

Single Service Procurement and the British Army's Main Battle Tank

Author

Tatham, Peter, Taylor, Trevor

Published

2014

Book Title

Case Studies in Defence Procurement and Logistics

Copyright Statement

© 2014 Cambridge Academic. The attached file is reproduced here in accordance with the copyright policy of the publisher. Please refer to the publisher's website for further information.

Downloaded from

<http://hdl.handle.net/10072/63083>

Link to published version

<http://www.liverpoolacademic.com/lap.nsf/BooksWeb/2F6F350EDA5C2CBB80257D1C0078F6E7!OpenDocument>

Griffith Research Online

<https://research-repository.griffith.edu.au>

Single Service Procurement and the British Army's Main Battle Tank

Dr. Peter Tatham and Prof. Trevor Taylor

Centre for Defence Acquisition, Cranfield University, DCMT Shrivenham.

Introduction

In November 1986, shortly after Vickers Defence Systems (VDS) had acquired the former Royal Ordnance Factory (ROF) in Leeds (for £11m), the company began work on the design and development of a new tank which, they proposed, would replace the ageing fleet of Centurions (dating from the 1960s) and also the newer Challenger 1s (first ordered in 1978) which were both unreliable and had poor gunnery accuracy. The first nine turrets were built (seven at Leeds and two at VDS' original factory in Newcastle) on a private venture basis prior to the issue of the Staff Requirement.

The perceived requirement for a new Main Battle Tank (MBT) took place against the backdrop of the "Levene" reforms to UK defence procurement which placed a premium on achievement of value for money through competition and taut contract conditions. Although in the pre-contract discussions VDS argued that there was a need to provide the new fleet of tanks quickly (to fill a capability gap), and that a single tender contract would safeguard employment (some 2000 jobs) at both Leeds and Newcastle, the company's reputation was poor having delivered unreliable tanks over budget and late in previous contracts. As a result, a full competition was unavoidable and this took place at the end of the decade, with the final tank being delivered in 2002.



A Challenger 2 pictured during live firing exercises in Grafenwöhr, Germany.
(Source: Cpl Wes Calder, RLC from defenceimages.mod.uk via Flickr)

CR2 - Doctrine

Whilst the decision to procure a new MBT coincided with the fall of the Berlin Wall in 1989 and then the Conventional Forces in Europe Treaty of 1990, there was perceived to be a continuing (but reduced) requirement for such a system. This will be discussed in greater detail later in this Case Study. The procurement decision also coincided with the doctrinal developments that saw the introduction of the manoeuvrist concept. Thus, whilst the Chieftain and, to a lesser extent, the Challenger 1 MBTs had a movement capability, unlike Challenger 2 (CR2), they could not be seen as a key component of the implementation of manoeuvrist doctrine.

CR2 - Organisation

The introduction of CR2 took place at the same time as the major revision in the role and *modus operandi* of the Armed Forces and, as part of this, the MOD's Planning Assumption was that a large scale conflict would entail a "warning time" of ten years. As a result, the number of armoured regiments in the Army was under severe pressure and, as part of the conditions tied by the MoD to the introduction of the CR2, the tank fleet was reduced from some 900 Chieftain/Challenger I to 386 CR2. This was formally achieved as part of the 1990 "Options for Change" reductions in the size of the Armed Forces which, in effect, saw the loss of five Armoured Regiments.

CR2 - Equipment

The provision of the CR2 MBT proved to be a complex undertaking that reflected, to a large extent, a number of external influences such as the emergence of a number of larger entities within the Defence Industrial Sector, and the influence of the Levene reforms mentioned above. As a result, this section of the Case Study will be broken down into the phases of today's CADMID Cycle (although the Downey Cycle was formally in place then).

The Concept Phase

As indicated above, VDS anticipated the requirement for a new MBT and, furthermore, concluded that it was a "must win" competition. To achieve this, they built a new factory at Leeds (at a cost of some £14m), and planned for production to be split equally between this and the existing Newcastle facility. Recognising the implications of the Levene reforms,

they also began to identify their own core competencies, and to review what should be sub-contracted. As a result of this work, VDS approached the competition by selecting the high value subcontractors based on value for money and confidence in their reliability.

This represented a major change of strategy for the company which had previously relied on UK companies with whom they had operated for many years but, having changed their procurement approach, VDS did little in the way of upskilling their Purchasing Department to deal with the new challenges. The result was a list of over 500 sub-contractors and, although some were mandated by the MOD e.g. the 120mm rifled gun from Royal Ordnance (part of BAE Systems) and the engines from Rolls Royce (part of Caterpillar Inc), other major parts were brought from Canada and France. This exemplified the growing internationalisation of the arms sector, but also placed VDS at a disadvantage in some instances – for example, the 386 fire control systems for the CR2s bought from CDC of Canada (now part of General Dynamics) were dwarfed by a parallel order of 8,000 systems by the US for the Abrams tanks.

