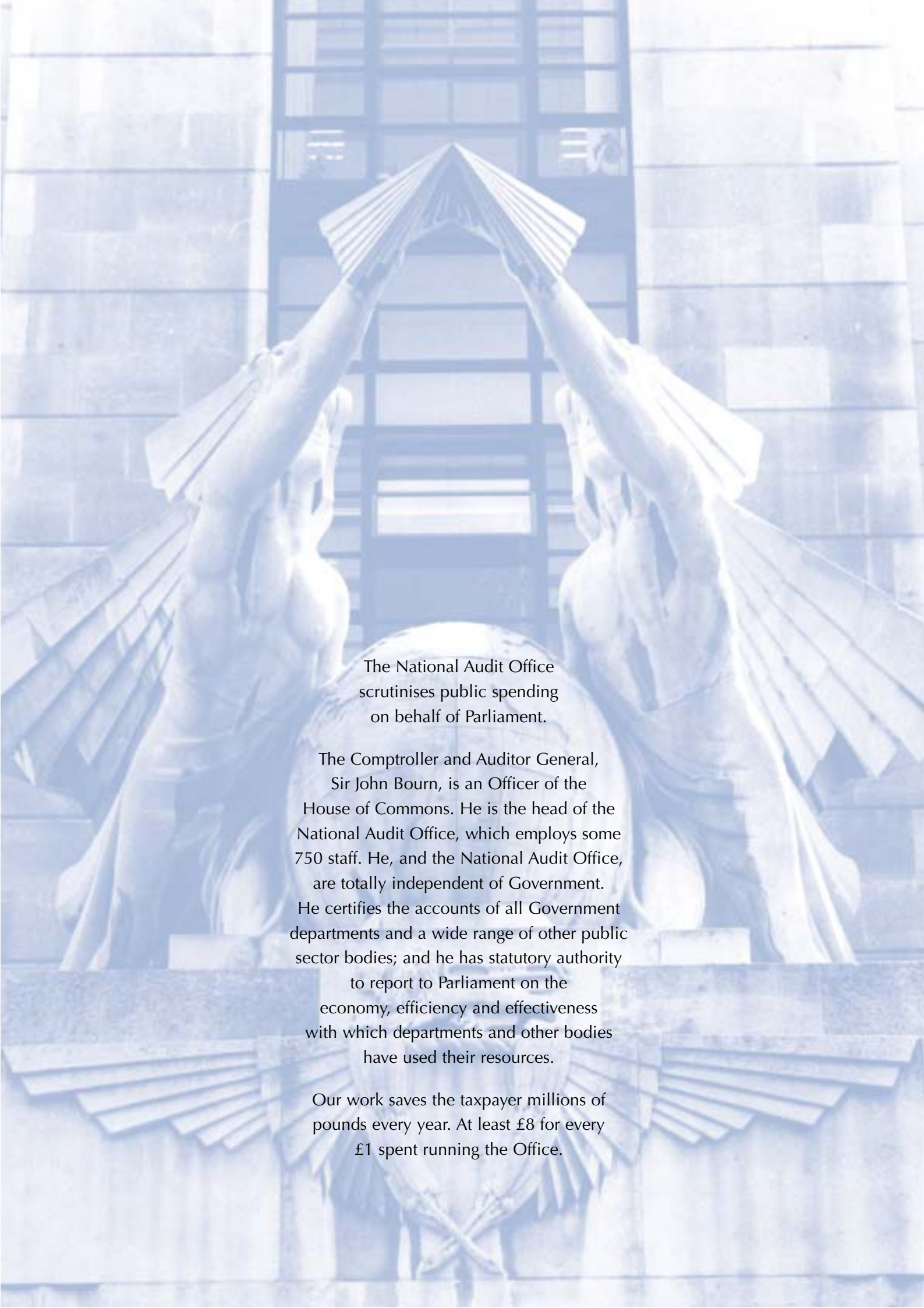
NATIONAL AUDIT OFFICE

Ministry of Defence:

Combat Identification

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 661 Session 2001-2002: 7 March 2002



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John Bourn
Comptroller and Auditor General

National Audit Office
4 March 2002

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1 Combat Identification refers to the means by which military units distinguish friend from foe during operations. Combat Identification enables them to improve combat effectiveness and minimise the risk of fratricide, which is the accidental destruction of friendly or allied forces.

2 The Ministry of Defence (the Department) defines Combat Identification as comprising the following three elements:

- Situational Awareness: Increasing combat effectiveness through the positive identification of friend from foe via a timely, high fidelity common operating picture.
- Target Identification: Protecting friendly forces from inadvertent attack by their own side (or, at least, minimising the risk of its occurrence) through the positive identification of all potential targets in the battlespace.
- Tactics, Techniques, and Procedures: Developed to enhance joint Situational Awareness and Target Identification capability because no purely technical solution exists.

Photograph:
Javelin Surface to Air Missile

3 In recent years, a number of factors have come together to increase the United Kingdom's need for an effective Combat Identification solution. There is an increasing reluctance on the part of the public to accept casualties in warfare which has drawn attention to the issue of fratricide. In addition, the United Kingdom's three armed services increasingly work together in joint operations with each other, and in coalition operations with a number of allies, which complicates the task of command and control in the battlespace. Finally, the increased complexity of warfare further illustrates the need for a Combat Identification solution that improves combat effectiveness and reduces the risk of fratricide.

4 This report assesses whether the Department has developed an approach to Combat Identification that considers the risk of fratricide alongside the need to maintain or improve combat effectiveness. Combat effectiveness is not an abstract good to be pursued for its own sake but is the best way to achieve military success in the shortest possible time thereby minimising all casualties, whether from enemy or friendly fire.

5 This report examines:

- Combat Identification within the context of the changing nature of modern warfare.
- The structures that the Department has put in place to deliver a capability for Combat Identification since the Strategic Defence Review of 1998.
- The way in which the Department is taking forward its strategy for Combat Identification.

6 We found that:

- The changing nature of modern warfare means that Combat Identification is complex, and that there is no simple solution to reducing the risk of fratricide.
- Since the publication of the Strategic Defence Review in 1998, the Department has created structures that are now beginning to facilitate the delivery of a Combat Identification strategy and capability.
- The Department is taking forward its strategy on Combat Identification, but more work is required to ensure that the strategy is implemented in full and in tandem with the requirements of NATO and other potential coalition partners.

There is no simple solution to reducing the risk of fratricide and improving combat effectiveness

7 History shows that fratricide appears to be an inevitable risk in warfare. It has for many years accounted for between ten and 15 per cent of friendly casualties during operations. Although the subject of fratricide has become more of an issue since the end of the Gulf War, the Department has not conducted wide-ranging analysis to assess the challenges of Combat Identification in joint and coalition operations. (Paragraphs 1.4 to 1.9.)

8 The Department continues to plan for a wide range of operations at all levels of conflict intensity. Contemporary operations are characterised by a less clearly defined battlespace, which is compounded in complexity by the increasingly joint nature of operations. The need to conduct joint operations requires adequate command and control measures particularly at the interfaces between the environments where the risk of fratricide is greatest. Differences in the approach of each service to Combat Identification are a consequence of the particular

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concerns of their operating environments, and make it difficult to have an all-embracing strategy. Achieving adequate tempo in operations is essential to enhancing the joint force's combat effectiveness. (Paragraphs 1.10 to 1.20.)

9 Coalition operations potentially further increase the risk of fratricide and most, if not all, future British operations are likely to be of such a nature. Fratricidal incidents between participating nations can endanger the cohesion of coalitions. Given this, there is a need to ensure that coalition forces can operate effectively with each other ("interoperability"). Achieving effective interoperability can be a particular problem when operating with members of an ad hoc coalition or with nations which have recently joined an alliance such as NATO. To achieve effective interoperability, it is necessary to address all aspects of working together, which includes examining doctrine and training as well as ensuring that equipment is interoperable. (Paragraphs 1.21 to 1.26.)

10 There have been instances where the utility of important military equipment has been reduced in effectiveness to reduce the risk of fratricide. It is therefore important to ensure that where appropriate business cases include an appraisal of Combat Identification when acquiring equipment. There are less tangible, but equally important, consequences arising from the risk of fratricide. Morale needs to be maintained by ensuring that appropriate steps are taken to prevent fratricide. Moreover, public opinion and political sensitivity must be taken into account at a time when the media's reporting of operations is widespread and immediate. (Paragraphs 1.27 to 1.29.)

The Department has created structures that are now beginning to facilitate the delivery of a Combat Identification strategy and capability

11 The Strategic Defence Review and the NATO Defence Capabilities Initiative have provided the Department with the impetus and structure to produce a Combat Identification strategy. The 1998 Strategic Defence Review has focused the Department's emphasis on delivering joint capabilities matched to the needs of the frontline user and high-level defence goals. Part of the Defence Capabilities Initiative, announced by NATO in April 1999, referred to Combat Identification with the intention of bringing all member nations up to the same level of capability. This has provided an extra impetus for the Department to ensure that its capabilities are interoperable with other NATO nations. (Paragraphs 2.3 to 2.6.)

12 As one of the many changes that occurred as a result of the Strategic Defence Review, the Department established the Equipment Capability Customer. As a result of the Joint Battlespace Initiative, focused on achieving information superiority, the Department established the Command and Battlespace Management Management Board. These organisations have helped to provide a coherent focus for Combat Identification matters within the Department. The Equipment Capability Customer is responsible for the provision and co-ordination of a joint, interoperable Combat Identification capability across the services and environments. The Command and Battlespace Management structure is designed to take forward the utilisation and effectiveness of digital communications into the battlespace by bringing together service and user needs, and preventing the duplication of high technology programmes across the Department. The two organisations are working closely together to deliver a Combat Identification capability. (Paragraphs 2.7 to 2.17.)

13 With many military operations now being undertaken on a combined basis with NATO, it is even more important that the Department is fully represented in the key NATO fora. We found that generally the Department is well represented and active on the relevant NATO Combat Identification bodies, but does not always have the resources to participate as much as it would ideally like. The Department is also actively working with other international fora on Combat Identification issues. (Paragraphs 2.18 to 2.27.)

14 In July 2001, the Department approved a policy paper on Combat Identification that outlined its definition of Combat Identification, the ensuing lines of responsibility and the aims of the policy paper. It also established a 1-Star Steering Group under the Command and Battlespace Management umbrella and provided this Group with a remit to carry forward Combat Identification solutions. Using the policy paper, the Steering Group has developed an action plan and will co-ordinate forward aims. The policy paper did set some priority areas, but did not establish clear time or budgetary ways forward, though timescales have followed in the subsequent Action Plan. (Paragraphs 2.28 to 2.37.)

The Department is taking forward its strategy on Combat identification, but more is required

15 The Department is taking forward its Combat Identification strategy using a technique known as the Six Lines of Development. In the past, the Department did not lay down recognised doctrine and standards for Combat Identification. Under its Action Plan, it is currently completing work on its joint doctrine for Combat Identification. In addition, the Department is also identifying the shortfalls in its tactical doctrine and the gaps in its tactics, techniques, and procedures. The latter work is ongoing and has no set deadline. (Paragraphs 3.2 to 3.6.)

