



National Audit Office

**MINISTRY OF DEFENCE**

Delivering digital tactical communications  
through the Bowman CIP programme

LONDON: The Stationery Office  
£11.25

Ordered by the  
House of Commons  
to be printed on 20 July 2006

## SUMMARY



**1** The Bowman family of digital radios, and the associated Combat Infrastructure Platform, (CIP<sup>1</sup>) project, are central to the plans of the Ministry of Defence (the Department), to transform military communications and enable the Armed Forces to operate more effectively and at a higher tempo. The pressing need to replace the ageing analogue Clansman radios used since the 1970s and provide secure, reliable voice communications has made Bowman one of the Army's top priorities.

**2** After the termination of the original Bowman procurement in 2000<sup>2</sup>, the re-competed Bowman contract was won by General Dynamics UK in 2001. In 2002 General Dynamics UK also won the contract for CIP. Sensibly, given their close links and dependencies, the two projects have been managed by the Department and General Dynamics UK as one £2.4 billion programme, called Bowman CIP. Bowman's In Service Date was achieved in March 2004, though with 27 provisos, since reduced to 20. CIP did not meet its approved December 2004 In Service Date but in March 2006 it was declared in service with effect from December 2005, albeit with 32 provisos in addition to those for Bowman. Declaring an In Service Date as achieved subject to provisos is not unusual and is a way of making useful capabilities available to the Armed Forces as soon as possible. CIP equipment is integrated with Bowman and a limited CIP capability has been used with Bowman in Iraq since April 2005, where the equipment is bringing benefits to the Armed Forces. Notably, the secure voice radios and equipment showing the position of units have performed well and soldiers have growing

confidence in them. Furthermore, the Department and General Dynamics UK have co-operated since 2003 to deliver Bowman enhancements under the Urgent Operational Requirements process, to provide the military communications capability needed to carry out specific operations in Iraq and Afghanistan.

**3** We have found evident commitment to the success of the programme from a wide range of participants in the Department, the Armed Forces and General Dynamics UK. Yet delivering the Bowman CIP capability desired by the Armed Forces within specific time and cost parameters has proved difficult. Such parameters are based on the idea that a project reaches finality and essentially remains in a steady state until a mid-life update. But programmes like Bowman are in a state of continual development, as technical change and operational experience require continual adjustments to be made to them. **Figure 1 overleaf** highlights these factors as they affect Bowman CIP. Responding to the challenges set by these factors requires Bowman CIP to be managed as a programme where continual evolution and refreshment are the norm. Traditional, linear, approaches to equipment acquisition, with development, production and support activity punctuated by one or more mid-life upgrades, will not deliver the desired capability in a timely manner or to an acceptable cost. This report examines the lessons which can be learned from the experiences on the Bowman CIP programme which may also be applied more generally to better deliver and sustain other, similarly complex, military capabilities.

<sup>1</sup> Combat Infrastructure Platform BISA, CIP, is described in Figure 3. It is a set of three interrelated projects with strong dependencies on Bowman that help with mission planning and dissemination of orders, provide additional hardware and information handling capacity and integrate these functions into armoured vehicles. It is intended to replace many existing manual military command and control processes.

<sup>2</sup> By 1999, the Department had lost confidence that the Archer consortium could deliver a system that met its requirement in the necessary timescale and that offered value for money.

## 1 The challenge of delivering Bowman CIP

- The evolution of much of the technology underpinning Bowman CIP is being driven by rapid developments in civilian digital communications. Traditional, lengthy acquisition cycles are not well suited to respond to such rapidly evolving technological advances, adapting them to operations in the more hostile military environment or dealing with the obsolescence problems associated with long-term use of components with short life-spans.
- The ready availability on the civil market of mobile telephones offering not just voice communications but also text, pictures, video and ever faster links to the internet inevitably influences the expectations of military users.
- Bowman CIP is a crucial part of the Department's emerging vision for Network Enabled Capability. Bowman CIP must be managed in a sufficiently flexible way that it can respond to the changing demands likely to be placed on it as the Department's understanding of Network Enabled Capability evolves and as the other equipments which will contribute to its application are developed.<sup>1</sup>
- Delivering the full Bowman CIP capability has required the Department and General Dynamics UK to manage the delivery and installation of Bowman hardware while at the same time developing and trialling successive increments of the software intensive CIP project.
- Responding to constant feedback, from a wide community of Army, Navy, Royal Marine and Airborne users, as capabilities are delivered in increments.
- Installing sensitive modern electronic equipment into a diverse range in type and condition of vehicles up to thirty years old.
- Delivery of the Bowman CIP equipment and software is only part of the jigsaw of capability delivery. Its utility will be degraded if other aspects of capability such as training and support are not managed as a coherent whole.
- Delivering against this changing context within an exacting fixed cost ceiling, and to a demanding two and a half year timescale to meet the Departments' March 2004 target in service date for Bowman, and CIP.<sup>2</sup>

Source: National Audit Office

### NOTES

- 1 Network Enabled Capability (NEC) offers decisive advantage through the timely provision and exploitation of information and intelligence to enable effective decision-making and agile actions. It involves joining up Defence systems in a "network of networks". A glossary of specialised terms is at the end of this report.
- 2 When General Dynamics UK was awarded the Bowman contract in 2001, the Departments' business case had concluded that the In Service Date should be maintained at the same date, March 2004, as had been set for the previous Archer consortium until 2000.