As a result, VDS moved from a previous position in which only 50% of their production was "bought in" to 80% - in effect changing the nature of their work from "production" to 'assembly'. Furthermore, many of the "sub" contractors were actually significantly larger companies than VDS and as a result, VDS was unable to flow down the MOD's Terms & Conditions as the large suppliers would not accept them and VDS could not enforce compliance.

The Assessment Phase

The formal competition for the new MBT was held between:

- VDS (UK): Challenger 2
- General Dynamics (USA): M1A2 Abrams
- Krauss Maffei (Germany): Leopard 2
- GIAT (France): Leclerc

It is interesting to note that, given the perceived wisdom that National Governments would always prefer their National arms companies, it proved necessary for the MOD to subsidise the bids from USA, France & Germany in order to achieve the desired competition.

As a result of the Invitation to Tender (ITT), the MOD (unusually) made a qualified recommendation to buy either the Leopard 2 (elderly, but proven and reliable) or the Abrams (modern, but with a novel and expensive gas turbine engine). The MOD did not

shortlist the CR2 as they did not believe that VDS had the capacity to deliver to time and cost. When this decision was taken to cabinet in 1991, the views of the key players are summarised below:

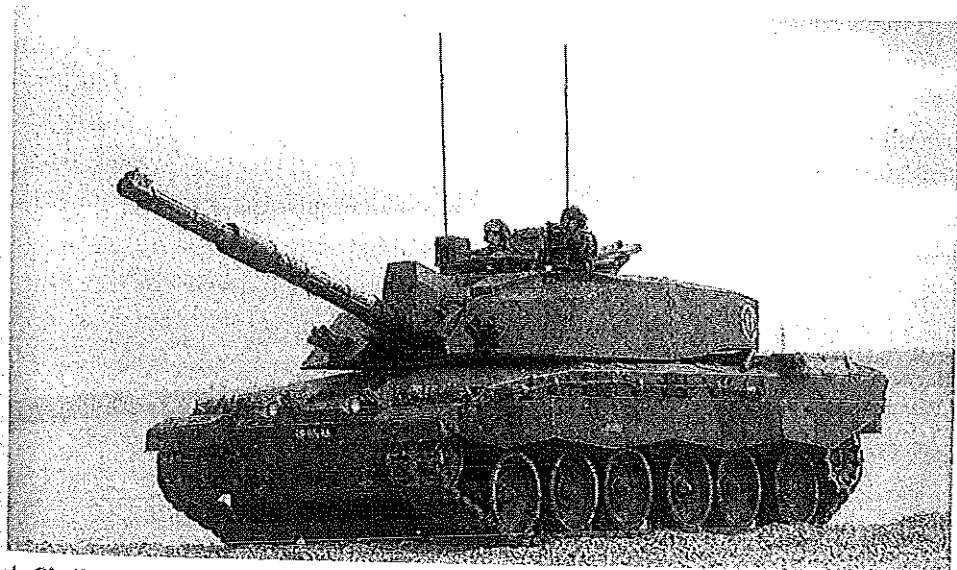
Prime Minister (Margaret Thatcher)	<ul style="list-style-type: none"> • Why do we need a new tank at all? • If one is necessary, would VDS be able to deliver to cost/time?
Defence Secretary (Tom King)	<ul style="list-style-type: none"> • No strong defence differentiators between the two short listed bidders
Foreign Secretary (Douglas Hurd)	<ul style="list-style-type: none"> • Some potential export benefit from CR2. • Neutral over short listed bidders.
Trade Secretary (Peter Lilley)	<ul style="list-style-type: none"> • Indigenous MBT production capability gave huge political kudos. • Embodied spirit of national engineering excellence. • Major political benefit in an election year (Leeds constituencies were marginals).

It is interesting to note that none of these four decision makers appeared to be particularly concerned with price and, much to the surprise and consternation of the MoD Project Team, the Trade Secretary's view eventually prevailed with VDS emerging as the declared competition winner.