16 The Department is working with NATO to ensure that the latter produces its operational and systems architecture for Combat Identification. This work has been slow, partly because of a lack of resources within NATO and the need for agreement amongst the Allies. At present NATO has two separate bodies which have an interest in Combat Identification matters and on occasion these interests have overlapped. (Paragraphs 3.7 to 3.10.)

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17 The key structural changes which the Department has put in place since 1998 have helped it to take forward the development of the Combat Identification strategy. Generally, the Department has communicated its strategy well to the key stakeholders. It is now faced with the challenge of cascading its strategy to all parts of the Department and finding Combat Identification solutions for the individual soldier and armoured vehicles. (Paragraphs 3.11 to 3.12.)

18 The Department has a number of discrete projects in train which will enhance its Combat Identification capability. The key programme under way is the Successor Identification, Friend or Foe programme for the air and the ground-to-air environments. In addition, the Department is seeking funding to implement its proposal for Combat Identification for the ground environment. The Department also has a number of other projects in hand which are designed to enhance Situational Awareness most notably in the naval environment. These advances in Combat Identification capability will still leave some gaps. The Department is aware of these gaps at a high level but it has commissioned research work to identify the detail of these gaps. (Paragraphs 3.13 to 3.25.)

19 The Combat Identification Policy Paper laid down a number of responsibilities for training. While a number of these have yet to be taken forward the Department is looking to establish how its joint doctrine operates in the battlespace. As a first step it is seeking to identify any lessons which arose from the Saif Sareea II exercise in Oman in 2001, and it will be also taking part in the Joint Combat Identification Evaluation Team exercise with the United States in April 2002. (Paragraphs 3.26 to 3.29.)

20 To enable it to fulfil its strategy for Combat Identification, the Department should implement the recommendations in the table overleaf:

Evidence from the Report

"The Department has not conducted more wide-ranging analysis to assess the challenges of Combat Identification in joint and coalition operations." (Paragraph 1.9.)

"[There are examples] of important equipment having reduced utility because of the risk of fratricide." (Paragraph 1.27.)

"Concerns have been expressed that there may be too many stakeholder interests represented in the Steering Group." (Paragraph 2.14.)

"Though the Department plays a central role in… NATO it is not always able to participate as much as it would like due to a lack of resources. This has meant that occasionally representatives from the Department have not always been able to take up some positions open to them." (Paragraph 2.24.)

"The Department is also undertaking work to incorporate Combat Identification into the doctrine and the tactics, techniques, and procedures for each of the services. This work is ongoing and currently has no set deadline for completion." (Paragraph 3.5.)

"The NATO Consultation, Command and Control Board… [is] responsible for implementing NATO's Defence Capabilities Initiative on Identification… NATO's Conference of National Armament Directors (CNAD)… is inter alia responsible for the…research, development and production of military equipment and weapons systems. This work can sometimes result…[in] overlap in NATO's work on Identification." (Paragraph 3.10.)

Action recommended

To inform decisions on Combat Identification, the Department should collate, analyse, and disseminate data on fratricide in joint and coalition operations and major exercises.

Business Cases for future acquisition programmes should address Combat Identification implications, where appropriate.

The Department should continue to involve all relevant stakeholders in its Combat Identification policymaking process. However, its Steering Group should be kept to a manageable size.

The Department should continue to develop its good work in NATO and ensure that staff are given every opportunity to participate fully in NATO's work on Combat Identification.

The Department should establish a definitive deadline for its work on tactics, techniques, and procedures, and its overhaul of doctrine even if only as a milestone within a continuous process.

We understand that the Department plays a key role in ensuring that either the NATO Consultation, Command and Control Board or the Conference of National Armament Directors has the lead on Identification issues to ensure that NATO has a fully co-ordinated way forward on this subject and it should continue to do so.

Part 1

Combat identification is complex

1.1 The history of warfare contains many examples of fratricide, which is defined as:

"The accidental destruction of own, allied or friendly forces, a result of what is colloquially known as 'blue on blue' engagement." (Ministry of Defence, UK Joint Warfare Publication 0-01.1, *United Kingdom Glossary of Joint and Multinational Terms and Definitions*, p. F-10, 3rd Edition, 2001.)

The most common cause of fratricide is a lack of Situational Awareness through poor identification and co-ordination of forces, and failures in communication together with inadequate procedures. Combat effectiveness is the only way of achieving military success in the shortest possible time thereby minimising all casualties, whether from enemy or friendly fire. Processes that deliver combat effectiveness contribute to military success and include Combat Identification.

1.2 Combat Identification is required to ensure that units can distinguish friend from foe during operations so as to prevent fratricide. It also helps to provide assurance against an adversary using similar equipment or employing ruses such as electronic counter-measures and the wearing of similar uniforms or civilian attire. The primacy of joint operations means that the boundaries in today's battlespace are less well defined than during the Cold War. Therefore, Combat Identification has become more complex. Consequently, the Department acknowledges that there is no simple solution to improving combat effectiveness and reducing the risk of fratricide.

1.3 This part of the report puts Combat Identification into perspective by examining it against the background of the nature of modern warfare. It assesses the extent to which the risk of fratricide can be quantified; looks at the various forms that military operations can take; and examines the importance of making properly informed trade-offs between the risk of fratricide and combat effectiveness.

It is difficult to quantify the risk of fratricide

1.4 It is very difficult to quantify the risk of fratricide as the risk itself depends on the operational situation, which includes the capabilities and experience of the commander. Moreover, the assessment of risk is subjective and relies in part on the commander's personal intuition. Fratricide is only one of several factors that he must contemplate. The Department therefore tends to focus on the components of Combat Identification such as equipment shortcomings and tactics, techniques, and procedures rather than the risk of fratricide *per se*.

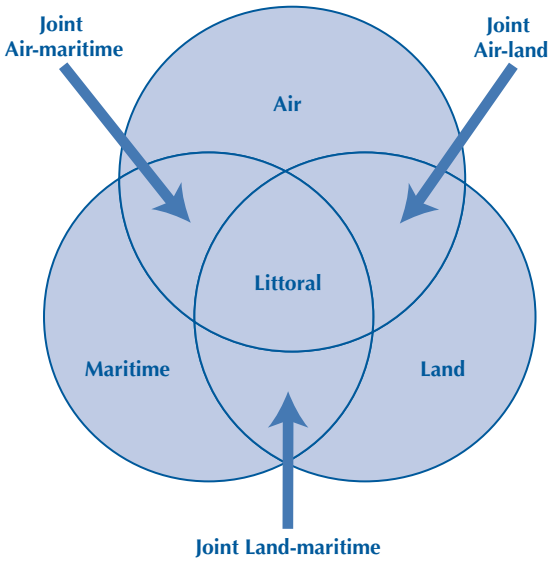
There is some data available on fratricide

1.5 There is some historical data available showing that fratricide is an unavoidable feature of warfare. American research shows that, historically, fratricide accounts for between ten and 15 per cent of friendly casualties during operations. A database compiled by the Department shows that cases of fratricide during the 20th century occurred across all of the environments (land, air, and maritime) and also at their boundaries. **Figure 1** illustrates the relationship between the environments that make up the battlespace, and **Figure 2** shows that some 46 per cent of incidents occurred in situations involving ground units only[1].

1.6 For the purposes of modelling, the Department assumes overall casualty rates of between ten and 15 per cent. The Department has analysed a small number of its training exercises to suggest that levels of fratricide will remain at about the same level as during the Gulf War, at least until digitisation - the exploitation of advances in digital technology to improve combat effectiveness - is realised. In 1995, analysis of exercises carried out by the army showed that 12 per cent of all engagements would have involved fratricide. **Figure 3** breaks down this figure by type of engagement.

1 *This Figure covers a number of conflicts during the 20th Century including the World Wars, the wars in Korea, Vietnam, the Falklands, the Gulf and Chechnya, and also the Arab-Israeli Wars.*

1 The Relationship between the environments



Source: Ministry of Defence

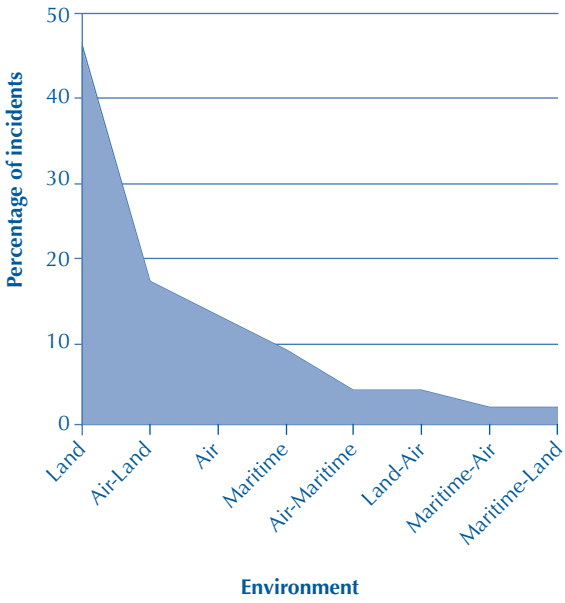
1.7 The important point to note about these exercises is that they were single service and should not be taken to reflect the situation across all environments or across all conflict scenarios. The exercises simulated a high intensity scenario, focusing on ground operations where each force had equivalent capabilities.

The Department has not collected much data on the risk of fratricide in joint and coalition operations

1.8 The Department has not assessed the risk of fratricide in joint and coalition operations though some work has been done with the United States on its Joint Combat Identification Evaluation Team (JCIET), which culminates in a biannual joint exercise that the Department participates in. This work revealed that 15 per cent of surface-to-surface (naval) close fire support engagements involving British forces ended in fratricide.

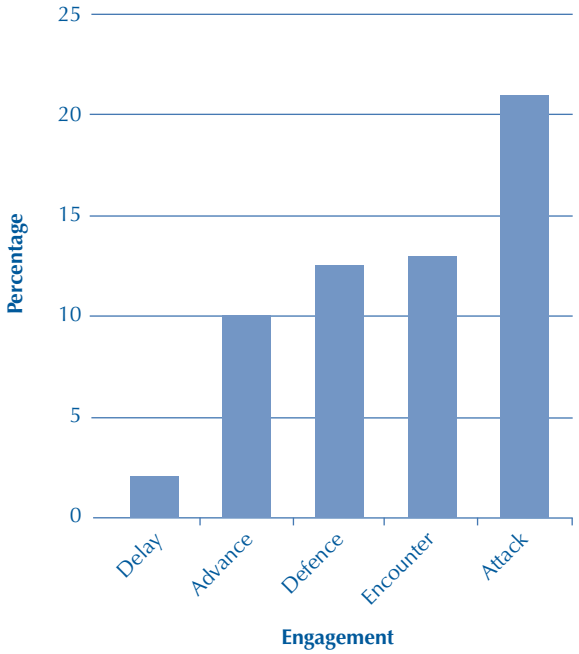
1.9 Since the Gulf War, there has been a cultural shift within the Department in that there is more willingness to discuss the subject of fratricide. Furthermore, the Department's doctrine has become more explicit in its recognition of the need to include Combat Identification. Given this, it is surprising that the Department has not conducted more wide-ranging analysis to assess the challenges of Combat Identification in joint and coalition operations.

