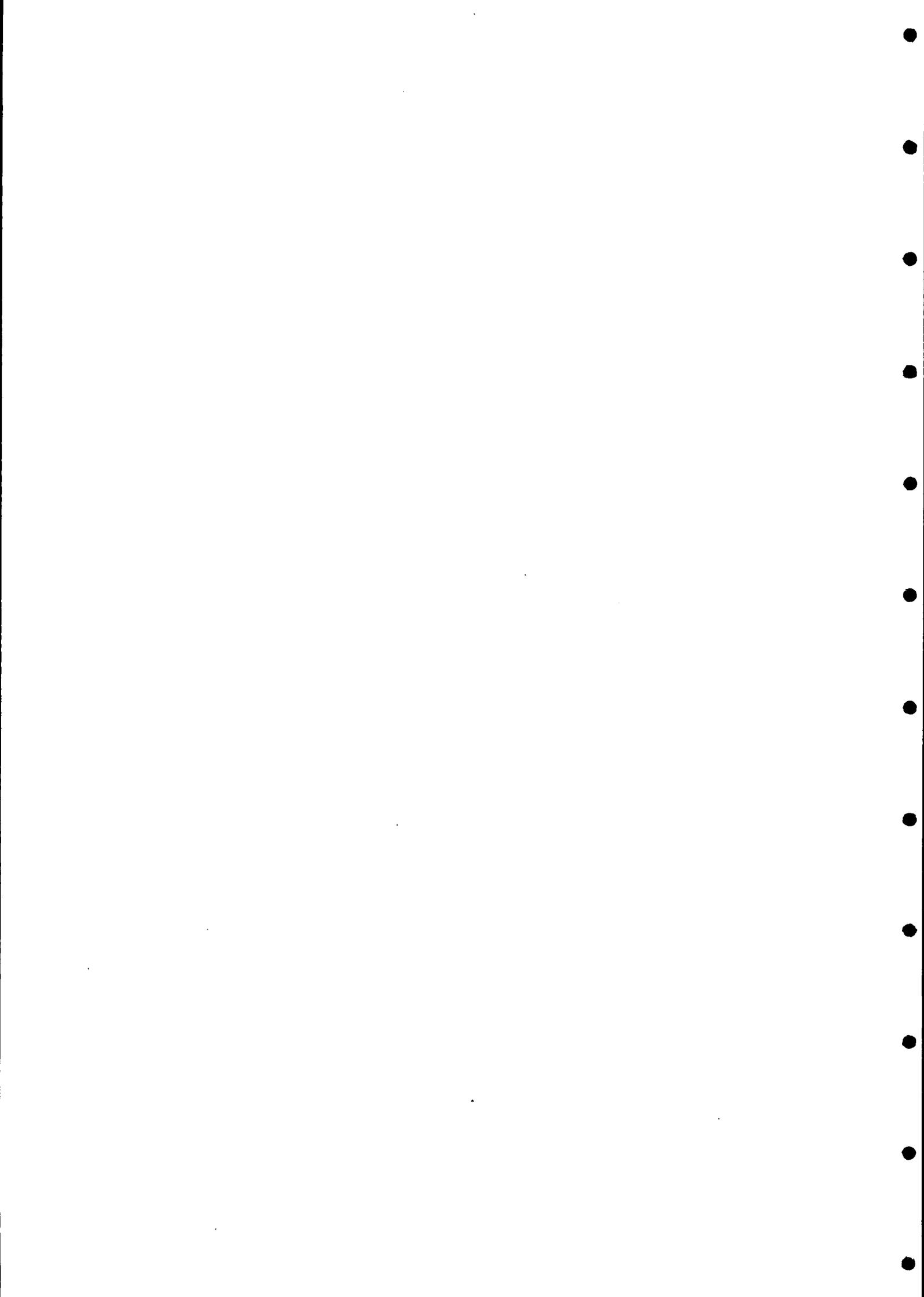
At the outset of the work it appeared that there was no defined means of quantifying whether collective training was achieving its objectives. This was in part due to the lack of an agreed terminology to express the ideas and develop necessary methods.

The work to date has begun to create a framework of terminology, the key component of which is the concept of Critical Collective Skills. Measurement and observation of human performance in exercises can be used for quantifying the competence of a formation in a given collective skill; algorithms relating these competence levels to operational performance can then be embedded in a combat model to determine operational effectiveness. Currently the model is intended to reflect the influence of the level of unit and formation training achievement on the execution of operations.

The work relates to the British Army and its requirements but the conclusions drawn may have universal application. MoD management planning terms and definitions are used throughout the document. The findings so far reflect the views of the authors and are not as yet endorsed by the UK MoD.

## Structure

The paper first discusses the background to the problem of the need to justify investment in training and puts training in context in the army. It goes on to describe the framework that we have developed for relating collective performance in particular skill areas to performance on the battlefield; and concludes with some thoughts on what remains to be done and where the work is leading.