The final MoD contract presented VDS with three key issues:

- First, the main contract set new standards and conditions for a prime contractor in terms of the scope of what had to be delivered and how. The contract penalties for failure were severe.
- Secondly, the package of contracts that made up the CR2 programme amounted to almost £2bn (at the peak over ninety percent of the VDS order book) making it the largest Armoured Fighting Vehicle (AFV) programme in Europe. But the financial size of VDS and even Vickers plc (the parent company) were quite small compared to a contract of this magnitude.
- Third, the complex technical and programme risks were new to VDS, the AFV supply chain and the MoD. Unlike virtually all previous major defence contracts the risks were to be managed entirely by the prime contractor who was also held to

be totally responsible and accountable. Furthermore, in line with the Levene model, very demanding conditions were placed on VDS and, given that the advice of the MOD CR2 team on the winning bid had been overturned, it is unsurprising that these conditions were robustly enforced in the subsequent contract.



A Challenger 2 coming ashore during an amphibious landing exercise in Gosport, Hampshire. (Source: Cpl Kellie Williams, RLC from defenceimages.mod.uk)

CR2 – Development & Manufacture

Previous MBTs built by VDS followed a recognisable technical design, namely a mechanically simple layout with a diesel engine, 105mm or 120mm rifled gun, fixed sights (all pointing in the same direction as the gun) with rudimentary night observation functions, a simple fire control computer to calculate gun pointing and the capability to hit a moving target whilst the tank itself was static. However, the requirements for CR2 were an order of magnitude more complex and well outside the traditional capabilities of VDS. For example, the design of the CR2 included a computer-controlled diesel engine management system, a high performance 120mm gun, a panoramic stabilised commander's sight linked to a gunner's sight including a high performance night sight, two laser rangefinders and a sophisticated NBC system. Furthermore, VDS had never designed an MBT for contracted levels of reliability which were to be incorporated in the first-off production tank through to the last tank produced, with no variations in quality across the production run.

The six year development phase started in earnest immediately after contract signature for an initial 140 tanks in June 1991 and, in order to achieve success, VDS conducted a

completely new type of development programme for the prototype vehicles. The most notable feature was the use of reliability growth trials (RGT) which required vehicles to undertake a set trials regime of mobility and firing based on a typical war profile called a battlefield day. The RGT was the single most expensive part of the development programme requiring three MBTs full time over three years conducting hundreds of battlefield days.

The development phase ostensibly went well with MoD concluding a follow-on contract for around 260 tanks, and with the NAO reporting no time or cost overruns in 1994 or 1995. Indeed, VDS managed to develop initial vehicles that met the specified tests, however the first completed production-standard CR2 MBTs delivered to the British Army were discovered in October 1995 to be well below the reliability requirement. This led, under the contract terms, to the stopping of payment and the imposition of Liquidated Damages. These included the cost of keeping existing Challenger 1s in-service until the CR2 problems were fixed - however long that took the company. In turn, the lack of payments meant that the vehicles already under construction either had to stop until the reliability problems had been solved, or would continue being built but would be known to be unreliable and fixed an undefined later date - all at the company's expense. Potentially, the financial penalties were sufficient to cause the parent company, Vickers plc, to be at risk of declaring bankruptcy.

The operational impact of this failure was considerable, for example the first Regiment that was planned to migrate to CR2 had already disposed of their Challenger 1 tanks but had to have them re-issued. More broadly, the image of VDS, British tank engineering and defence industry in general were at an all time low particularly with the MoD, Army and NAO. That said, there was no doubt that the MoD used the CR2 programme as a very public example of their strict adherence to the new competitive environment wherein the prime contractor, rather than the customer (ie the MOD), took the technical and financial risks.

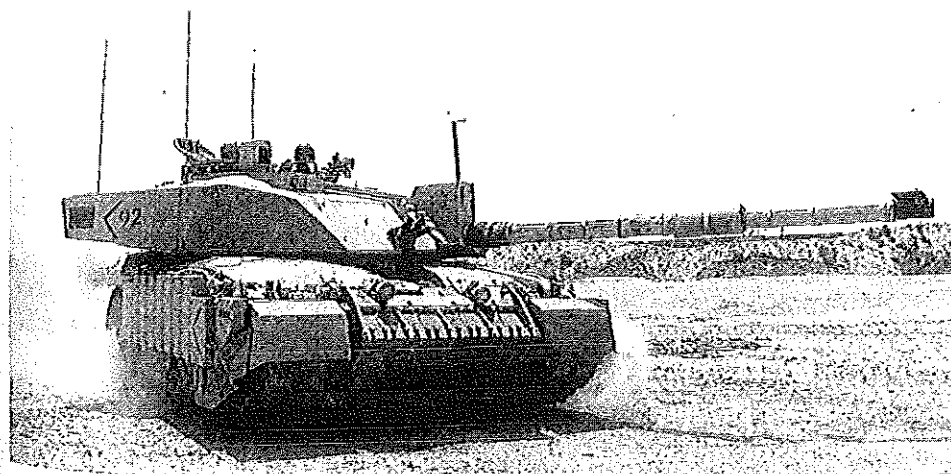
In the face of the severe financial difficulties faced by the company, it undertook a major restructuring programme. This included the freezing of all salaries (from Board level downwards) until the performance improved. In addition, the shopfloor workers had their long-standing arrangement for 'piece-rate' pay stopped and replaced with a flat hourly rate. Nevertheless, despite the dire financial position of the company, the Trades Unions held a ballot for strike action which received overwhelming support. The strike arrangement consisted of a one day a week stoppage for one month. In response, the MoD Project Team were furious and blamed the VDS management team for this situation, and there were even rumours in the MoD and NAO of cancelling the entire contract and buying the American M1A2 Abrams.