2 Twentieth Century Fratricide



Source: National Audit Office

3 Proportion of fratricides according to type of engagement



Source: National Audit Office

Military operations take many forms making it difficult to have an all-embracing strategy for Combat Identification

1.10 Modern military operations are characterised by a less clearly defined battlespace. The United Kingdom's armed forces are deployed in accordance with the planning assumptions underpinning the Strategic Defence Review of 1998. These are based around the principle of expeditionary operations whereby the armed forces could be deployed anywhere in the world at short notice in a variety of conflict scenarios, which could range from high-intensity warfighting to peace support.

The Department plans for a wide range of operations

1.11 Throughout the Cold War, the Department planned for its contribution to fighting a "General War" against the Soviet Union and its Allies in Europe. General War describes a conflict between major powers in which vital national interests, perhaps even survival, are at stake. The higher the level of intensity, the less constraint there is on the weapons, tactics, and force used. Following the end of the Cold War, the Department now has to plan to conduct operations across the full spectrum of conflicts.

The Department also has to plan for conflict at lower levels of intensity

1.12 Low-intensity conflict is characterised by constraints on weapons, tactics, and force. It encompasses counterinsurgency, counter-terrorism, and peace enforcement. Examples of low-intensity conflict that the Department has conducted are shown in **Figure 4**.

1.13 Peace Support Operations are conducted by the military in conjunction with diplomatic and humanitarian agencies. Peace Support Operations differ from peace enforcement in that they emphasise consent not coercion. Examples of Peace Support Operations that the Department has conducted are shown in **Figure 5**.

The complexity of the modern battlespace is compounded by the increasingly joint nature of military operations

1.14 Joint operations involve elements from the land, sea, and air environments co-ordinating their operations at all levels of war to fulfil strategic directives. There is now an increased emphasis on joint operations, which, without attendant improvements to joint command, control, communications, computers, information, surveillance, and reconnaissance (C4ISR) could increase the risk of fratricide. Joint fires co-ordination - the joint planning and executing of fire so that a given set of targets can be engaged - emphasises the outcome of efforts being made by the single services when fighting at the tactical level of war to enable success to be achieved at the operational level. **Figure 6** shows the inter-relationship between the three levels of war.

4 Examples of low-intensity conflict

Location	Time	Command Authority	Description
Bosnia	1992-1995	UN	Peace enforcement
Iraq	1993-present	US/UK	Enforcing sanctions
Serbia/Kosovo	1999	NATO	Peace enforement
Sierra Leone	2000	UK	Counter-insurgency
Afghanistan	2001	US/UK	Counter-terrorism

Source: National Audit Office

5 Examples of Peace Support Operations

Location	Time	Command Authority	Description
Bosnia	1996-present	NATO	Peacekeeping
East Timor	1999	UN	Peacekeeping
Kosovo	1999-present	NATO	Peacekeeping
Mozambique	2000	UK	Disaster relief
Sierra Leone	2000-present	UK/UN	Peacekeeping
Macedonia	2001	NATO	Weapons collection

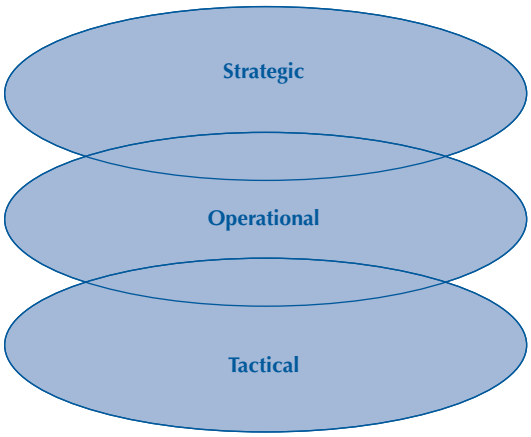
Source: National Audit Office

More lethal weapons and the nature of expeditionary operations may also increase the risk of fratricide

1.15 The increasing range and destructive capacity of weapons will leave few safe sanctuaries within the battlespace, which may mean that friendly forces on the ground are inadvertently targeted by friendly weapon systems from land, sea, and air where they are fighting close-in battles. Combat Identification will therefore become paramount to ensure that the effect of new weapons is maximised and that the inherent "fog of war" is minimised.

1.16 Continuous operations made possible by the ability to fight at night place greater stress on troops through fatigue and can result in human errors such as fire indiscipline. Moreover, thermal sights used during night fighting, particularly in the ground environment, are good at detection but poor at identification compared with the visual band. There is also a risk of fratricide

6 The Levels of War and their Interrelationship



Source: National Audit Office

occurring when engaging targets at short range in closed countryside and in built-up areas. The current emphasis on expeditionary operations means that large numbers of troops may be inserted into unfamiliar and hostile terrain, particularly in urban areas, with no time for acclimatisation. This will serve to compound the stresses that operations can impose on the individual soldier thereby increasing room for error.

The risk of fratricide is greatest at the interfaces between the environments

1.17 Major air and sea assets can be used in support of ground troops as well as fighting battles exclusively within their own environments. Rules-of-engagement refer to directives governing the circumstances and limitations under which forces initiate and execute engagements. The implementation of Rules-of-engagement can become more complex in the air-to-ground and ground-to-ground environments when there is a large array of entities in the battlespace. The emphasis on technical solutions deployable also varies according to environment. Ground operations place more emphasis on tactics, techniques, and procedures whereas air operations, because of the likelihood of fewer enemy air assets, tend to be more dependent on technical solutions making it difficult to have an all-embracing strategy for Combat Identification.

1.18 Air power tends to be at the forefront in modern conflicts. By the time ground troops become involved, the risk of fratricide is likely to be greater than before, both on the ground and at the air-to-ground and ground-to-air interfaces. Operationally, the air-to-ground interface is becoming more crucial with the growing influence of aircraft such as the attack helicopter and A10 close air support aircraft. For example, in the Gulf War, American A10s inadvertently destroyed two British Warrior armoured vehicles killing nine soldiers.

1.19 There is less risk of fratricide in deep-water operations, which have become less likely since the end of the Cold War. It is in the littoral where the risk of fratricide is greatest given that the land, sea, and air environments meet here. Most of the naval equipment that would operate in the littoral was originally designed for operations in deep water where Combat Identification was not such an issue. However, it is a real issue where maritime forces interface with forces from the air and land.

Achieving adequate tempo will maximise the joint force's combat effectiveness

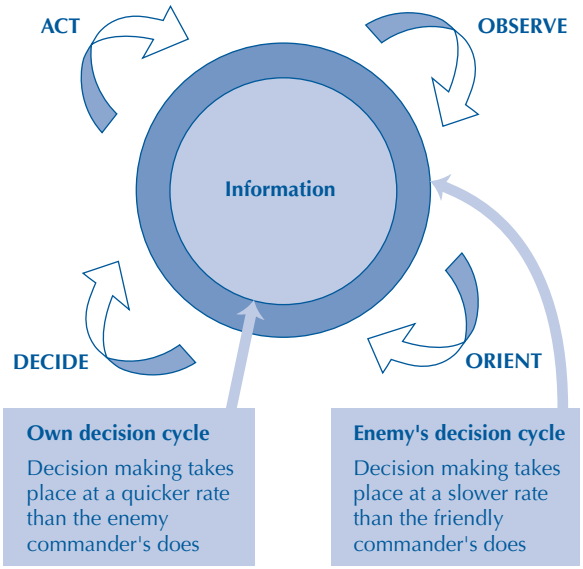
1.20 Tempo refers to the rate of friendly activity relative to that of the adversary and aims to maximise combat effectiveness by reducing the time taken to make decisions. In so doing, the adversary's decision-making process will be paralysed by information overload caused by the rapidity of events, which will force him to make decisions at a faster rate than he can cope with. Decision making is characterised by four elements: observation, orientation, decision and action. **Figure 7** illustrates tempo.

Coalition operations further increase the risk of fratricide

1.21 The Department has recently participated in a number of operations under the auspices of different command authorities whether national, NATO, or through the United Nations. (See Figures 4 and 5.) Most, if not all, future operations involving British forces will be coalition or alliance based making interoperability a priority. Interoperability is defined by the Department as:

"The ability of Alliance forces and, when appropriate, forces of Partner and other nations to train, exercise and operate effectively together in the execution of assigned

7 The concept of tempo



Source: National Audit Office

missions and tasks". (Ministry of Defence, UK Joint Warfare Publication 0-01.1, *United Kingdom Glossary of Joint and Multinational Terms and Definitions*, p. I-11, 3rd Edition, 2001.)

1.22 The cohesion of coalitions can be endangered by incidents of fratricide between the forces of participating nations. A coalition commander from a non-British nation might have a different view of risk to his British counterparts. In Peace Support Operations, for example, the British approach is different from that adopted by other nations. Arguably, such differences are as much cultural as they are doctrinal.

The Department is committed to NATO, but there may be tensions between operations with NATO and other coalition partners

1.23 While the United States tends to be the driving force behind interoperability, it also requires solutions for theatres outside NATO. The United Kingdom has operated with the United States in the majority of its recent operations, including the Gulf War, Kosovo, the Iraqi No Fly Zone and Afghanistan, but the United States has many other alliances. The British carrier, HMS *Invincible*, has encountered difficulties operating with a carrier group from the US Pacific Fleet as a result of its procedural differences with the US Atlantic Fleet, which operates with other NATO fleets. The Department recognises such problems and is playing a key role in reconciling tensions between NATO's needs and those of the United States elsewhere. Interoperability is therefore an issue that is as much about doctrine and training as it is about equipment.

Interoperability is a particular problem when operating with new NATO members or non-NATO allies

1.24 The newer NATO members continue to use equipment traditionally operated by the Warsaw Pact, which makes identification more difficult though the level of potential confusion will also depend on whether an adversary is using the same equipment. For example, the Polish Army has an inventory of ground-based air defence equipment as a legacy of its days in the Warsaw Pact. In terms of range and other capabilities, this equipment capability is currently better than that possessed by most other NATO nations. However, without procedures, it would be identified as a threat by other NATO forces and consequently attacked.

1.25 NATO's partnership for peace programme exposes partner nations to NATO procedures. Critical information is made available to partner nations and other allies when required. Checks are in place to ensure that partner nations and other allies can adapt to NATO standards.

1.26 The need to preserve security complicates the design of any Combat Identification system. The Department tends to use a NATO (United States) crypto (code for concealing messages) and is wary of passing this to non-NATO states. Link 11 is a tactical datalink used for maritime and air defence operations, which consists of multiple links connecting platforms. It shares data through formatted display messages. On one occasion, the Department supplied Link 11 to a Finnish naval vessel. However, given concerns about security, the Department also had to supply an officer to operate the system.