## 2 Background

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### Introduction

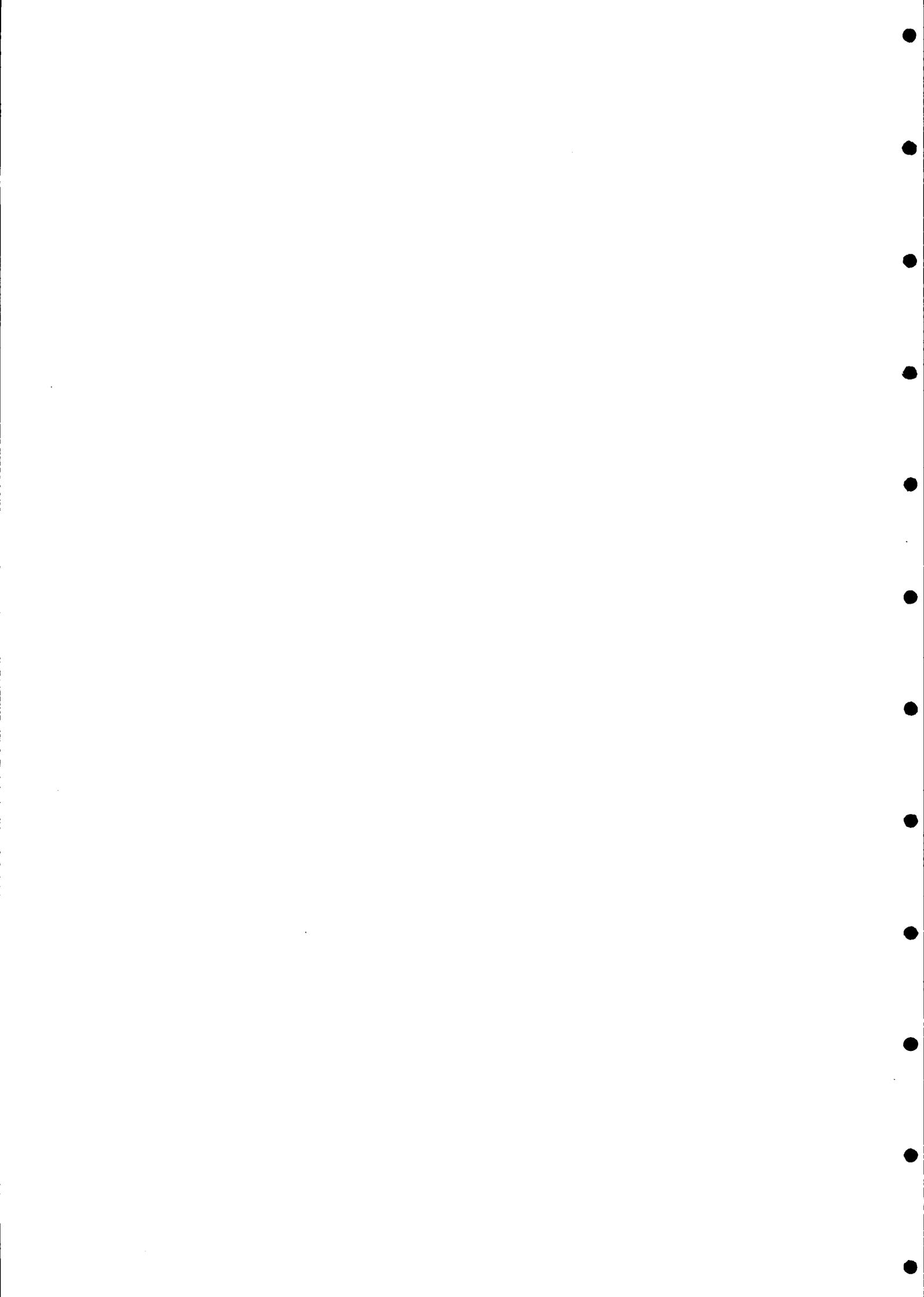
Command and control is the exercise of authority and direction by a designated commander over assigned forces to accomplish a mission or military task. Intelligence, describing the information which is critical to the commander's plan, is an integral part of the process.

Effective C<sup>3</sup>I is fundamental to successful operations: it broadly describes the function of the "brain" of the military organisation in assessing, planning and directing in order to apply the right amount of "combat power" at the appropriate time and place. C<sup>3</sup>I is exercised through the medium of drills and procedures which rely on the vertical and horizontal exchange of critical information, as well as the ability of subordinates to use their initiative and to apply prescribed doctrine.

Developing the necessary collective expertise to command a military force in the chaos and confusion characteristic of most operations and of war calls for constant, collective practice in a realistic training environment with representative conditions. Unremitting environmental and financial pressures have reduced opportunities for collective training in the field on operational equipment with FTXs now restricted to unit/BG level and below. This throws up an increasing dependence on simulation to ensure best use of limited field training and to provide a medium for exercising formation levels of command.

Satisfying this need requires both continuing expenditure to support a critical level of live training and considerable investment in simulation. Expenditure for all training facilities must be shown to be essential and cost effective.

To justify such expenditure and identify priorities within the training budget it is necessary to establish the link between training and battlefield ability; in this case the



causal link between Collective Performance<sup>1</sup> and Operational Effectiveness<sup>2</sup>, an input to and the output of executing a Military Task<sup>3</sup>.

C<sup>3</sup>I is only part of the process of successful operations and has to be considered in the context of all factors affecting defence output as defined in the current MOD Management Terms. For the purposes of operational analysis, these can be grouped into the inputs, processes and outputs together with the relationships and dependencies shown in Figure 1.