The crisis developed further when the VDS Board announced the closure of the entire Leeds factory (that had only been built some five years earlier) with the loss of some 900 staff, and the movement of the outstanding CR2 production from Leeds to Newcastle. This was aimed at reducing the company's overheads that were judged to be excessive

due to the 'unnecessary' duplication of manufacturing between the Leeds and Newcastle sites. The financial situation was, indeed, difficult as the MoD had, by this stage, stopped paying VDS for CR2 and the tanks themselves were being stored as they were finished in a purpose built shed on the Leeds site all at VDS expense.

Fortunately, the changes to the business produced quick results. Within a few months the MoD agreed to a new accelerated development programme, and VDS agreed to take responsibility for the reliability failures as the prime contractor. As an example, although the company had planned to select their contractors on the basis of proven reliability, in practice they had to cast the net rather wider and this resulted in much of the estimated eighty two percent by value of each CR2 being bought-in from relatively unknown or inexperienced sub-contractors. As part of this process, VDS developed a number of improved supplier management teams which, working closely with their quality control colleagues (itself an innovation), resulted in greater supplier control and communication as well as quality improvement groups both in VDS and with the suppliers. Joint VDS/supplier closed loop action systems were introduced involving an electronic system to jointly track and identify problems at source thereby implementing corrective and preventative action.

With a two year programme of business change, CR2 re-testing and re-building, progress was good and reliability improvements were recorded from July 1996. The MoD was sufficiently satisfied to allow the formal handover of CR2 to the Army in 1998, with the final tank being delivered in 2002. However, the financial impact on the business was considerable and it is estimated that the original £2bn CR2 contract finishing with an overall profit margin of 1.5 percent compared with the planned 9 percent.



A Challenger 2 patrolling outside Basra during Operation Telic 4. (Source: MoD via defenceimages.mod.uk)

CR2 – In Service

The original CR2 fleet was purchased in two tranches:

- June 1991: 127 MBTs and thirteen Driver Training Tanks (DTTs)
- July 1994: 259 MBTs and nine DTTs

As part of the latter decision, it was decided to mandate the use of 230 120mm rifled barrels that had already been ordered from the then Royal Ordnance factory so that they could be retro-fitted to the Chieftain tanks. It was argued that these barrels were available "at no cost" when it was decided to replace the whole Chieftain fleet with CR2. However, in doing so, the UK was out of step with most other European armies that had adopted a 120mm smooth bore barrel as standard.



*A Challenger 2 on a night exercise.
(Source: army-technology.com)*

potentially, allowing the same smooth bore barrel to be used as part of the direct fire unit of Group 2 of FRES.

It is understood that the Challenger 2 Capability Sustainment Programme (CSP) (that is designed to maintain the system's capability until 2035) will incorporate the Challenger Lethality Improvement Programme (CLIP) which includes the replacement of the rifled barrel with a smooth bore version. This would have the benefit of allowing the use of ammunition available from a wider range of sources as well as,

CR2 – Training

As noted above, previous generations of MBTs built by VDS followed a recognisable technical design with fixed gun sights pointing in the same direction as the gun and rudimentary night observation functions. They incorporated a simple fire control computer to calculate gun pointing, and the capability to hit a moving target whilst the tank itself was static (but with relatively low probability of success). Whilst this form of design led to comparatively high training requirements and crew skill, the requirements for CR2 were

an order of magnitude more complex. The intention was that tank crews, with little training background, should be able to engage a moving target whilst on the move themselves with a high probability of a hit, rapid target switching and high speed of subsequent engagement. A key element was that the commander should have the means to identify and prioritise the next target while the gunner was busy engaging the last one. This clearly generated technical requirements (a sight giving the commander broad field of vision), training needs and considerable trust of the gunner's performance by the commander.