It is essential to make properly informed trade-offs between the risk of fratricide and combat effectiveness

The risk of fratricide can affect the effectiveness of equipment

1.27 A good example of important equipment having reduced utility because of the risk of fratricide is ground-based air defence. In a situation where air supremacy is not guaranteed, the danger to land-based assets from enemy aircraft is significant. The High Velocity Missile and the Javelin ground-based air defence systems were deployed to Kosovo in 1999. Shortcomings in identification capability meant that these assets had to be placed on a "weapons hold" procedure to avoid fratricide, meaning they could only be used in self-defence. Moreover, the Rapier ground-based air defence system could operate under similar restrictions and the

Department estimates that it would then function at only 25 per cent of its full capability. Although the Successor Identification, Friend or Foe (SIFF) programme (see paragraph 3.15) is addressing this particular capability gap, the Department needs to address the implications of Combat Identification in any relevant business cases made to acquire future equipment.

If Combat Identification solutions are not in place, the morale of the armed forces could be affected

1.28 The Department has a duty of care towards its employees, including armed forces personnel, and needs to be able to demonstrate that it has taken appropriate steps to prevent fratricide. Without adequate Combat Identification, the subsequent risk of fratricide could have a negative impact on the morale of the armed forces, which could adversely affect combat effectiveness. Morale could also be affected by the growing influence of litigation whereby the Department could be held legally responsible for any injuries or deaths resulting from incidents of fratricide.

Fratricide is a prominent public issue

1.29 Political sensitivity and public opinion have increased the prominence of fratricide as an issue in modern operations, and this is compounded by more widespread and immediate media coverage. Political aversion to casualties means that those incurred in operations that do not involve the defence of well-defined national interests are more difficult to justify. Where the overall aim of an operation is perceived to be worthwhile, public opinion will generally support it despite the knowledge that it may incur casualties. However, public opinion is less tolerant of any casualties, especially those incurred through fratricide, where the overall aim is questionable.

Part 2

The Department now has structures in place to deliver Combat Identification

2.1 After the Gulf War, the Public Accounts Committee recommended that the Department give top priority to procuring a Combat Identification system. The Department noted the Committee's conclusion and indicated that work was in hand to ensure that lessons were learnt from the Gulf War. In 1994, the House of Commons Select Committee for Defence commented that "[t]he shortcomings of [Combat Identification] equipment must be addressed as a matter of the greatest urgency". In its response, the Department stated that it was "fully seized of the need to do everything to prevent [fratricide] and continues to afford a very high priority to work on Battlefield [Combat Identification]".[2]

2.2 This part of the report examines the organisational structures that are now facilitating the delivery of a Combat Identification strategy and capability. The structures have been created as a result of the Strategic Defence Review and NATO's increased emphasis on Combat Identification standards. The Department has made good progress establishing and working within new organisational structures and the momentum has increased since the Department ratified its policy paper on Combat Identification in July 2001.

There have been key domestic and international drivers for change

2.3 The Department's organisational structures have changed significantly since 1998. For Combat Identification, the major relevant changes arose from the Department's new acquisition methods which were adopted after the Strategic Defence Review, and from the NATO Defence Capabilities Initiative.

The Strategic Defence Review

2.4 The Strategic Defence Review (1998) acknowledged that the Department was not properly structured to deliver the needs of the frontline user because its procurement strategies were centred on a single service, equipment based system. Since the Strategic Defence Review, the principles of Smart Acquisition have concentrated on delivering joint, tri-service capabilities which are interoperable with other capabilities based on achieving wider high-level defence goals. This is especially important for Combat Identification, which is necessarily required to be joint and interoperable.

NATO Defence Capabilities Initiative

2.5 At the NATO Washington Summit of April 1999, the Alliance announced a Defence Capabilities Initiative, as a result of the lessons learnt from its operations in Bosnia and Kosovo, which was intended to bring member nations up to a comparable capability. There were two capabilities that dealt specifically with Combat Identification.

- **Effective Engagement 5: Combat Identification**, concerned with achieving a near-term, interoperable, interim solution to the problem.
- **Effective Engagement 19: Joint Combat Identification Systems**, concerned with long-term measures for Combat Identification.

2.6 NATO's objective for Combat Identification is that:

"NATO nations should develop, with a view to fielding, interoperable joint Combat Identification systems covering all aspects of the air/land/maritime battlespace".

2 *Please refer to Appendix 1 for further information.*

The impact of this NATO statement on the Department is twofold. Firstly, if the United Kingdom wants to continue to be an active member of NATO, its equipment will have to be compliant with NATO Combat Identification technical Standardisation Agreements (STANAGS).[3] Secondly, it means that capabilities and doctrine should be developed with multinational interoperability clearly in mind. We found that the Department now considers NATO standards and issues when developing its Combat Identification capabilities.

The Department now has a coherent focus for Combat Identification matters

2.7 The Department is now drawing together relevant stakeholders to ensure there is clear communication and co-ordination between the frontline users of equipment in the Armed Forces, those who establish equipment requirements (the central Equipment Capability Customer) and key Combat Identification stakeholders in the Department's Command and Battlespace Management programme.

2.8 The Command and Battlespace Management concept was developed in response to the growing importance of the provision of digital information in the battlespace. The aim of Command and Battlespace Management is to identify and deliver the operational aspects of the Defence Information Strategy[4], and encompasses leadership, effective command, and decision making supported by reliable data. Significant parts of a Combat Identification capability are reliant on high-technology systems. Command and Battlespace Management is an overarching concept within which, for Combat Identification, the Equipment Capability Customer is responsible for the provision of an equipment solution, and the Directorate of Joint Warfare is responsible for coherency across the Department. The relationship between the Department's Equipment Capability Customer, Command and Battlespace Management programme, and NATO is demonstrated in **Figure 8**.

2.9 The Strategic Defence Review's creation of the Equipment Capability Customer in 1999 means that there is now one organisation responsible for co-ordinating Combat Identification equipment activity, the Capability Manager (Information Superiority). The Equipment Capability Customer develops equipment plans based on what is needed to achieve a certain goal, or capability, and passes this requirement on to specialist procurement teams. The Equipment Capability Customer is split into different capability areas to interpret the implications of the Joint Essential Task List outlining grand strategic tasks and turn this into requirements. A Combat Identification capability, by its nature, cuts across all of these capabilities.

The Equipment Capability Customer provides an improved focus for equipment requirements

2.10 The Director of Equipment Capability (Command, Control and Information Infrastructure) is tasked by the Capability Manager (Information Superiority), as being responsible for ensuring that all three services, operational environments, and relevant capabilities are compliant with Combat Identification technical standards. The Director of Equipment Capability (Command, Control and Information Infrastructure) is also the focal point for Combat Identification equipment requirements. The aim is to be able to field an integrated and coherent Combat Identification equipment programme.

2.11 Combat Identification is part of a number of other capabilities as well as being a discrete capability in its own right. The Director of Equipment Capability (Command, Control and Information Infrastructure) is responsible for co-ordinating activity across the Equipment Capability areas by chairing the Combat Identification Cross-Capability Working Group which includes all relevant Equipment Capability representatives. The role of all Directors of Equipment Capability with responsibilities related to Combat Identification is to determine the specific need for Combat Identification capabilities, taking into account lessons learned, relevant doctrine and, most importantly, the overarching requirements of the Combat Identification systems that the Director of Equipment Capability (Command, Control and Information Infrastructure) is responsible for.

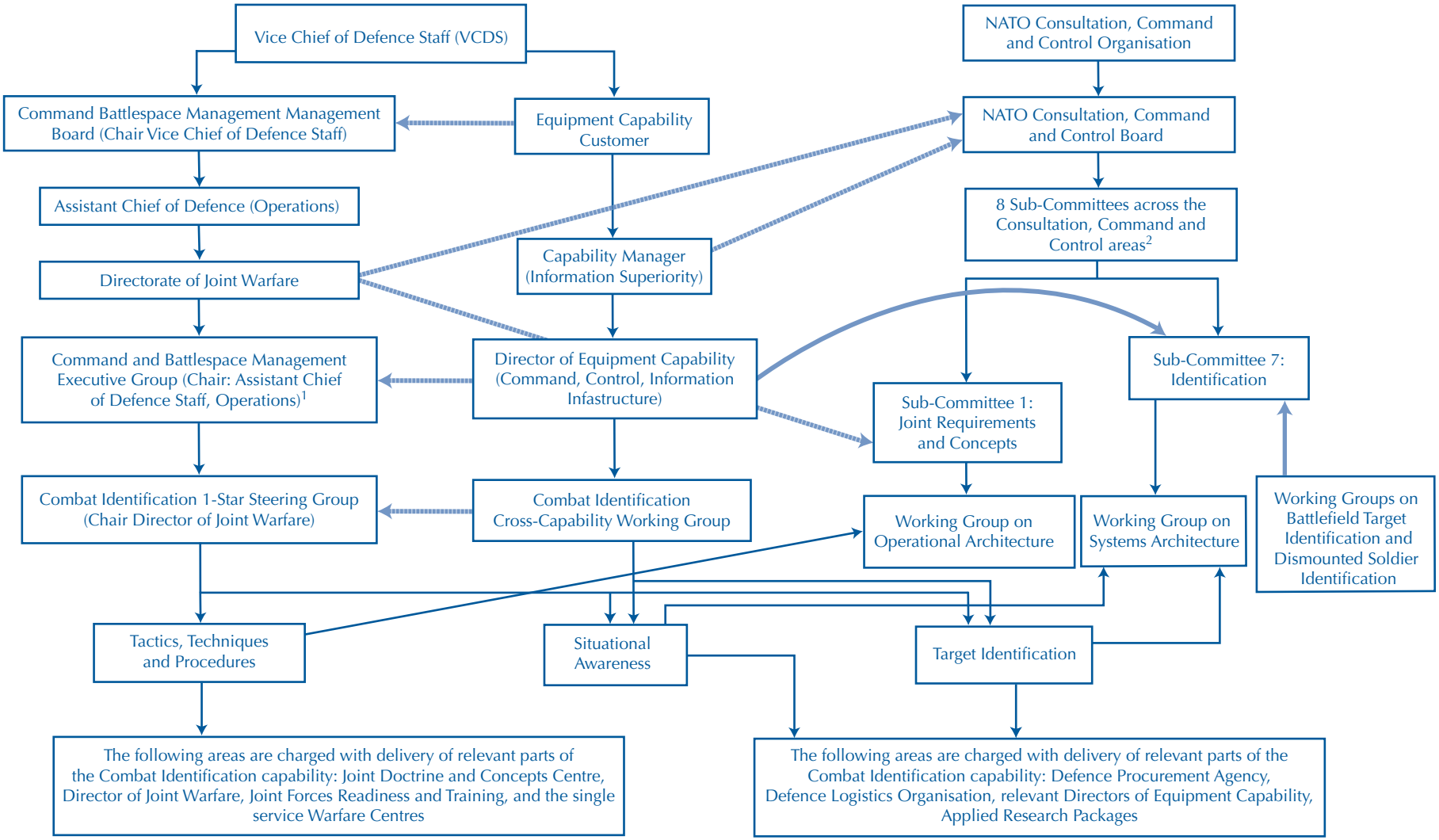
The Command and Battlespace Management programme is responsible for overarching coherency in Combat Identification Capabilities

2.12 The Command and Battlespace Management programme has a Development Programme outlining its vision to provide "enhanced military capabilities through Decision Superiority in the Joint multinational battlespace, in order to fight and win". The two main aims are:

- **Bringing together a wide range of stakeholders to look at service and user needs.**
- **Developing a coherent approach that will eliminate duplication of Command, Control, Communications, Computers, Information, Surveillance and Reconnaissance (C4ISR) programmes across the Department.**
- Bringing together a wide range of stakeholders to look at service and user needs

3 *STANAGS identify levels of standardisation that should be achieved by all member nations within specific areas of operations, equipments and procedures.*
4 *The Defence Information Strategy develops the way the Department manages information.*

8 Relationships within Command and Battlespace Management, the Equipment Capability Customer and the NATO Consultation, Command and Control Organisation



1 This group has responsibility for co-ordinating action across the six Lines of Development for each of its six High Level Goals. For ease of understanding, this diagram only includes Goal 1 which is to achieve "[S]eamless operational processes with the right enablers across a joint and multinational force". Combat Identification is a high level change objective under this.