## Management arrangements must be flexible and responsive and embrace all aspects of capability

4 The sheer scale and the demanding timescale of the Bowman CIP programme have severely tested many of the Department's regular management arrangements. The programme is not unique in this sense. As several of our recent reports have highlighted<sup>3</sup>, the Department has not routinely supplemented its managerial and budgetary structures with a Senior Responsible Owner who is fully empowered with the authority to effectively manage a programme to deliver and sustain a given defence capability. Following the recent review of acquisition structures and processes in support of through life capability management ("Enabling Acquisition Change"), the Department is now moving towards more systematic use of Senior Responsible Owners for large equipment programmes. In the case of the Bowman CIP programme, in early 2006, recognising the need to improve higher

level programme management, the Department took steps to establish a programme office to coordinate the delivery of the networks and the programmes supporting Network Enabled Capability, incorporating Bowman CIP.

5 The higher level programme management weaknesses contributed to shortcomings in the management of risks. Such risks have not consistently been well tracked and mitigated, and user requirements and expectations could have been better managed. The Department's processes for benefits realisation and tracking have also needed strengthening. There has been recent strengthening in both areas. Trials and ad hoc reports have given insights into how aspects of initial versions are performing. However, as only a limited capability has so far been delivered, it has not been possible to quantify how far the full system will bring the claimed measurable improvements in operational tempo and effectiveness. The Department intends to strengthen benefits realisation and tracking in taking the programme forward.

3 National Audit Office Reports: Ministry of Defence, *Building an air manoeuvre capability: The introduction of the Apache helicopter*, HC 1246 Session 2001-2002: 31 October 2002. *Combat Identification*, March 2006.

## How the Department can further develop its managerial arrangements for the delivery and sustainment of military capability

The recent review of acquisition structures and processes recommended a number of changes to improve the cost effective and timely delivery and sustainment of military capability in the changing defence environment. Building on these changes:

- a** The role of Senior Responsible Owner requires both the authority that comes with senior rank and sufficient time to effectively discharge the onerous responsibilities. It would be unusual to find individuals in the Department with both. The Department should consider more regularly pairing a senior official with a full time programme manager leading a properly resourced programme office. This approach could be resource neutral if the Department re-allocates to the Programme Office tasks (and the resources at present being used to deliver them) which are being undertaken piecemeal by different parts of the Department or by its industry partners.
- b** The Department should increase the profile of benefits management on major programmes such as Bowman CIP to identify, optimise and track the expected benefits from the Business Case through to their realisation. A strong benefits management function generating robust evidence across all areas of a given capability should help programme managers to make better informed decisions in trading-off anticipated benefits against time and cost.
- c** All stakeholders, including suppliers, should have common access to information on risks and benefits tracking. Responsibility for the collation and analysis of data from all stakeholders, and co-ordination of subsequent actions, should rest with a programme manager.
- d** The Joint Systems and Networks Integration Bodies of Suppliers and Departmental officials, established in 2003 to link up Bowman CIP with complementary projects, are a step in the right direction. The Department should track their performance closely to understand how the principles can be applied to other defence programmes facing similar complex integration challenges that span multiple projects.

- e** In a long running programme such as Bowman CIP; measuring the continuing strength of the customer/supplier relationship, objectively and at regular intervals, will be particularly important.

## Agile decision making must be underpinned by high quality information

**6** Planning for and managing the delivery of new military capability is a hugely complex challenge. Successive Major Projects Reports have highlighted the adverse effects of the Department and its industry partners making key decisions, in cases where technical progress and operational experience require continual development and improvement of capability, without a robust understanding of technical maturity or realistic estimates of the costs and timescales.

**7** By the time the Department had, sensibly, appointed General Dynamics UK as a single supplier to run both the Bowman and CIP projects as a coherent programme, it had already spent five years and £397 million (equivalent to 16.5 percent of the expected procurement cost of Bowman) on earlier stages, of which it subsequently wrote off some £51 million as not contributing to the later programme.<sup>4</sup> Despite this extended assessment phase, the Department's business case still understated the costs, timescales and technical challenges associated with delivering key elements of the Bowman CIP capability. The need for extra funding of £121 million has been identified, to overcome technical difficulties identified during the development of the Bowman system and for essential updates to take account of advancing technology.<sup>5</sup> Such changes are handled through amendment to the contractual Systems Requirement document. Though equating to only five percent of total equipment costs this is in the context of a reduced total number of vehicles and aircraft needing to be converted, and the deferral of less urgent, though important, capabilities to a possible later project. A trebling of the training facilities assessed as necessary to make full use of Bowman CIP in service will add a further £24 million of costs, and £204 million in total operating costs over 25 years. Robust system support costs are still being developed but are expected to rise beyond the levels forecast in the business case in 2001.

