

Combat Identification

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Introduction

Intellect is the UK trade association for the IT, telecoms and electronics industries. Its members account for over 80% of these markets and include blue-chip multinationals as well as early stage technology companies. These industries together generate around 10% of UK GDP and 15% of UK trade. Intellect provides a singular voice for these industries across all market sectors, and is a vital source of knowledge and expertise on all aspects of the technology industry.

This paper has been written by a working group from Intellect's Battlespace Systems Council, comprising industrial representatives from technology companies active in UK defence & security. The working group formed to address specific issues raised in the Public Accounts Committee's 2007 report (*Progress in Combat Identification*), and subsequently broadened its investigations to include all relevant aspects of UK Combat Identification.

Intellect welcomes the cooperation of the UK Ministry of Defence during this paper's development – in particular Capability Manager (Information Superiority) and his team, who have provided significant insights. Their willingness to engage, discuss and share information where appropriate has greatly assisted the development of this paper, and ensured industry is better informed than it would otherwise have been. The views expressed in this paper remain, however, solely those of Intellect.

Definition: *Combat Identification is the process of combining situational awareness, target identification and specific tactics, techniques and procedures (TTP) to reduce the incidence of fratricide and increase the operational effectiveness of sensor and weapon systems.*

Intellect's position

Britain's Defence – both now and in the future – requires close cooperation between different UK services and coalition allies, and the nature of operations increasingly involves chaotic and diverse operational circumstances. It is, sadly, an inevitability of modern warfare that with this cooperation comes the risk of fratricide. The UK's attempts thus far to develop a Combat Identification (C-ID) capability in order to lower this risk and improve operational effectiveness have been fragmented, and constrained by complexity, scale and the need for overall cohesion.

A UK C-ID capability is likely to be a system of systems that has different solutions optimised for the above water, below water, air, littoral and land environments. It will include technology assets alongside human factors including tactical, technique & procedural elements. Ideally, these will form an active tactical target identification system which positively identifies friend from foe from non-combatant, with a low level of latency. It is this latency which distinguishes it from strategic Situational Awareness (SA) capability, though some sharing of common identification assets is to be expected.

Intellect believes that an opportunity to move C-ID forward exists in the form of MoD's Network Enabled Capability (NEC) architecture, which is currently under development. The creation of this architecture (under the Key Systems Adviser (KSA) initiative) represents a critical nexus for the UK's ability to develop C-ID – if the architecture is designed to support the integration of a range of interdependent assets into a federated system of systems, it will form an effective supporting infrastructure for the development of future C-ID capability. If, however, this capability is not adequately nurtured within the architecture, industry believes the pervasive technical and interoperability requirements of C-ID will be extremely difficult to fulfil – retrofitting a coherent solution at a later date may not be a practical or cost-effective option.

Intellect believes that industry can help MoD deliver an effective and efficient capability, and is determined to leverage suppliers' experience and expertise to help support its development. This paper sets out Intellect's views on the need for and challenges around a coherent UK C-ID capability, and offers some recommendations which industry believes can help make progress in this important and sensitive area. These views are intended to begin a dialogue between industry and the MoD – including the incoming Key Systems Architect(s) – on how to develop effective and efficient Combat Identification for UK forces.

The need for Combat ID

Summary of known UK and US friendly fire incidents, 1991-present:

<i>Operation</i>	<i>Killed</i>	<i>Wounded</i>	<i>Materiel Damage Incidents</i>
Desert Storm/GRANBY <i>January-February 1991</i>	47	92	34
Enduring Freedom/HERRICK <i>October 2001-May 2002</i>	21	22	7
Iraqi Freedom/TELIC <i>March 2003 - April 2003</i>	26	102	26

According to joint US-UK analysis, the incidence and casualty rate of friendly fire has remained reasonably constant in proportional terms, whilst the circumstances contributing to fratricide have varied across the different operations included above. Delving deeper into this analysis, cross-service incidents (especially Air-Ground) and incidents involving US fire were a significant proportion of UK casualty figures.

The analysis above is, however, not as complete or reliable as it could be, and suffers from the lack of a comprehensive recording and analysis system for both combatant and non-combatant coalition forces. Conclusions drawn from a solely UK focused database will be unreliable because of the significant effect of US-UK friendly fire, for example. The ability to understand and assess comprehensive fratricide data is an irreplaceable part of developing future C-ID solutions, and the Public Accounts Committee (PAC) accordingly recommended the establishment of a fratricide database, to include allied forces and non-combatants, in both 2002 and 2007. Intellect echoes this recommendation.

Intellect's members understand that in the complex conflicts the UK has undertaken with its allies the risk of friendly fire can never be completely extinguished. Industry is not in a position to establish what an acceptable level of fratricide might be for the UK, or to judge what level of friendly fire is inevitable in modern conflict. What is clear is that the current incidence of fratricide has a wider effect which the PAC, amongst others, believes needs to be addressed.