2 For ease of understanding, this diagram only includes the two Sub-Committees with the most direct involvement in Combat Identification and only the principle working groups.

Source: National Audit Office

2.13 The newly formed Combat Identification 1-Star Steering Group, comprising officers at Brigadier or equivalent level, provides input to the Command and Battlespace Management Management Board on the subject of Combat Identification. It aims to provide a coherent input to the Equipment Capability Customer from those responsible for in-service aspects of capability, known as the Second Customer. The Steering Group is led by the Directorate of Joint Warfare and established under the Command and Battlespace Management's Executive Group on behalf of the Assistant Chief of the Defence Staff (Operations), as shown in Figure 8. It is also charged with providing user aspirations for Combat Identification in the short, medium and long term. It first met in July 2001 to establish an action plan. The Steering Group has proposed a way forward in the context of the Department's six Lines of Development (see paragraph 3.2) with actions for each. The Lines of Development are used as a planning tool for future requirements. The Steering Group's first formal meeting to review progress was in December 2001.

2.14 Combat Identification cuts across environments and equipment programmes, and therefore there are a number of stakeholders that need to be represented. Concerns have been expressed that there may be too many stakeholder interests represented in the Steering Group. There are currently 17 areas of the Department represented within this particular high-level group.

2.15 The Combat Identification Cross-Capability Working Group is a forum for the Equipment Capability Customer to co-ordinate Combat Identification equipment in the different capability areas and to analyse any capability gaps. The Cross-Capability Working Group and the Steering Group have a close relationship - each is represented in the other, and they share information and requirements.

- Developing a coherent approach that will eliminate duplication of Command, Control, Communications, Computers, Information, Surveillance and Reconnaissance (C4ISR) programmes across the Department

2.16 The Command and Battlespace Management Development Programme will continue to look at short and medium-term objectives for specific C4ISR programmes and common enablers through the Steering Group's action plan. Command and Battlespace Management aims to provide a mechanism to evaluate longer-term C4ISR concepts. The Department is actively encouraging more work to be undertaken in the initial research and concept stages of capability development in all areas of acquisition. The Command and Battlespace Management branch in the Equipment Capability Customer is a forum for new concepts to be more formally progressed through Applied and Corporate Research Packages, Operational Analysis or live/synthetic trials, with the aspiration to derive the most effective concepts.

2.17 Under Command and Battlespace Management, the Department is also considering joint and international interoperability issues to achieve a common view of the nature of operations and future command. Firstly, Command and Battlespace Management is aiming to eliminate duplication of activity between the Department's warfare centres, the Joint Doctrine and Concepts Centre, the Equipment Capability Customer and in any research. This will be achieved by Command and Battlespace Management giving coherent direction and co-ordination to the Steering Group, within which the above areas are represented. Secondly, Command and Battlespace Management will promote the Department's involvement in international bodies, making sure the Department is represented on NATO and other international fora.

The Department is contributing internationally on Combat Identification, both with NATO allies and in other international fora

2.18 As demonstrated in Part One, contemporary military operations usually involve a coalition of forces. It is important that the Department is represented in NATO and more widely internationally on Combat Identification matters. For the Department to be compliant with and to have influence on the decision-making process, it is paramount that the Department is adequately represented in all the relevant fora and has the necessary resources to participate.

The Department is represented at NATO

2.19 NATO has a dedicated forum where Combat Identification is discussed. It is a NATO version of the Command and Battlespace Management programme, which is called the NATO Consultation, Command and Control Organisation. The NATO Consultation, Command and Control Organisation is headed by the NATO Consultation, Command and Control Board. The Board is charged with the provision of a NATO-wide, cost-effective, interoperable and secure capability to produce a high-level Consultation, Command and Control policy for military forces. It examines all aspects of military operations through a joint perspective, from equipment to doctrine. The NATO structure for Combat Identification and its links with the Department are in Figure 8.

2.20 The Capability Manager (Information Superiority) represents the Department on the NATO Consultation, Command and Control Board as the Customer within the Department that owns high-technology integration issues. The Directorate of Joint Warfare supports the Capability Manager on the Board, as the office responsible for implementing strategy along the six Lines of Development. It is important that these two

organisational structures are represented in the NATO Consultation, Command and Control Board as it is this Board which decides Combat Identification Standardisation Agreements for the North Atlantic Council to agree and for member nations to ratify. The Department has committed to being compliant with these Agreements in its Combat Identification policy paper (See paragraph 2.28).

2.21 The Standardisation Agreements originate in the eight Sub-Committees of the NATO Consultation, Command and Control Board. They are all closely linked, though the Identification Sub-Committee 7 is the only one specifically tasked to examine Combat Identification issues, as some aspects of Combat Identification matters are examined in other Sub-Committees. Sub-Committee 7's main areas of work are:

- Developing systems and interconnections in the battlefield that provide for or support warfighting functions, known as systems architecture.
- Strategic initiatives that will aid interoperability between nations.
- Developing Standardisation Agreements.

2.22 For example, reporting to Sub-Committee 7 is the Combat Identification Working Group, which has delegated responsibility for developing land-based solutions on behalf of NATO. The Director Equipment Capability (Direct Battlefield Engagement) is represented on the working group. The United Kingdom is the author of the now promulgated Standardisation Agreement for the platform mounted Battlefield Target Identification Device (BTID), and the draft NATO Staff Requirement for the Dismounted Soldier Identification Device (DSID). The Department's Customers are well represented in NATO's research work and will be able to influence and gain information to aid the progress of UK research.

2.23 The Directorate of Joint Warfare represents UK interests in Sub-Committee 1, Joint Requirements and Concepts, which is charged with developing descriptions of tasks, operational elements and information flows required to accomplish or support a warfighting function, also known as operational architecture. Also feeding into this process is the Joint Doctrine and Concepts Centre, under the remit of Command and Battlespace Management, and the Directorate of Joint Warfare. It is here that the three elements of Combat Identification come together and so the Department is fully represented.

2.24 Though the Department generally plays a central role in the Sub-Committees of the NATO Consultation, Command and Control Board, it is not always able to participate as much as it would like due to a lack of resources. This has meant that occasionally representatives from the Department have not always been able to take up some positions open to them.

The Department is represented on other international Combat Identification bodies

2.25 The Department is represented on other committees and working groups that have some involvement with Combat Identification. For example, the Command and Battlespace Management group and the Joint Doctrine and Concepts Centre represent the Department on the Quadripartite Combined Joint Warfare Committee (QCJWC), which comes together to discuss concepts.

2.26 The United Kingdom is involved in a Situational Awareness-dedicated Multinational Interoperability Programme for the ground environment. Other nations involved in this include the United States of America, France and Germany. A demonstration took place in December 2001. NATO members were invited to attend as observers. If NATO determines it to be a success, it may use some of the findings to inform its own requirements.

Photograph: NATO Headquarters, Brussels

2.27 The Department is also involved in the Five-Power Shared Tactical Ground Picture Group which is a non-NATO coalition of nations, comprising the United States of America, France, Germany and Australia. The Group is committed to developing a Shared Ground Picture using Situational Awareness techniques.

The Department now has a Policy Paper for Combat Identification

2.28 In July 2001, the Department approved a policy paper on Combat Identification, which provides an aim, a clear definition of the required elements of the solution, delineates responsibilities and details forward policy. It has provided a basis for setting broad priorities.

The Department has a clear aim for a Combat Identification solution

2.29 The policy paper indicates why Combat Identification is important, saying that it is "[f]undamental to the achievement of the objectives of Command and Battlespace Management and will greatly enhance a commander's operational decision-making and increase operational effectiveness".

2.30 For the first time, the United Kingdom has a clear definition of Combat Identification and has outlined the elements of the solution. We have used this definition throughout this report. It has a vision for Combat Identification that will maximise the ability of the armed forces to successfully complete operations in single, joint and multinational scenarios. The ultimate goal is to have rapid, secure, positive identification of platforms, equipment or people throughout the battlespace. If the policy paper is successful, there should be coherent operator advice on Combat Identification for each component of the total capability.

Responsibility for taking the Policy Paper forward is clear

2.31 The Vice Chief of the Defence Staff has overall responsibility for taking the Combat Identification policy paper forward and requires quarterly reports on progress.

2.32 Under the policy paper, the Command and Battlespace Management programme is responsible for achieving a Combat Identification capability. It has charged the Combat Identification 1-Star Steering Group with responsibility for co-ordinating the Department's approach to achieving the aims of the policy paper and is chaired by the Director of Joint Warfare. The Steering Group's output will be to advise "on the required Combat Identification capabilities in terms of doctrine, equipment, and tactics, techniques and procedures". The Director of Joint Warfare is also responsible for ensuring that joint training incorporates Combat Identification. The Director of Equipment Capability (Command, Control and Information Infastructure) is responsible for ensuring a coherent Combat Identification equipment programme.

2.33 Specific tasks within the policy paper are delegated to the relevant bodies, who are represented on the Steering Group, as shown in **Figure 9**.

9 Delegated Responsibilities from the Policy Paper

Organisational responsibilities	Departmental Area	Likely areas of work
Policy	Vice Chief of the Defence Staff	Has overall responsibility for Combat Identification Policy.
Operations	Joint Commander	■ Responsible for operational policy.
	Joint Task Force Commander	■ Responsible for implementing policy.
Concepts and Doctrine	Joint Doctrine and Concepts Centre (JDCC)	Responsible for the development of joint concepts, joint operational and tactical doctrine, and the co-ordination of single service doctrine.
Equipment Capability	■ Capability Manager (Information Superiority)	■ Has overall authority across all services, equipment and capabilities.
	■ Director of Equipment Capability (Command, Control and Information Infrastructure)	■ Sets standards and framework to achieve integrated equipment programme.
Training	Directorate of Joint Warfare	Responsible for co-ordinating Combat Identification training requirements into Defence Exercise Programme.