<sup>4</sup> This was a combined cost of all the relevant work conducted with the previous Archer Consortium, and an extended Assessment Phase post Archer.

<sup>5</sup> Paragraphs 4.6 to 4.7 illustrate the nature of the changes concerned.



**8** The Department recognised from the outset that its aspiration to deliver the original capability within the approved timescale was ambitious. While there were clear cost and operational reasons which made it sensible to combine the fielding of Bowman and CIP in a single conversion, the rapid delivery of Bowman radios heightened the time pressure to develop and install CIP – a software-intensive programme requiring extensive trialling and development.<sup>6</sup> The Department and General Dynamics UK sought to mitigate this risk with a plan to install the hardware for both systems at the outset, followed by successive downloads of CIP software. But with too little time to trial, refine and retrial the equipment and software, and with the scale of the technical challenge becoming more evident, delivery of capability has slipped behind the original schedule.

**9** Another and different kind of difficulty is that the Department and General Dynamics UK under-estimated the challenge of installing Bowman in the land vehicle fleet. In particular, not enough preparatory work was done by the Department or General Dynamics UK to underpin assumptions about how much variation there was within the approximately 20,000 vehicles in the fleet. Managing the conversion programme has been a difficult challenge for General Dynamics UK to resolve, for some of which they have borne the costs. Improved conversion rates, coupled with a reduction in the number of vehicles required to be converted, increase confidence that conversion can be completed by the end of 2007, within three months of the original schedule.

### **What more the Department can do to take well informed, agile decisions**

In future, as complex capabilities are introduced and upgraded incrementally, making effective investment decisions on the delivery and sustainment of a given capability will place a premium on the ready availability of accurate, up to date management information. The Department is implementing initiatives to improve programme management and ownership in the Information Systems area.<sup>7</sup> Building on this work, and reflecting the experiences on the Bowman CIP programme, the Department should:

- f** Work with its industry partners to share and maintain full listings of programme assumptions as well as the rationale underpinning them.
- g** Consider further how to address the problem that advanced development programmes as complex as CIP bring inevitable uncertainty as to how they will be used. The greater use of limited mock ups or simulations for future Information and Communications systems (in particular showing how their human/computer interfaces will work), can help to plan for training needs. It can also help users understand how the system may actually be used in practice, including the implications for future tactical doctrine.
- h** Recognise more explicitly that the timely delivery of capability to the Armed Forces is always likely to include elements of programme concurrency, where a number of parallel activities must all be completed before a key stage can be passed. The Department needs to develop metrics to assess the extent of this in programmes. This should bring better informed judgements about whether programmes have enough risk margin and whether proposed timescales for the delivery of capability are realistic.
- i** Revise its definition of In-Service Dates so that progress on programmes planned to incrementally meet evolving capability needs can be monitored against appropriate “way-points” established when each increment of capability and the technology needed to deliver it can be defined with certainty.
- j** Maintain regular channels for contractors and end users to develop a shared, detailed, and regularly updated understanding of how new equipment will be used. Similar arrangements need to be built into procurement bidding processes, (which was not in General Dynamics UK’s view sufficiently the case for Bowman CIP).
- k** Ensure statistically representative testing of the configuration and condition of existing vehicle fleets when planning major conversion programmes. The alternative given the complexity of the problem, is to achieve better configuration control of land vehicles.

<sup>6</sup> The Brigade trialling Bowman was deployed to Iraq in 2005; trialling continued at a smaller scale using the Army’s established trials organisation.

<sup>7</sup> White Paper on Defence Industrial Strategy, Cm 6697 paragraphs C1.22–C1.24, December 2005.

## The future of Bowman CIP

**10** By December 2004, it was clear that the Bowman CIP programme was over-ambitious and needed thorough revision. A recast programme was approved in July 2006. The recast of the Bowman CIP programme has given the Department and General Dynamics UK greater confidence about the way ahead. Funding for the programme has been raised by £121 million (five per cent) and the timescale for delivering capability has been extended by two years to mid 2007<sup>8</sup> for full delivery of the minimum military capability required. Technical challenges remain to be overcome to secure and build on the operational benefits already being obtained through faster, secure voice transmission.

**11** Beyond the capability to be delivered in 2007, the future of Bowman CIP will be heavily influenced by the outcome of a £10 million validation exercise to assess delivery of those high-risk, still-evolving capabilities which have now been deferred until they can be better understood. These include ensuring that the system is interoperable with other United Kingdom and allied countries' communication and information systems under the latest joint and NATO standards. The Department's best estimate to date of the possible cost of this modified, deferred capability, pending the outcome of the assessment exercise, is £200 million, but it emphasises that the estimate is highly uncertain given the extent of continuing and predicted change in the area of battlespace management projects. The decision to defer CIP capability to a later programme and to devote resources to understanding the risks and possible solutions was a prudent one to take in the circumstances.

<sup>8</sup> Two years delay based on the level of capability envisaged in the Interim version of CIP planned for 2005 and broadly equivalent to the level of capability planned for CIP by 2007 under the recast programme.