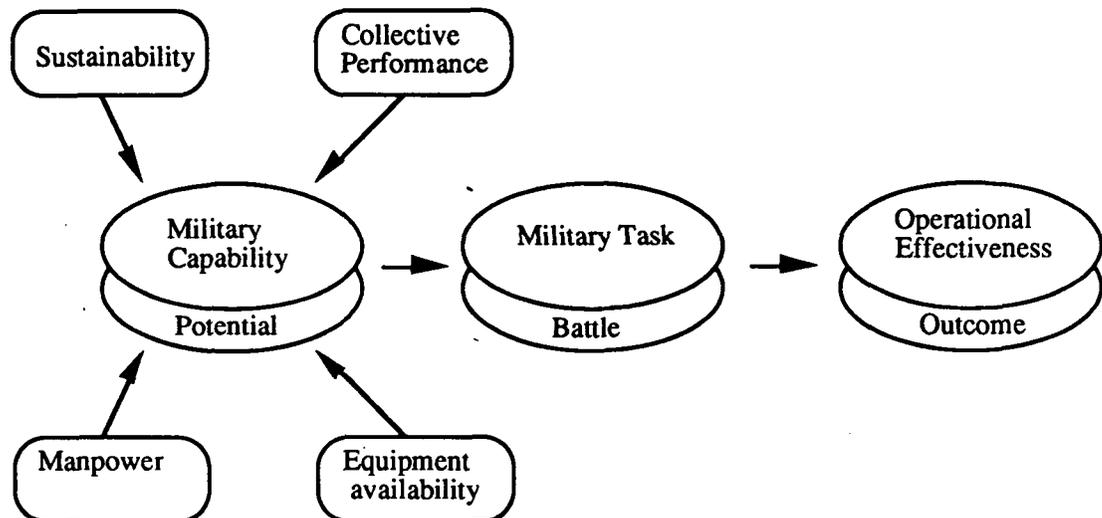


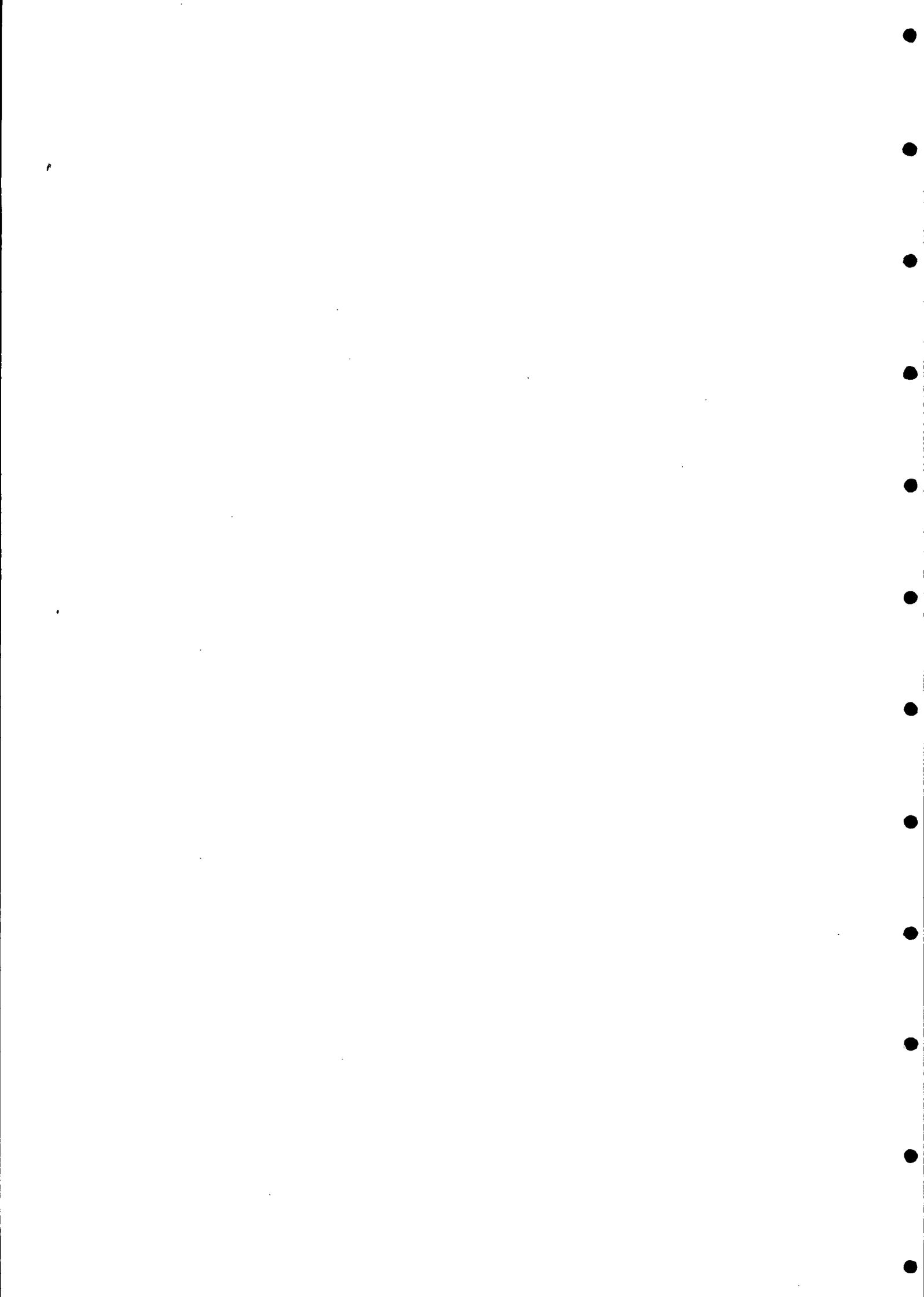
Figure 1 Relationship : Defence output

Those terms on the left of the diagram describe input or the "potential" of the military force for its task and are defined in the MOD's Management Planning Terms. The centre of the figure is the process, the "battle", and the right shows the output, the Operational Effectiveness. The focus of this work has been to establish the link from one element of the input, collective performance, to the overall output by considering what happens during the process of the battle.

<sup>1</sup>Collective Performance : an aspect of Military Capability. The ability of units or formations to function as cohesive entities and to operate their equipment to the limit of its capability.

<sup>2</sup>Operational Effectiveness : the final defence output. The probability of achieving a Military Task in a defined operational context.

<sup>3</sup>Military Task : The current operations and contingency tasks for which it is required to maintain forces under each defence role. When fully defined Military Tasks will include a readiness and requirement and an operational context including a military objective.



## Collective Training

Training in the British Army is categorised as:

- a) Individual training - to teach and sustain basic individual skills.
- b) Collective training - undertaken by groups from crews and detachments to formations to develop and practise collective skills, tactical drills and procedures.

Both categories are critical and impact on performance or the ability of the individual or group to realise their potential. Collective training is both more resource intensive and more difficult to measure than individual training.

### C<sup>3</sup>I

C<sup>3</sup>I has four components:

**Command** - which is the personal function reflecting "the authority vested in an individual for the direction, co-ordination and control of military forces" (1).

**Control and Communications** - is largely the province of the staff and embraces the management and technicalities of execution, including communications and procedures.

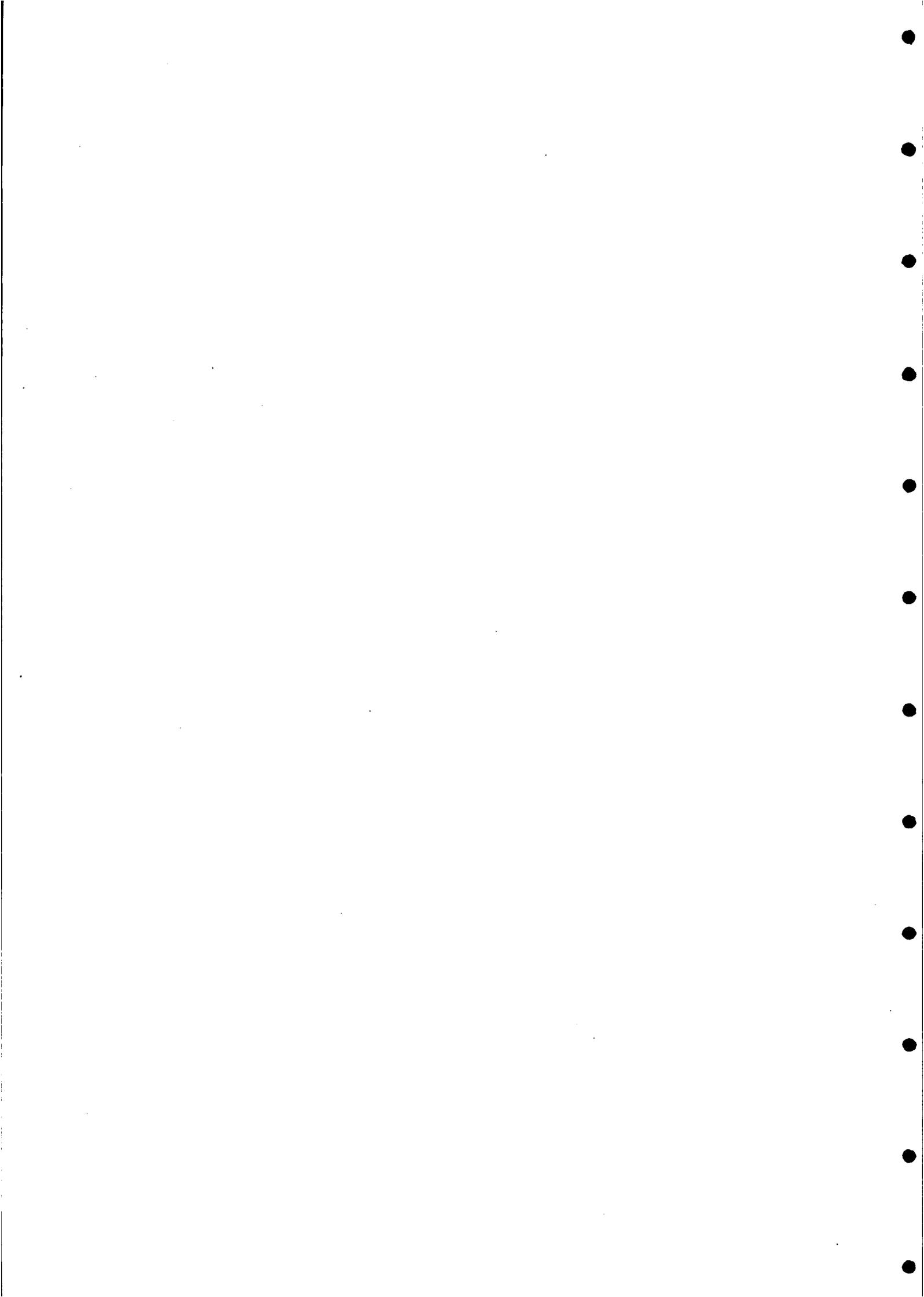
**Intelligence** - describes information which has been processed i.e. collated, evaluated, analysed, integrated and interpreted to establish its significance. Intelligence is the best information on which a commander can act; in practice, many command decisions will have to be based on unprocessed or combat information.