Source: National Audit Office

The Department has a clear definition of Combat Identification and the required elements of the solution

2.34 The Department now has a clear definition of what Combat Identification is and what it aims to achieve. This should provide a basis on which decision making can take place. Combat Identification is a:

"[S]ystem of systems which aims to provide commanders with rapid, secure, positive identification of platforms, equipment and people in or approaching the Joint Operations Area." (UK Policy for Combat Identification - Chief of Staff Endorsement. July 2001, A-1.)

The three elements of Combat Identification are Tactics, Techniques and Procedures, Target Identification and Situational Awareness.

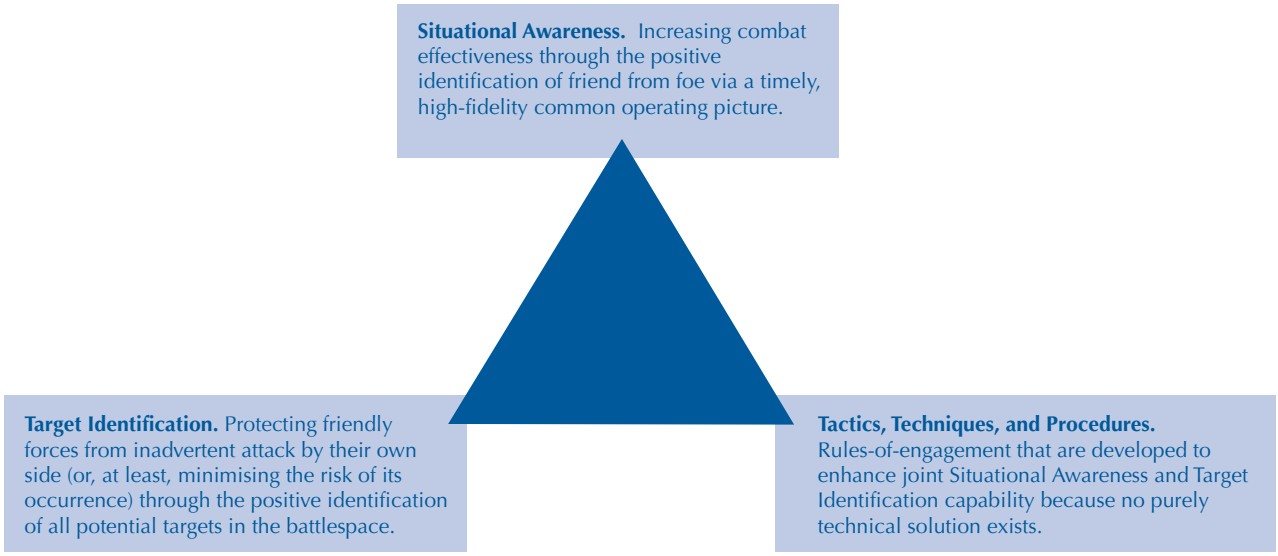
- **Tactics, Techniques and Procedures (TTPs)** are developed either by the individual services or jointly. They evolve from extant doctrine and from lessons learned in operations and exercises, and come in several general forms: they can be informal and developed in response to certain situations at all command levels; formal and particular to units or services; or formal and contained in standard operating procedures and laid down in doctrine. Tactics, Techniques and Procedures are important and will be retained even when an integrated technical solution is in place. Examples include painting inverted "Vs" onto platforms, flying national flags from antenna on tanks, or performing certain manoeuvres.
- **Target Identification (TID)** is a technical solution that aims to positively identify, with a high degree of confidence, any potential target in the battlespace. Ideally, Target Identification systems would be able to identify all platforms, identifying them as friend, foe or neutral. Target Identification systems often comprise "question and answer systems", which send out an electronic "question" to a potential target which, if fitted with a compliant transponder, will then reply to identify itself as a friend. The reply signals can be as simple as one meaning "I am a friend", or much more detailed including the platform's position or other battlefield information. The systems are relatively small and are usually added to existing platforms by simply "bolting them on", although system integration can be complex.
- **Situational Awareness (SA)** aims to develop a timely and full virtual picture of the entire battlespace, known as the common operating picture, built up from all available sources, including Target Identification and Tactics, Techniques and Procedures. The picture would be available to those commanders who require it for tactical, timely decision-making to occur. This means that commanders will be able to better understand the battlespace and make faster and more correct decisions on the basis of this information. Situational Awareness is illustrated in **Figure 10**.

10 Situational Awareness

Source: Ministry of Defence

2.35 The balance of these three elements in a Combat Identification solution will depend on the type of operation the Department is involved in, though currently, the solution is weighted in favour of Tactics, Techniques and Procedures as other elements are generally not fully operational yet. The Department intends to place more emphasis on Target Identification and Situational Awareness by developing and procuring more technical solutions and therefore redress the balance. A summary of the Combat Identification equation is shown in **Figure 11**.

11 The Combat Identification Equation



Source: National Audit Office

The Policy Paper has set broad priorities

2.36 The policy paper has established broad priority areas, which are summarised below. However, in line with Departmental practice, it has not set detailed priorities:

- Exploiting current Combat Identification capability through improved management in the battlespace.
- Setting standards and a framework to deliver a Combat Identification equipment programme and to develop technical solutions, for example, Target Identification.
- Developing joint doctrine.

2.37 The policy paper does not include either a firm budget or time commitment for delivering a Combat Identification capability. The 1-Star Steering Group is currently working to develop timescales in accordance with an action plan. The greater challenge for the Department is to identify the level of funding, given that the Department's accounting systems do not allow a figure to be placed on the amount of spending for related capabilities. Whilst the Department knows that it is currently spending £398 million in total on Combat Identification specific equipment and research programmes, it is unable to identify all of its Combat Identification-related expenditure, which reflects that Combat Identification is part of many other capabilities. Furthermore, many other capabilities, which will enhance Combat Identification once in service and other Combat Identification enablers, such as training or the drafting of doctrine, are in different budgetary areas. Hence, the Department's view is not to attempt to identify funding strands for all Combat Identification-related capabilities.

Part 3

The Department is taking forward its strategy on Combat Identification, but more is required

3.1 Part Two of this report discussed the new structures and new initiatives which have been set in place both within the Department and by NATO which have helped the Department to produce a policy and strategy for Combat Identification. This part of the report examines how far the Department has progressed in taking forward its strategy for Combat Identification. It finds that the Department has made an important start in a number of key areas but that it still has a significant amount of work to complete both within the United Kingdom and with NATO to ensure that the strategy is implemented in full.

The Department has recently adopted a strategy for taking forward its policy on Combat Identification

The Department is implementing its strategy using its Six Lines of Development

3.2 As discussed in Part Two of this report, the Department's Combat Identification Steering Group is taking forward its Combat Identification strategy using the Six Lines of Development. This is a technique that was initially developed by the Army as a means of taking forward a particular policy. The Lines of Development consist of the following headings:

- Concepts and Doctrine;
- Structures and Processes;
- Personnel;
- Equipment Capability;
- Training; and
- Sustainment.

3.3 The Department's actions to date in taking forward the Lines of Development have concentrated mainly on Concepts and Doctrine, Structures and Processes, Equipment Capability, and Training. As a result we have concentrated our examination in this report on these four Lines of Development.

The Department is putting in place the Concepts and Doctrine required for its Combat Identification strategy

The Department's Joint Doctrine and Concepts Centre is currently developing the doctrine for Combat Identification

3.4 A key action in taking forward any military policy is to ensure that the appropriate military doctrine is in place and that this doctrine has been applied in exercises. Military doctrine comprises a series of statements that demonstrate how the Armed Forces should be deployed, employed and recovered from operations. In the past, the Department did not lay down recognised doctrine and standards for Combat Identification. This was left to the discretion of the three services. In September 2001, the Department's Joint Doctrine and Concepts Centre (JDCC) published a revised version of Joint Warfare Publication (JWP) 3-00, *Joint Operations*, which contained a short section on Combat Identification doctrine. This document is designed to support the revised JWP 0-10, *United Kingdom Doctrine for Joint and Multinational Operations*, which was ratified on 14 December 2001 and is currently being prepared for publication. These papers will require Combat Identification to be considered when planning campaigns at the operational level.

3.5 The Department's Permanent Joint Headquarters (PJHQ) has been charged with co-ordinating an investigation aimed at identifying the shortfalls within the United Kingdom's tactical doctrine for Combat Identification. This will involve PJHQ producing a gap analysis based on returns received from the services' warfare centres.

This work is due to be completed by March 2002. The Department is also undertaking work to incorporate Combat Identification into the doctrine and the tactics, techniques, and procedures for each of the services. This work is ongoing and currently has no set deadline for completion.

3.6 The Joint Doctrine and Concepts Centre has also been charged with identifying where there are gaps in those areas where Combat Identification crosses boundaries between the different military environments, most notably in the littoral environment. This work is also due to be completed by March 2002.

3.7 NATO does not have a specific policy document on what it terms Identification. However, its work on this issue is now governed by the Defence Capabilities Initiative on Combat Identification that was described in paragraph 2.5. NATO also has a draft Military Operational Requirement on Identification and, as noted in paragraph 2.23, is currently working on producing an Operational Architecture for Identification. This document will provide the framework within which NATO nations should operate in respect of Identification.

3.8 The work on the Operational Architecture is being led by the NATO Identification Systems Co-ordinating Office. This office commenced this work in Spring 1999 and hopes to have it completed and to have had its paper ratified by NATO's Military Committee, which is the highest military authority in NATO, by Spring 2002. This work has only progressed slowly, partly because it is difficult to deliver the agreement of 19 nations to such a document, and partly because of a lack of resources within this office. At one time, three permanent representatives, including one from the United Kingdom, staffed the office. Currently, it only has one representative from the United States.

3.9 Once it has completed its work on the Operational Architecture, the office will produce the Systems Architecture for Identification which is due to be completed by the end of 2002. NATO will also continue to review and amend, as appropriate, its existing Standardisation Agreements and Staff Requirements which are applicable to Identification. Through the Joint Doctrine and Concepts Centre, the Department is making a significant contribution to NATO's development of its Operational Architecture.

3.10 The NATO Consultation, Command and Control Board, and the NATO Identification Systems Co-ordinating Office are responsible for implementing NATO's Defence Capabilities Initiatives on Identification and for taking forward a number of tasks which stem from the work on Identification. NATO's Conference of National Armament Directors (CNAD) is NATO's senior body dealing with production and logistics issues. It is inter alia responsible for identifying opportunities for collaboration between member states in the research, development and production of military equipment and weapons systems. This work can sometimes result in the CNAD taking forward programmes which impact on Identification issues, which can sometimes lead to overlap in NATO's work on Identification. We understand that the Department plays a key role in ensuring that one of these bodies always has the lead on Identification issues to ensure that NATO has a fully co-ordinated way forward on this subject and it should continue to do so.

Clear structures and processes are needed to enable the Combat Identification policy to be taken forward

Need for communication to the lower levels of the Department

3.11 Part Two of this report demonstrated the significant structural changes which the Department has introduced that have enabled it to develop its policy on Combat Identification in a clear and structured manner. We also found that despite the large number of stakeholders from the Department involved in taking forward the Combat Identification policy, the key stakeholders are generally satisfied that they are being kept well informed of developments in a timely manner and well appraised of what is required of them. The Department acknowledges that one of the key challenges it now faces is ensuring that the messages on Combat Identification are communicated successfully to the lower levels of the Department.