Fratricide has a disproportionate impact in terms of operational effectiveness, through the adoption of prescriptive processes and measures, lost tempo, and morale within the forces. It also has a unique and significant resonance in the wider environment, where each incident further focuses public, political and media attention on the perceived failing of MoD and industry to develop a solution.

Combat Identification is therefore both a practical and a reputational problem for UK Defence. Industry's perception, however, is that at present the development of a comprehensive C-ID capability – incorporating equipment, training and procedures across coalition forces – is not a high priority for UK MoD.

This is partly because of a focus on operational concerns which are perceived to be more urgent. In any conflict, force protection is rightly high on the agenda, and outputs from the current Equipment Programme (EP) and Urgent Operational Requirement (UOR) procurement channels currently reflect this priority in support of ongoing operations in Iraq and Afghanistan. It is industry's view, however, that a greater priority should be given to the future development of an overall C-ID capability as part of force protection, and in keeping with MoD's commitment to safeguard the personnel under its charge as far as possible.

Whilst industry fully appreciates that technology is but one part of overall C-ID capability, and must be harmonised with joint training and suitable practices, suppliers will inevitably have a key role to play in the development of any future solution. Intellect is determined to support and help coordinate the development of C-ID, by facilitating industrial cooperation, engagement with MoD and the Armed Forces, information sharing and the spread of domestic and international best practice.

The current situation

Currently, technological aspects of Combat ID capability are typically provided by co-operative systems sharing information. Fundamentally there are 3 different approaches:

- **Interrogator/Responder Systems:** A target (or target area) is interrogated and compatible transponder systems reply. Examples include Radio Based Combat Identification (which uses US SINCGARS-compatible equipment), **Battlefield Target Identification Device (STANAG 4579)**, and Inverse Mode5/S.
- **Blue Force Tracking (BFT):** BFT systems share positional information, typically GPS, across a battlefield C2 network or other bearers.
- **Non Co-operative Target Recognition (NCTR):** Non-co-operative systems operate independently to ascertain whether a target is friendly - e.g. Synthetic Aperture Radar or Burst Illumination Laser with assisted target recognition.

It is important to clarify that the UK does have a significant number of programmes and capabilities designed to contribute to Situational Awareness (SA), but the specific latency requirements and level of granularity required by an effective C-ID solution are not typically found within these broader SA capabilities. The UK's SA programmes and assets are, however, likely to be able to contribute in part to the development of a C-ID solution.

Thus far, C-ID systems have typically been deployed in a fragmented manner - in Iraq, for example, seven incompatible BFT systems were fielded at one stage, and in Afghanistan 19 BFT systems were deployed.

As a consequence, the maturity of systems deployed also varies. In the air and maritime environment Identification Friend or Foe (IFF) transponders and standards are well established in both the commercial and military sectors. In the ground and air-ground environment, however, Coalition IFF or C-ID systems are not widespread. Although some common standards have been agreed and successfully demonstrated, they have yet to be fielded.

In a number of cases, the need to distinguish friend from foe has been partially addressed through a range of interim and makeshift solutions, including beacons, visual panels, and procedural measures.

The UK position

In the UK, true Combat ID is a cross-cutting capability, which would require co-ordination across a number of Defence Lines of Development (DL0Ds), including 7 of the 11 Directors of Equipment Capability (DECs). Capability Manager (Information Superiority) is the Senior Responsible Owner for Combat ID.

Since the Public Accounts Committee's 2007 report some progress has been made, including:

- deployment of Ground Asset Tracking System (GrATS)
- deployment of Helicopter ATS BFT systems
- issue of an Urgent Operational Requirement (UOR) for Enhanced Low-level Situation Awareness (ELSA) in 2007 to provide an interim BFT solution for Afghanistan (likely to be a Personal Role Radio/GPS solution)
- Improved Air-Ground secure radio links, targeting pods and full motion video
- deployment of C2 networks, such as Bowman, improving awareness of blue force disposition

The JDN Backbone programme, which has just been postponed till late 2009, will provide tactical datalinks such as Link 11, 16, 22, VMF, HeATS, GrATS and Bowman.

A requirement for a Battlefield Target Identification System (BTIS) – managed by the Medium Armoured Systems IPT – was due to undergo initial gate approval in December 2007. Industry does not believe this has taken place, and some believe this pause is related to the concurrent delays to the publication of Defence Industrial Strategy v2 and Planning Round '08.

The Future Infantry Soldier Technology (FIST) programme is also slated to include Personal Role Radio/GPS situational awareness and/or BFT capability. Main gate approval is awaited.

The US position

The US currently has 12 separate non-interoperable BFT programmes with over 50,000 deployed systems. This is expected to grow to around 250,000 systems by 2015, with direction from the OSD to make them interoperable or phase them out.