The measures of effective C<sup>3</sup>I are timely decisions and direction based on the best available information as well as the assurance of execution through dissemination of orders and adjustments as necessary in the light of events. It is vital to provide timely direction in order "to get inside the opponent's decision-making loop" thereby gaining or keeping the initiative. The philosophy of "mission command" is key to this process with subordinates being told what to achieve and why and being allowed to decide, within their delegated freedom of action, how best to achieve the mission.

The exercise of effective C<sup>3</sup>I therefore involves teamwork and interaction between a number of elements within the military organisation at each level from platoon, to sub-unit, to BG, to brigade, division and corps. C<sup>3</sup>I is a vital aspect of collective performance which can only be developed through effective collective training.

In summary, Collective Performance, as an aspect of military capability, is the factor most directly related to training and depends on opportunities to both develop and rehearse core competencies. Justifying the investment needed in collective training means establishing some causal link between input, in terms of potential achieved or demonstrated on training, and output in terms of battlefield achievement.

The focus in CORDA's work has therefore been on Collective Performance and its attributes. In this work we are concerned with collective performance as an input to the military task ie the group capability prior to commitment to operation.



### 3 Establishing the Framework

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#### Introduction

Within the execution of a Military Task numerous activities are undertaken by the various elements in a formation. The quality of the execution of these activities is driven by the Military Capability of the formation and hence, from Figure 1, is dependent on the collective performance of the elements involved. Our approach has two main phases

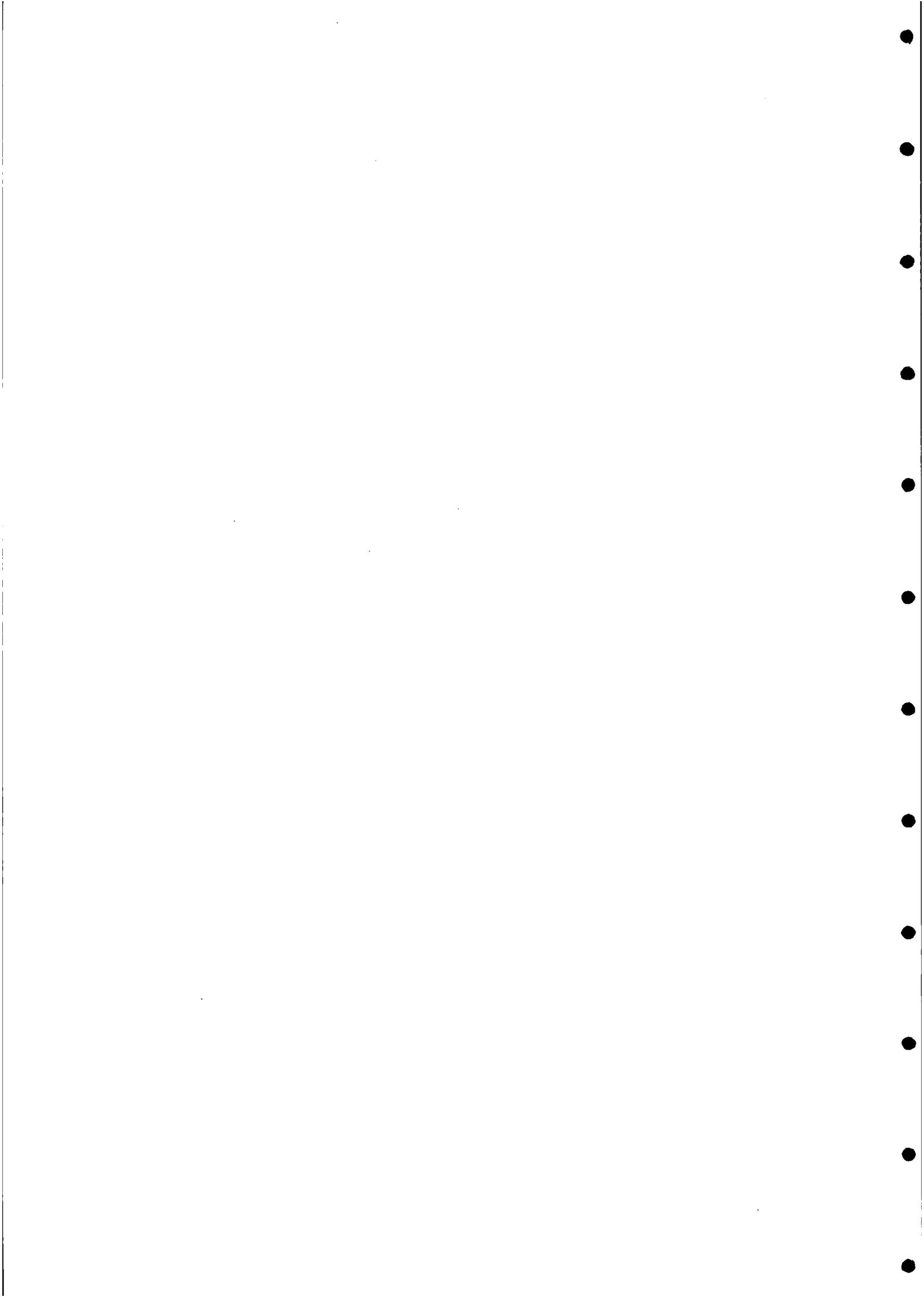
- firstly, to establish a qualitative link between training achievement and warfighting capability;
- then to quantify this linkage in such a way that would allow a combat simulation to be constructed representing such effects.