Challenger 2 Tank

There were some pockets of poor communication in taking forward the Combat Identification strategy

3.12 We examined how successfully key staff were being informed of progress and other developments which were taking place in taking forward the Combat Identification strategy. We found that generally recent progress has been good although there were a few places where a lack of communication had occurred. For example, we found that at the time of our audit, the relevant part of the Command and Battlespace Management area had not been informed of progress on some of the key Combat Identification capabilities. We also found that at the time of our meeting in August 2001, the Successor Identification, Friend or Foe Integrated Project Team had not seen the Combat Identification policy paper. These matters have now been rectified.

There is concern as to how Combat Identification solutions for armoured vehicles and the individual solder can be acted upon

3.13 Establishing and fitting a Combat Identification solution is generally more straightforward for the air and naval environments than for the land environment because of the generally smaller number of individual platforms involved. The Department has also acknowledged that it will be particularly difficult to ensure that a cost-effective solution is adopted to satisfy the Combat Identification requirements for armoured vehicles and for the individual soldier on the battlefield.

The Department has charged the Director for Command Control and Information Infrastructure with the long-term delivery of Combat Identification Capability

Current equipment projects which will enhance Combat Identification

3.14 The Department has a number of projects in train that will enhance its Combat Identification capability. These are the Successor Identification, Friend or Foe project, which will operate predominantly in the air environment and the Battlefield Target Identification requirement for the land environment. The Department also has a number of projects underway in the naval environment which will also enhance its Combat Identification capability.

Successor Identification, Friend or Foe

3.15 The Department is currently spending a total of £396 million on installing its Successor Identification, Friend or Foe system (SIFF) on a total of 40 platforms covering aircraft, including helicopters and fixed wing, naval vessels and other military equipment such as ground-based air defence systems. The Department has already let a number of contracts to install what is known as an Identification, Friend or Foe system, Mark 12, Mode 4 for the military sector and Mode S, which covers the requirements of the civil aviation sector. All the remaining contracts should be let by the end of

2002. The in-service date for the equipment is 2006 and it is due to be fully installed on all the platforms by 2010. New platforms which are being introduced into service are being delivered with the Mark 12 Modes 4 and S capability already fitted. An absence of Mode 4 capability to date has, however, had both cost and operational implications for the Department.

3.16 The Successor Identification, Friend or Foe system will work by enabling surveillance platforms (air or sea) or air defence equipment to identify a friend (aircraft or ship), which is fitted with the system, although not necessarily a foe, using a waveform question and answer system. This system works out to a range of 270 miles but the information is not encrypted to a high standard and there is a danger that it could therefore be corrupted by other forces. The introduction of SIFF will, however, enable the Department to meet the standards of identification now required by civilian aircraft rules and the current NATO Standardisation Agreement on Identification, Friend or Foe. The introduction of SIFF is replacing six different variants of existing Identification, Friend or Foe systems currently in service within the Department.

3.17 A NATO Working Group is now working to produce a Standardisation Agreement for a Mode 5 capability that would provide a significantly enhanced, encrypted Identification, Friend or Foe capacity. As part of its procurement of Mark 12 Mode 4, the Department is procuring transponders and interrogators which will have the capacity to be upgraded to Mode 5 relatively quickly. The Department is currently undertaking preparatory work in advance of producing a strategy, which would outline an approach to introducing a Mode 5 capability onto its platforms.

Battlefield Target Identification

3.18 The Department has spent some £7 million over the last ten years on research into land-based Combat Identification solutions. Initial efforts addressed near term quick fit solutions and Target Identification technology studies. More recent work has focused on supporting the work to develop the Standardisation Agreement for the Battlefield Target Identification Device (BTID). The Department has a budget of £2.4 million for risk reduction work to meet the NATO Standardisation Agreement for the ground environment. This work culminated in a successful trial of a prototype BTID system in September 2001. However, a proposal to equip an armoured brigade with BTID has not yet passed Initial Gate. Subject to such approval, the Department is confident that it will have an integrated BTID equipment which will be ready to participate on a planned United States-led NATO Advanced Concepts Technology Demonstration (ACTD) in September 2005. This will provide an opportunity for individual nations to demonstrate whether their Combat Identification equipment solution for the ground environment is compliant with the relevant NATO Standardisation Agreement. The Department is confident that its solution is already compliant.

The Bowman Radio System

3.19 A key programme in the Department's drive towards digitisation, which was discussed in paragraph 1.6, is the Army's combat radio system project (Bowman). This project will greatly improve Situational Awareness primarily in the land environment. It will provide a secure voice tactical data communications system for all three services in support of operations in both the land and littoral environments. Because of the very long delays on the programme, and the reopening of the competition, this project now has an in-service date of March 2004.

The Naval environment

3.20 The naval environment has a number of existing and current programmes which significantly enhance the Situational Awareness capability available to naval commanders. Naval vessels process considerable amounts of information about the environment in which they are operating from a wide range of sources including ships, aircraft and satellites. Tactical datalinks between ships can ensure that all ships of a particular force share a common tactical picture based upon these sources of information.

3.21 The Royal Navy currently has Link 11 fitted as standard, which is a system used by both the United States and more widely in NATO. The United States Navy is currently introducing Link 16 to its fleet, which meets the requirements of the current NATO Standardisation Agreement in this area. Link 16 is a system which provides a more sophisticated data picture than Link 11. Link 16 is also a more secure and faster system. A few UK platforms such as the Tornado F3 aircraft have Link 16 installed and the Department plans to expand this capability to include other aircraft, naval and air defence platforms as funding becomes available.

3.22 The Department is also working on introducing a Co-operative Engagement Capability (CEC). This is also an American system which enables platforms which are in sight of each other to exchange a range of information on other vessels, aircraft and other targets very quickly. It is a system which is interoperable with Link 16. If funding is approved, this system is planned to be introduced onto Type 23 frigates from 2007 and later fitted retrospectively to the new Type 45 destroyers from 2012. CEC will then be fitted retrospectively to other vessels in the fleet as funding permits.

Type 23 Frigate

Need to identify the remaining capability gaps within Combat Identification

3.23 Under the terms of the strategy agreed by the Combat Identification Steering Group, the Director of Equipment Capability (Command, Control and Information Infrastructure) is charged with identifying the performance requirements of the armed forces to enable him to develop a coherent long term (ten-year) equipment programme for Combat Identification based upon those various requirements. The advances in Combat Identification capability provided by the projects identified above will still leave gaps in the Department's Combat Identification capability. While the Department has recognised the gaps at a high level, the Director of Equipment Capability (Command, Control and Information Infrastructure) has commissioned follow-on research work to identify the detail of these gaps as part of the Department's overall Applied Research Programme known as Project 59. This work is being co-ordinated by QinetiQ (formerly part of the Defence Evaluation and Research Agency) based at Malvern.

3.24 The first stage of this project is to produce, by March 2002, a gap analysis on the Department's Combat Identification capability for each environment based on the types of operations the Department is likely to be involved in. The remaining elements of this programme are to identify Near Term (i.e. to 2010) and Far Term (i.e. to 2015) systems architecture for Combat Identification. This work is due to be completed by September 2004. The Department currently has four Applied Research Programmes underway which have a direct bearing on Combat Identification **(Figure 12)**.

3.25 The Combat Identification Action Plan noted that the Department was looking to achieve some "quick wins" in planning the equipment programme for 2002. However, to date, the Department has not been able to identify any such proposals for consideration in the current equipment planning round.

12 The Department's Applied Research Programmes that impact on Combat Identification

Package	Content of Package
Package 13 (Combat Identification - Project 59)	This programme is initially designed to produce a gap analysis on the Department's current equipment for Combat Identification. The second phase is to produce a Near Term and Far Term Operational Architecture for Combat Identification.
Package 7 (Direct Battlefield Engagement)	This package provides UK resources to support the Combat Identification Working Group, which is developing NATO Battlefield Target Identification and Dismounted Soldier Identification agreements.
Package 5 (Identification Sensors Technology - Project 7101)	This project is primarily aimed at identifying a number of different techniques for identifying types of aircraft by, for example, identifying particular aircraft by their specific engine noise.
Package 14 (Air Studies - Project 21)	This project is charged with examining, by the use of a simulation package, the operational effectiveness of a range of Combat Identification techniques of the sort being developed in Package 5. This work is based exclusively in the Air environment.

Source: National Audit Office

The Department has started to identify the training required for Combat Identification

Responsibilities set out in the Policy Paper

3.26 Under the requirements of the policy paper, the Director for Joint Warfare is responsible for co-ordinating the Combat Identification training requirements of the Commanders-in-Chief and the Chief of Joint Operations into the Department's Defence Exercise Programme. He will exercise this responsibility through the Defence Exercise Co-ordination Group.

3.27 The Chief of Joint Operations also has specific responsibilities for training under the aegis of the Combat Identification policy paper. He is responsible for the planning and execution of joint training (known as Tier 3 training). This covers the development and conduct of individual joint warfare training and determination of the operational level military standards required for the participation in joint, or potentially joint, operations and assessing those standards on joint operations and Tier 3 exercises. Finally, the single service commands and the Director of Special Forces are responsible for Collective and Individual training (Tiers 1 and 2). The Steering Group's Action Plan does not, to date, give an indication of any specific activities which are being undertaken to ensure that all these training responsibilities are being taken forward.

Application of the doctrine in exercises is being examined

3.28 The Department is looking to enhance a joint awareness of Combat Identification issues and to establish how its joint doctrine for Combat Identification operates in the battlespace. Primarily, the Department will be using exercises run by Permanent Joint Headquarters and the Chief of Joint Force Operational Readiness and Training to achieve these objectives. The first opportunity for assessing the new doctrine in action was the Saif Sareea II exercise held in Oman at the end of 2001. The lessons identified from this exercise started to become available in February 2002.

3.29 The Department plans to participate in the United States Joint Combat Identification Evaluation Team exercise in April 2002. As noted in Part One of this report, this is the Department's main exercise that is planned specifically to test joint Combat Identification procedures and equipment. However, because of the long lead times involved in planning such exercises, it is now too late to change the nature of the exercise to take account of the United Kingdom's recent changes in Combat Identification doctrine and related areas. The first such opportunity will arise in the exercise planned for 2004.

Appendix 1 Previous Parliamentary Interest in Combat Identification

Committee of Public Accounts, The 1990 Statement on Major Defence Projects and the 1989 Summary of Post-Costing Activity, 10th Report, Session 1992-93

"(iii) NIS (Q&A)

23 The NATO Identification System Question and Answer (NIS Q&A) is a communication and electronic system to be fitted to equipment to permit the identification of friendly forces whilst operating in a potentially confused environment. Its absence is the most serious deficiency in NATO's air defence capability.