The US is pursuing both BTID and Radio Based Combat ID/BFT Systems. In the US Army, Force Battle Command Brigade and Below (FBCB2) has a BFT capability which operates over either Enhanced Position Location Reporting System (EPLRS) radio network or commercial satellite. Radio Based Situational Awareness programme extends thus down to individual vehicles using VHF only.

The US Marines Command and Control Personal Computer has a BFT capability, and Joint Battle Command-Platform software will be introduced to connect the Army FBCB2 BFT and Marine BFT systems.

Key Activities

- *CCID Advanced Concept Technology Demonstration 2001-date – US JFCOM and NATO Allied Command Transformation.*
- *CCID Exercise URGENT QUEST – 2005 (ground and air-ground interrogation-based system & BOLD QUEST - 2007 (air-ground interrogation-based and networked SA systems).*
- *CCID Exercise NEXT QUEST - 2009 (networking sensor and SA systems).*

Challenges

Combat Identification doesn't come in a box – it is not an isolated asset that can be easily procured. The development and deployment of a future UK Combat Identification capability will require a harmonization of technology, TTP and management, together with the integration of a large number of legacy and new systems. There are a number of attendant challenges which must be understood and addressed.

Stakeholder complexity¹: The number of stakeholders who must be involved in the provision of effective C-ID in the UK is significant. Development of UK C-ID potentially requires a joint effort between services, allied forces, DECs, DE&S, DLoDs, intelligence agencies, funding authorities, research bodies and industry. Resulting issues are likely to include:

- **Ensuring interoperability:** between services, agencies and allies
- **Governance:** ownership and management of capability development and deployment
- **Funding:** C-ID requirements are not currently included within EP or UOR capabilities under procurement. No comprehensive C-ID budget line currently exists
- **Design:** including ownership and refresh of architectures and standards
- **Through-life support:** responsibility for ongoing maintenance, support and replacement

¹ Members believe that – by way of example – the Possible Future Purchase Notice No:CA/C/00128 for a Non Co-operative, Enhanced Combat Identification (ID) Devices is evidence of a need for greater coordination of apparently disparate multinational lines of development, financial control and priority

- **Dependencies:** C-ID depends on, for example, the provision of sufficient situational awareness within a suitable timeframe
- **International dependencies:** the overwhelming need for interoperability with allied forces has disincentivised many nations from developing C-ID solutions until the US (in particular) commits to a specific approach

Operational complexity: The process and training elements of Combat Identification are as crucial as the technology which enables it, and must be developed in step. In addition, C-ID must operate effectively in a variety of operational theatres with wildly varying characteristics.

Technological evolution: The pace of change in many supporting technologies is rapid, and the pace with which hostile forces can implement countermeasures can be equally rapid. For bureaucratic, political, and financial reasons, however, the roll out of improved component technologies can often be somewhat slower.

Legacy systems: The development of C-ID capability will need to include the incremental upgrade of a broad range of legacy platforms and systems to bring them within the capability envelope.

Technical: Some technical aspects are currently available and serve well in the scope for which they have been designed (e.g. IFF), but this is by no means universal. Issues include:

- Incompatible implementations
- The capability of technology to differentiate reliably between items
- An ability to operate independently from supporting infrastructure
- Significant demand for bandwidth
- Low latency in interrogation systems compared with BFT radio and satellite networks
- Insufficient connectivity of radio-based networks (e.g. Bowman, FBCB2)

Enemy action: Technically capable enemies will seek to exploit and manipulate C-ID systems

Public and political scrutiny: Intense wider interest in C-ID as a means of preventing fratricide is inevitable, and is likely to be unbalanced – focusing for example on technological aspects. The seeming ubiquity of complex and related technology like satellite navigation and mobile communications has raised public expectations and consequently lowered political tolerance of – perceived – technological failures in the military.

Willingness: Industry perceives that C-ID is often placed in the “too difficult” box because of the scale and complexity involved. Current operational contexts have also, rightly, focused attention on critical immediate needs - force protection against Improvised Explosive Devices, for example. Some willingness to improve TTP in the short term has been evident in order to protect forces on operations, but the development of a complete and integrated capability will require a significant commitment from UK Defence management and leadership.

Quantification: Establishing a “business case” for Combat ID is technically difficult, as well as being politically and morally perilous. Typically, analyses are based on assessments of cost vs benefit, but in this case the scale and likely difficulty of corralling all the elements of a C-ID capability means that a solution is unlikely to be cheap. Conversely, the quantifiable benefit of developing such a system may be relatively low – warfare carries a risk of death and collateral damage that cannot be entirely eradicated irrespective of the money invested.