This section describes the construction of the framework which enabled this process.

The combat simulation must represent a variety of activities which occur on the battlefield. The model must be capable of reflecting the dependences and influences between the skills achieved in training and the successful completion of activities. However in an aggregated model it is not feasible to provide a one-to-one mapping for each activity.

Figure 2 shows the schema adopted to link the military capability, as expressed by the measured collective performance, with the military task and its outcome, as represented by the combat simulation. This schema has two main objectives:

- firstly to decouple the actual performance evaluation from the modelling input,
- secondly to provide a means of aggregating detailed measurements of task performance in a trial or exercise into more generalised estimates of collective performance. This was achieved by grouping the critical aspects of performance into Critical Collective Skills (CCS) which reflect common areas of endeavour which broadly map onto collective training objectives.



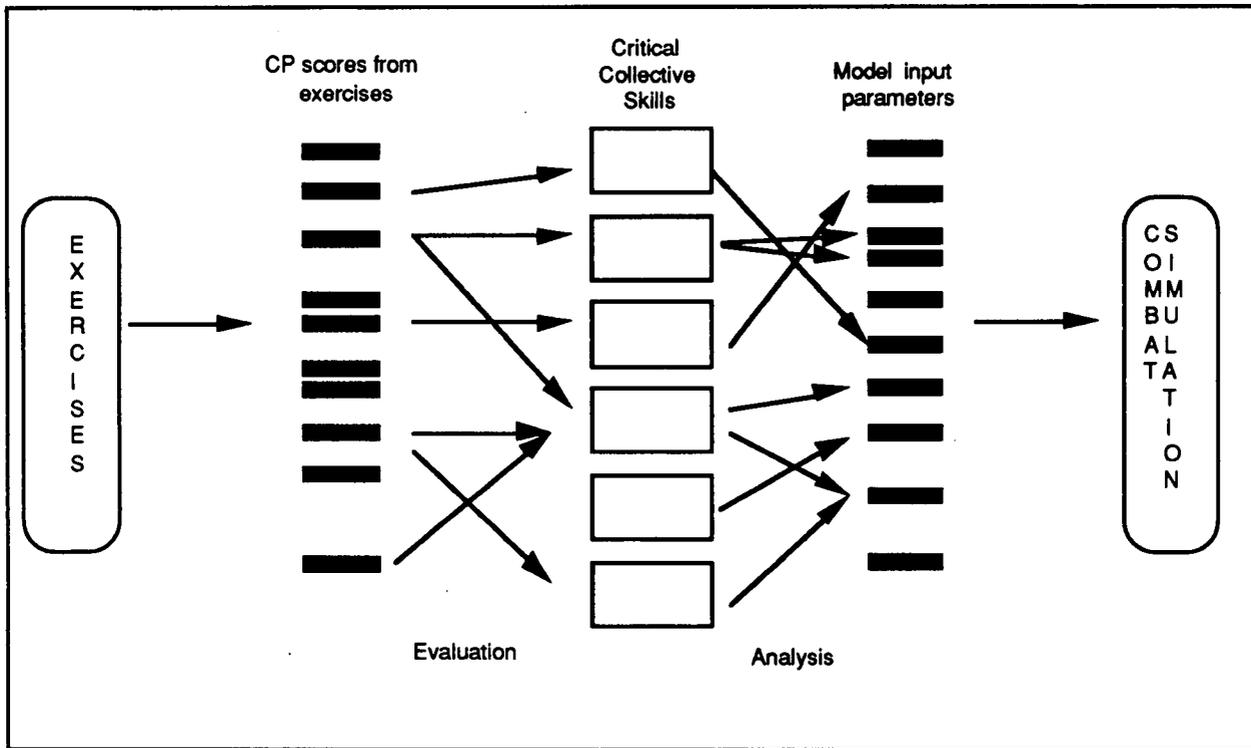


Figure 2 Initial schema

### Critical Aspects of Collective Performance

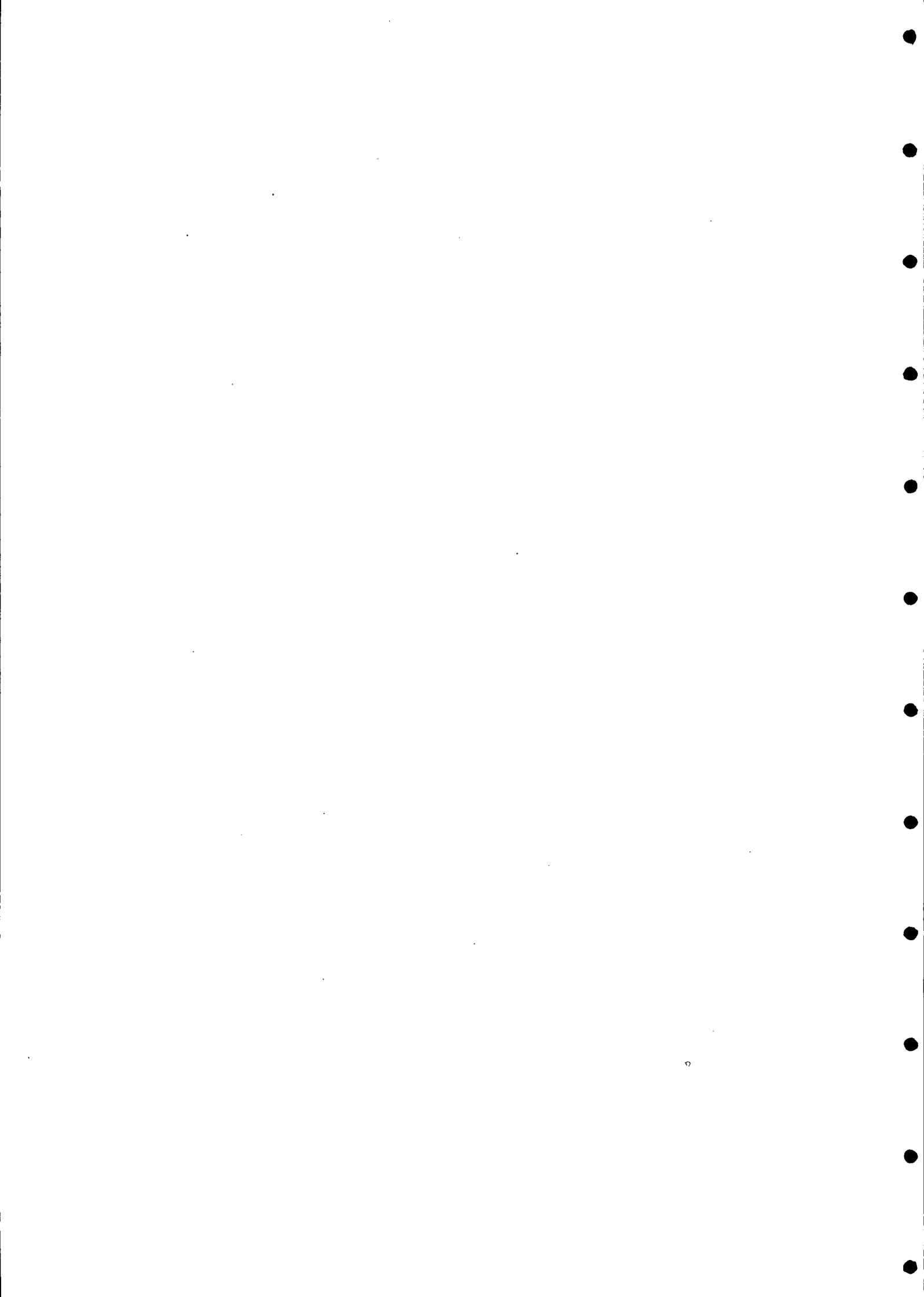
In the first phase of their work for DOAC, CORDA conducted a qualitative exercise to compare the operational effectiveness of a BG with poor collective skills against a BG with satisfactory collective skills in one particular scenario - the Quick Attack. The performance capability of a group or its collective skills depend on the separate skills of the individuals who make up the group. For the purposes of the work for DOAC, collective skills were defined as those skills requiring development and rehearsal in team conditions.

From this judgmental exercise critical aspects of collective performance and their effects on operational effectiveness were identified. This involved a two stage process:

- 1) Identifying the critical collective skills or competencies which impact on operational effectiveness
- 2) Analysing the effects of not demonstrating these collective skills to a satisfactory level and describing the consequences in terms which can be modelled or measured.

### Stage 1- Critical Collective Skills (CCS)

Based on an analysis of the judgmental exercise, coupled with a review of Army Field Manuals and documented lessons from BG training, a list of six CCS were derived which impact on the operational effectiveness of a BG in all phases of war. These refer



to the group ability of all entities within the BG and concern their collective competencies or skills in six aspects:

- 1) **Doctrine:** the ability to understand and apply common doctrine.
- 2) **Information:** the ability to acquire, process, disseminate and transfer critical information.
- 3) **Command and Control:** the ability to exercise efficient command and control.
- 4) **Resources:** the ability to make optimum use of available resources given the prevailing conditions.
- 5) **Drills and Procedures:** the ability to execute efficient battle drills and procedures.
- 6) **Discipline:** the ability to apply strict battlefield discipline.

CCS 1 to 4 all apply to C<sup>3</sup>I.

The CCS provide a means of aggregating detailed measurements of task performance in a military trial or exercise into more generalised estimates of collective performance. The CCS have been defined as areas of endeavour which are familiar to the military and which broadly map onto defined collective training objectives. They are a reflection of function and ability.

### **Stage 2 - Effects**

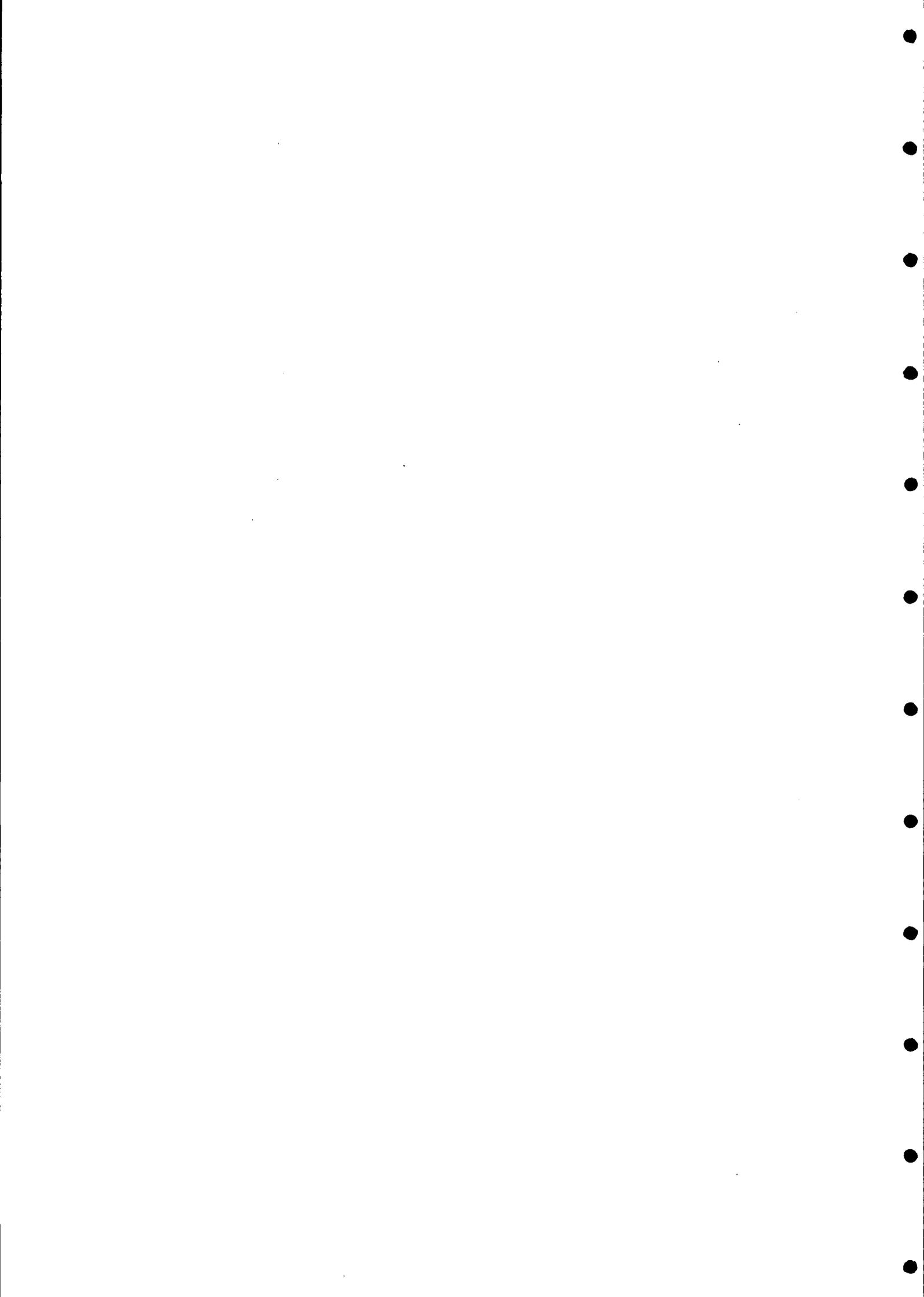
The next stage was to look at the effects of not showing these collective competencies in two levels:

- 1) Manifestations - how lack of the requisite collective skill shows in the BG.
- 2) Consequences - the effects and outcome consequent from these manifestations expressed in terms which can be measured or modelled.

### **Scoring**

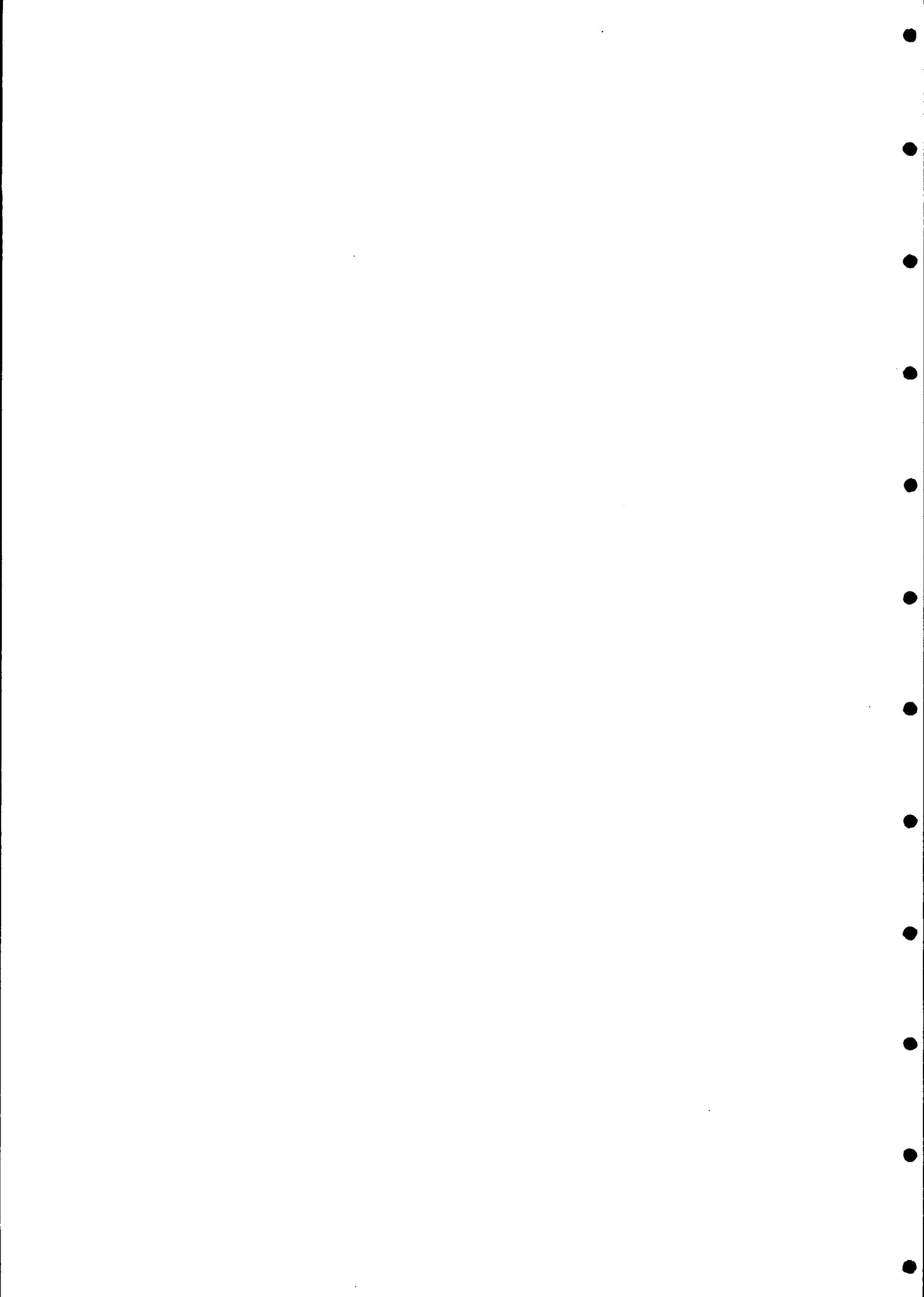
The scoring method was required to provide a means of measuring training achievement. Currently there is no formal method for scoring collective performance in the British Army, so the adopted approach reflects criteria being used in trials.

A quantitative relation was derived using a scoring system ranking units from 0-5 (see table 1). The initial analysis concentrated on looking at Battlegroups with a score of 2 (poor) or 4 (good) on certain aspects of the performance. With these definitions we can assess the effect of having a given level of CP within a CCS when performing an activity within a given operational context. Further, these effects can be quantified by considering the representation which would appear as a model.



Score	Assessment
0	Untrained
1	Partially trained. Significant weaknesses
2	Partially trained. Collective skills weak
3	Partially trained. Fit for limited operations
4	Partially trained. Fit for operations
5	Fully trained. All skills satisfactory