24 The need for such a system was established by NATO in 1971. We asked the Department why it had taken so long to develop and whether, in the light of experience in the Gulf where the lack of an effective system resulted in casualties, the project was now being approached with a renewed sense of urgency. The Department told us that the development of NIS (Q&A) was intrinsically technically very difficult if its operation was not to compromise the position of our own forces. This had led to differing views among the national governments involved about the efficacy of the different technical solutions. However, the Department assured us that following the Gulf conflict the NIS (Q&A) requirement was now receiving high priority in both Europe and in the United States. The objective was to agree an acceptable system for all nations to use and it was towards this that the United Kingdom was working.

25 The procurement arrangements for NIS (Q&A) were based on the "common module" concept whereby partner countries develop, to common standards of interoperability, assigned modules. This unique arrangement was necessary because the varying capabilities of the individual users militated against a common equipment. However, commonality of modules permitted the collaborative development of the system. For example the United States equipment would not have included the radar mode element required by most of the European partners, but whilst producing an equipment of a lower capability, this will not affect the commonality of the basic system. We questioned the Department about the continuing potential of these "common module" arrangements for both NIS (Q&A) and other projects. The Department told us that it was difficult to comment on the continuing applicability of these arrangements to NIS (Q&A) until revised national and common requirements had been agreed. However, in general terms the Department acknowledged that the "common module" approach was a particularly useful procurement technique, although its application to other projects may be limited by the very high commonality requirements for the equipments being procured nationally.

Conclusion

26 In the light of the experiences of the Gulf we expect to the Department to redouble their efforts to secure an agreed approach to procuring an Identification Friend or Foe system. We also recommend that the Department should establish whether there is further scope for using the Common Module approach to collaborative procurement as originally proposed for NIS".

Government Response to the 10th Report of the Committee of Public Accounts, Session 1992-93

"137 MoD notes the Committee's conclusion. The European Allies and the United States are engaged in a concerted effort to ensure that future identification systems take account of the lessons learnt in the Gulf War. Contracts have been placed by the United Kingdom, France and Germany with separate national prime contractors to study options on the way ahead. The three contractors are working in collaboration with one another, and the results of these studies will enable us to influence and consider fully the United States concept study.

138 The benefits of 'common modules' are reduced development costs for participants, longer production runs, a reduced logistic burden and the ability to alter configuration to suit individual platforms. These cost and timescale advantages may, in part, be offset by the increased overall cost incurred through the management of a complex collaborative project, a lack of flexibility in design and, in an international programme, the possible need for participating nations to underwrite cost growth. The advantages and

disadvantages will be considered once the outcome of the European and United States studies mentioned above are known.

139 MoD has also tasked the Defence Research Agency to assess the technical solutions and options for a land-based battlefield Identification Friend or Foe system. The study will identify the best short-term option".

House of Commons Defence Committee, The Implementation of Lessons Learned from Operation Granby, 5th Report, Session 1993-94

"Identification Friend or Foe

76 In a fast moving battle and in peacekeeping operations it is essential to be able to identify friend or foe quickly and with certainty. As we noted in our Report on United Kingdom Peacekeeping and Intervention Forces, without effective IFF equipment there is either an unacceptable risk of fratricide or procedural controls such as restricting flights to particular areas and corridors have to be introduced. Procedural controls, however, place severe limits on the way aircraft and air defence missile systems can be used, reducing their operational flexibility and effectiveness.

77 The IFF equipment fitted to much of the RAF's front line and support aircraft before Operation Granby was known since 1971 to be deficient and in need of replacement. An attempt to develop a common secure and reliable identification system within NATO collapsed in 1991 when the NATO countries involved, after years of delay and expenditure by MoD approaching £50 million, could not agree on a common approach. At the outset of Granby, therefore, the RAF was still using equipment that was deficient and which was not interoperable with the equipment used by its allies. The RAF therefore purchased and rapidly fitted the Mk XII IFF equipment developed privately (i.e. with no help from MoD) by COSSOR Electronics in the United Kingdom and by other nations.

78 The Mark XII was therefore forced upon the RAF as an interim solution. MoD are now assessing the way forward. The three main options now are:

- to purchase Mk XII and fit it to remaining platforms;
- to develop an improved Mk XII which could be in service by 2002;
- to develop a new system - the Next Generation IFF (NGIFF) by the year 2005.

A key factor in the decision will be the approach adopted by our potential allies and particularly the US Navy. A decision is due on this imminently.

Battlefield Identification Friend or Foe

79 During manoeuvre battle there is an increased risk of Blue on Blue engagement, i.e. mistakenly being attacked by friendly forces. There were four occasions when British soldiers were killed or injured by friendly forces during Operation Granby. The most serious occurred in February 1991 when nine soldiers were killed when a USAF A-10 aircraft targeted their Warrior vehicle. In order to prevent such occurrences a wide range of Battlefield Identification Friend or Foe options were trialled in the Gulf. In addition MoD told us that the Defence Research Agency has been tasked to examine the advantages and disadvantages of different types of combat identification systems. Secondly, the Ministry are consulting Allies to establish whether there could be procedural improvements to prevent Blue on Blue engagements.

80 **Up to now the attempts to develop an effective IFF system have been a debacle. The United Kingdom spent £50 million on developing a system that was abandoned and interim equipment had to be fitted for Operation Granby. As we understand it, an effective solution is technically feasible but requires allied nations to agree a common approach. We expect MoD to play a proactive role in securing the agreement, not least because of the recent tragic losses of British servicemen as victims of friendly fire. It is disappointing that a next generation equipment would not be ready before 2005. Any further delay could not be tolerated. As regards Battlefield Identification Friend or Foe, we support any move that would help to prevent "Blue on Blue" engagements and we trust that the MoD will accord the highest priority to this work, which must be closely co-ordinated with that on Identification Friend or Foe equipment for aircraft so that systems that are fully compatible and effective are produced…**

82 **We also welcome the speed with which aircraft were upgraded before the conflict. We are disturbed, however, that so much electronic counter-measure and IFF equipment had to be updated. We trust that MoD will learn the lesson from this and will ensure that sufficient investment be made in key equipments to keep them up to date. The shortcomings of IFF equipment must be addressed as a matter of the greatest urgency".**

Government Response to the 2nd, 3rd, 4th and 5th Reports from the Defence Committee, Session 1993-94

"20 A key requirement for any IFF system is interoperability with our major allies. We are currently involved in studies of the various options with our major European allies and the US are conducting their own studies. As previously stated in the Government's response to the Committee's report on UK Peacekeeping and Intervention Forces, the Government is doing everything possible to expedite a decision. The US are not expected to be in a position to make a formal decision until later this year. The Government is fully seized of the need to do everything possible to prevent Blue on Blue engagements and continues to accord a very high priority to work on Battlefield Identification Friend or Foe (BIFF). The IFF and BIFF programmes are closely co-ordinated although, given their different technology, solutions are likely to be available in different timescales".

Glossary

This glossary provides definitions of terms used in this report that reflect the National Audit Office's understanding. The Ministry of Defence's definitions can be found in its UK Joint Warfare Publication 0-01.1, *United Kingdom Glossary of Joint and Multinational Terms and Definitions,* 3rd Edition, 2001.

Battlefield Target Identification Device (BTID)	A requirement for ground-to-ground *Target Identification*.
Combat Effectiveness	The key to achieving military success in the shortest possible time thereby minimising casualties.
Combat Identification	Aims to provide assurance that units have sufficient confidence to be able to distinguish friend from foe during operations. It comprises *Target Identification, Situational Awareness,* and *Tactics, Techniques, and Procedures*.
Command and Battlespace Management (CBM)	A change management programme designed to improve the command and management of information in the battlespace.
Crypto	Code for concealing messages.
Defence Capabilities Initiative	A series of planned improvements to Alliance capability, with particular emphasis on *interoperability,* announced by NATO at its Washington Summit in April 1999.
Digitisation	The process by which advances in digital technology are incorporated into a warfighting capability.
Dismounted Soldier ID	A requirement for *Target Identification* for the individual soldier on the battlefield.
Equipment Capability Customer	The Department's customer with responsibility for developing and managing a balanced and affordable equipment programme. It also has through life responsibility for equipment capability.
Fratricide	The inadvertent destruction of friendly or allied forces during operations.
General War	A conflict between major powers in which vital interests, perhaps even a nation's survival, are at stake.
In-Service Date	The point at which the military capability provided by a system is assessed as being available for operational use.
Interoperability	The ability of military forces and, when appropriate, coalition forces, to train, exercise and operate effectively together.
Joint Warfare Publication (JWP) 3-00	Provides guidance on the planning and conduct of operations to the deployed staff within a joint task force headquarters focused at the *operational level*.

Lines of Development	A management tool for developing overall capability by bringing together the six "lines" of concepts and doctrine; standards, resources, and planning; equipment capability; sustainability; training development; and people.
Littoral	Coastal sea areas and that portion of land that is susceptible to influence or support from the sea.
Low Intensity Conflict	A conflict characterised by constraints on weapons, tactics, and force, which can encompass counterinsurgency, counter-terrorism, and peace enforcement.
Mark 12	IFF capability comprising Mode 4 IFF, which allows for encrypted (coded) interrogation of platforms to indicate those that are friendly.
Mode S	IFF capability that is required to meet civilian air traffic regulations. It provides information about aircraft speed, height, and direction.
Mode 5	An improved IFF waveform, which is fully encrypted to allow interrogation of platforms to identify those that are friendly.
Operational Architecture	Describes the tasks, operational elements, and information flows required to support a warfighting function.
Operational Level of War	Campaigns are planned at this level and link the objectives of the *strategic level* to the actual warfighting, which takes place at the *tactical level*. The campaign is the responsibility of a Joint Commander.
Peace Support Operations	Conducted by the military in conjunction with diplomatic and humanitarian agencies by placing an emphasis on consent among warring factions.
Rules of Engagement	Directives issued by commanders to specify limits under which forces can initiate and continue combat engagements with an adversary.
Situational Awareness	The operator's perception of what is happening around him in the battlespace.
Standardisation Agreement (STANAG)	The record of an agreement among some or all NATO member nations to adopt like or similar equipment or procedures.
Strategic Level of War	The level at which military force is employed to fulfil the aims of policy. Strategy is developed by the Chiefs of Staff under the direction of the Secretary of State.
Successor Identification, Friend or Foe (SIFF)	The United Kingdom's programme to implement *Mark 12, Modes 4 and S* IFF with the potential for upgrade to *Mode 5*.
Systems Architecture	Describes the systems and interconnections supporting a warfighting function.
Tactical Datalinks	Links that connect military platforms by sharing data through formatted display messages.
Tactical Level of War	Battles and engagements, which are conducted by land, air, and maritime forces, are fought at this level as part of the joint campaign.
Tactics, Techniques, and Procedures (TTPs)	Developed to enhance joint *Situational Awareness* and *Target Identification*.

Target Identification	A technical solution that can positively identify any potential target within the battlespace.
Tempo	The rate of friendly military activity relative to that of an adversary.
Transponder	A receiver-transmitter that will generate a reply signal upon proper interrogation.
United Kingdom Doctrine for Joint and Multinational Operations (UKOPSDOC)	The United Kingdom's primary *operational level* publication available to the operational commander and his staff in the planning and execution of operations.
"Weapons Hold"	A rule of *engagement* that only allows personnel handling weapons to fire if they feel they are under direct threat.