The “business case” for C-ID must therefore recognise factors other than replacement or compensation costs for loss or damage of personnel and materiel, and these costs must be quantified. These factors include, for example, how the perceived failure to protect forces adequately affects morale and recruitment, or how a comparatively backward capability impacts relationships with allies.

Commercial and contractual: A cross cutting capability across many different procurement projects will need to be contracted for within each one, taking account of (for example) resulting dependencies between suppliers.

Interim measures: Small scale procedure-based approaches to target acquisition and confirmation have offered minor improvements in recent operations. A more confused or dynamic battlespace will, however, quickly expose the inefficiencies of a partial or interim solution which lacks technological support and integration into a wider C-ID capability.

The opportunity for action

The size and complexity of Combat Identification as a problem and as a solution have prevented any single programme or supplier being able to grasp it in full. Any implementation in the near term is unlikely to solve the totality of the problem – the goal must be for a succession of incremental improvements across the stakeholder base, seeking to produce a family of integrated solutions spanning the different Defence Lines of Development.

Intellect believes that in order to meet the various challenges above – using an incremental and best practice approach – a programme management view is needed to enable the many contributing programmes to be integrated into a coherent and interoperable capability supported by an overall architecture. This will include specific, funded and implemented technical and operational measures.

MoD's decision to create and own an NEC architecture is welcome, and in industry's view is an important milestone for future C-ID capability development. As the programme and architecture develop, suppliers will be able to recognize where industrial engagement and capabilities can add value, understand how different systems and capabilities can integrate, and identify opportunities for innovation and efficiency.

With allied fire playing a significant role in current levels of fratricide, not only must MoD be constantly monitoring relevant overseas developments, but industry must be able to respond to changes in requirement in short order. An effective architecture will facilitate rapid reaction and adaptation of UK capability when changes in allies' systems or operating procedures necessitate adjustments.

This will only be possible, however, if the architecture's development pays due regard to the specific likely needs – including for example bandwidth needs – of a C-ID capability. The NEC architecture must recognise the need for a coherent capability integrated into a range of contributing programmes - future C-ID could be stillborn if the infrastructure is not in place to support it.

Recommendations

Intellect's working group recommends the following measures to MoD as a means of moving forwards. Industry is keen to help explore and implement these recommendations in partnership with Government.

Recommendation 1 – cost-benefit analysis

MoD should undertake a clear cost-benefit analysis for the development and support cost of a UK C-ID system, conducted across DLoDs in order to assess increased costs in e.g. training or equipment against increased operational benefits and morale.

Recommendation 2 – road map

Working with industry, MoD should develop a "Road Map" of existing and future systems with some C-ID capabilities (including both EP and UOR programmes), outlining how they can be integrated into a cohesive solution. This would provide clarity, governance, a forward migration plan for legacy systems, and inform the development of the NEC architecture.

Recommendation 3 – industrial engagement

Industrial engagement in relevant working groups needs to be broadened, including:

- EC CCII interoperability work being undertaken in concert with QinetiQ and DSTL and in liaison with the US Department of Defense through TTCP².
- IPT working group - include leaders of other relevant IPTs as well as industry

Recommendation 4 – framework programme

A joint MoD-industry framework programme of prototyping, experimentation and testing needs should be established to assess how programmes, assets and emerging technologies can be effectively integrated into a C-ID capability. As a subset of this, MoD and Intellect should establish an industry forum for relevant C-ID technologies to broaden understanding of available and deployed C-ID technology across all lines of development.

Recommendation 5 – contributing programmes

At the appropriate time, MoD commercial arrangements should place firm integration and interoperability requirements on procurement programmes identified as contributing to the C-ID capability, including fielding and deployment of common standards.

Recommendation 6 – JSP777

Following its upcoming renewal, JSP777 must recognise that most, if not all, systems will contain fragments of a holistic C-ID solution; and those fragments of current and envisaged programmes (across DLoDs) that impact C-ID components must be drawn together and coordinated as a single entity.

Recommendation 7- user interface

Moving forwards, MoD C-ID development should explore a coherent and universal interface, to ensure a common user experience despite the incorporation of a range of underlying technologies.

Conclusion

This paper is not a “silver bullet” which will solve the Combat Identification conundrum, just as no single system can be the answer. Challenges which exist around interoperability, interdependency and scale are substantial and require coordinated and incremental action.

The recommendations above suggest how UK Defence can prepare the ground for future C-ID capability development. Intellect believes that the NEC architecture’s potential as a framework for an integrated C-ID solution should not be wasted, and that a significant opportunity exists to move forwards.

Intellect is keen to continue developing the ideas outlined in this paper, and looks forward to engaging further with MoD and others to make progress. Intellect and its members remain committed to bringing industry’s expertise and experience to bear on this issue, and to helping MoD exploit this opportunity for the good of UK defence.

² The Technical Cooperation Programme