Table 1 Evaluation Criteria



## 4 Filling the framework

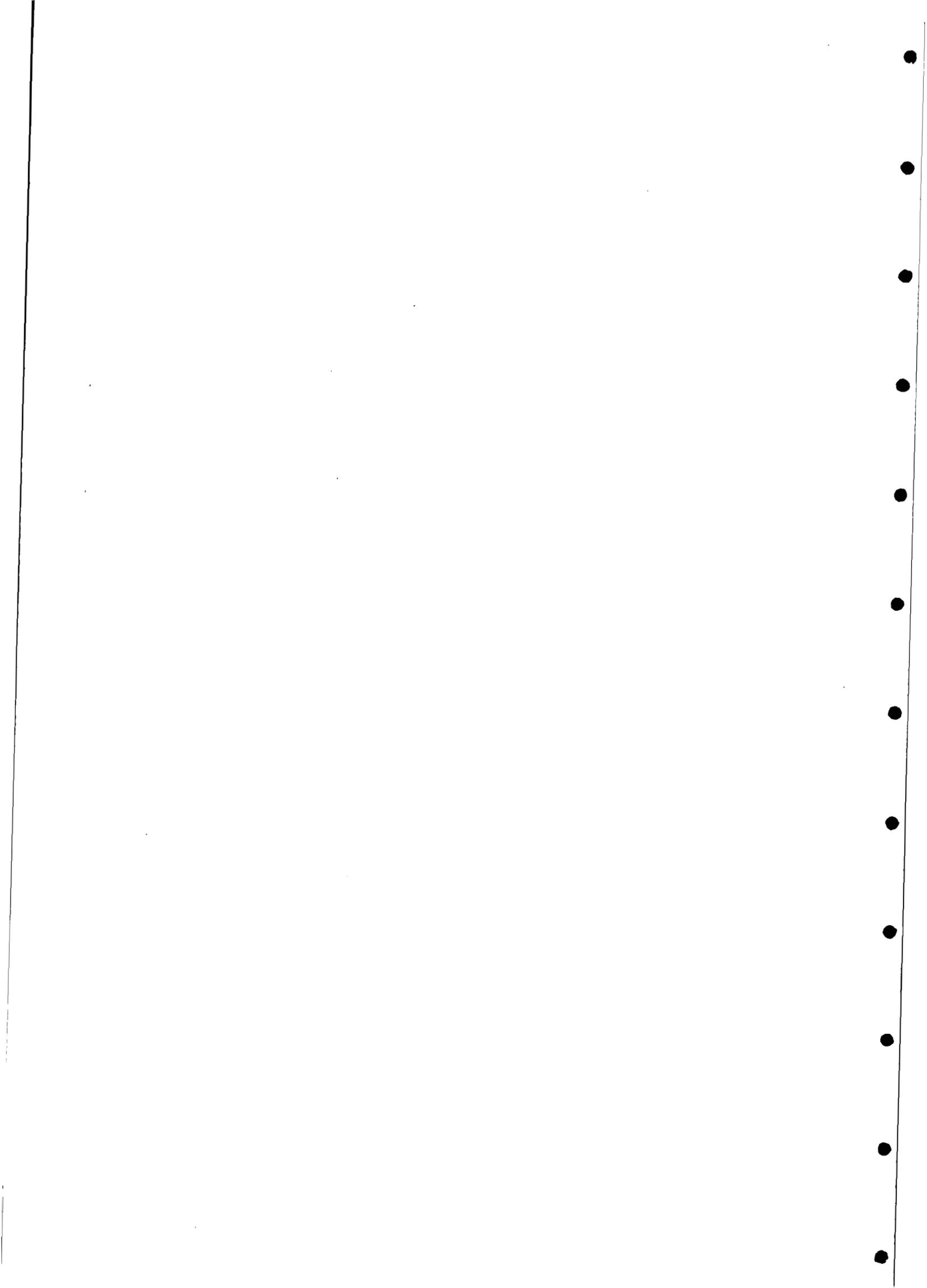
In the work to date we have considered the comparison of two BGs with performance levels of 2 and 4, and identified relative effects between the two. We have used CCS as a means of considering aggregated performance. This exercise has demonstrated that a difference in battle outcome can be reasoned through assessment of the effects at each turn of the battle.

For a particular scenario (here the quick attack) the qualitative relationship between training input and effect on battlefield performance has been loosely established by considering both the modelling aspects (which input parameters may be involved) and military judgement (to consider the level of the effect). We illustrate the process here by considering the example for the "efficient Command and Control" CCS, looking at the qualitative influence of the effects of poor C<sup>2</sup> on the battlegroup, and its knock-on throughout the battle. Table 2 shows the some possible effects.

	Better ←-----	<b>Level of Collective Performance</b>	-----> Worse
<b>Manifestation</b>	Proactive direction of available Combat power in a fluid situation		Ponderous reactive direction of available combat power
<b>Effects</b>	<p>better likelihood of holding initiative</p> <p>better likelihood of generating and applying decisive combat power</p> <p>Better reaction to the unexpected leading to focused and economical use of combat power</p>		<p>Lessening likelihood of retaining initiative, enemy likely to dictate events</p> <p>worse likelihood of generating and applying decisive combat power</p> <p>Poor reaction to the unexpected leading to dissipated and uneconomical use of combat power</p>

Table 2 Manifestations

In modelling terms, to provide a quantitative measure of the influence, our aim is to represent the immediate effects explicitly, through the use of control parameter settings on the execution of a given activity. The analysis identified the key criteria which can



be used to characterise the competence with which each activity can be carried out and used military judgement to apply values to these parameters.

Following through the example given above, two factors which can be modified and which represent these manifestations have been identified for the initial modelling:

- timeliness of planning (time delays associated with initiating orders), and
- probability of delaying H hour.

In this example the probability of delaying H hour will increase with decreasing collective performance, whilst the delays will increase. Lists of factors for each of the combat function/critical collective skills combinations have been defined and included in a combat model which we are currently constructing.

This combat model being designed to accommodate the modifiers will ultimately represent the whole cycle of operations, not just the combat/attrition phase. To allow inclusion of the factors identified above the model must represent the C<sup>2</sup> function at higher levels in such a way that certain entities are required to exercise command over subordinate entities through the issuing of orders and reports at certain times. There must be an ability to allow the HQ to judge whether or not certain actions are within acceptable levels of risk, and whether or not to continue the battle as planned.



## 5 The Future

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In this paper we have briefly discussed a work in progress; to date we have shown that it is feasible to quantify in general terms the benefits of collective training in C<sup>3</sup>I in terms of battle outcome.

We have developed a model which has CP level for a given Collective Skill area as an input; this drives the activity modifier specified in the model within a given combat function; this in turn modifies how successfully the activity is executed. We can then go on to address how sensitive the outcome of the battle being represented is to different levels of CP in a given Collective skill. This may help to identify where training pounds might best be spent. The work could then be extended by differentiating between arms in a formation and identifying which arm is most sensitive to training in which Collective skills.

This work remains to be validated and then extended to cover other arms so that the comparative value of training different parts of the force can be evaluated, particularly the non combat elements. This validation will take in historical data, trials data, results from other models and expert opinion. Once validated the model may then be used to support the OE studies which DOAC wish to undertake.

Ultimately, we desire a model with the sensitivity and discrimination to represent the ability of well-trained troops to apply successfully the concept of manoeuvre warfare on the modern battlefield, and so defeat the enemy by pre-emption, dislocation, and disruption.