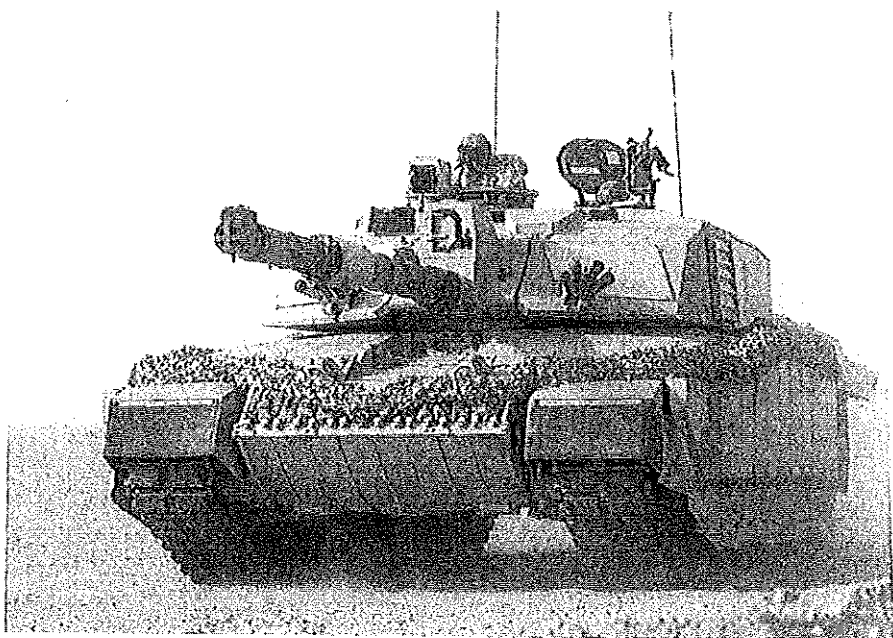
However, within the Land Environment, the support for CR2 is seen as the first successful application of the "systems approach to training". The result was a suite of training aids that provide the necessary understanding and experience to allow the various crew roles to be filled successfully. One of the more recent developments is the use of a live firing solution called the Enhanced Capability for Armoured Training System (ECATS) which allows a sub-calibre round to be fired within a certain range bracket in which the trajectory is a close approximation to that of the full effect charge. The key reason for this approach (apart from reduced barrel wear) is that the ECATS round costs some £7 – versus some £1,200 for the standard Armour Piercing Fin Discarding Sabot (APFDS) round.

CR2 – Logistics

Although originally supported by a traditional MOD-managed arrangement, the Challenger Innovative Spares Provision (CRISP) contract was signed in 2000 with BAE Systems as the Prime Contractor and Lex Multipart Defence (LMD) as the key sub-contractor. Through this contract, LMD was appointed the "custodian" of the legacy consumable spares inventory; whilst future stock is procured by LMD based on their assessment of the MOD's demand forecasts and their own inventory management routines that have been developed in a variety of non-military contexts. In 2007, it was estimated that CRISP has delivered:

- 89% reduction in the MOD inventory under LMD custodianship.
- 27% increase in spares availability
- 95% on time in full delivery direct to units in barracks or on exercise
- 90% reduction in lead time.
- 33% reduction in costs.

Moving forward from this success, the future support to CR2 arrangements are being developed by the IPT as part of the broader proposed contract between the MOD and BAE Systems called the Armoured Support Vehicle Initiative (AVSI).



A Challenger 2 from the Queen's Royal Hussars, attached to the 1st Royal Regiment of Fusiliers (1 RRF) Battlegroup at Camp Coyote, Kuwait in 2003. (Source: Cpl Jarvis, RLC from defenceimages.mod.uk)

Although there were undoubtedly a number of changes associated with the remaining of development, not least those relating to the introduction of the Bowman communication system (see Case Study 2.5), the main acquisition lessons can be gleaned from the L were discussed above.

Summary

In summary, the chequered story of the acquisition of Challenger 2 took place in part with a sea change in a number of significant areas. Firstly, the platform was procured against the background of the development of the manoeuvrist doctrine and the end of the Cold War. Whilst it might be argued that the latter did not have a direct effect on acquisition process *per se*, in practice it might have meant that Challenger was seen as a pressing capability and, therefore, one that could be used as a means of demonstrating government's resolve to get to grips with defence procurement. It should not be overlooked that even the much criticised Challenger 1 was operated with considerable success in the 1991 war against Iraq, albeit after extensive preparations.

This determination to improve defence procurement reflected the Thatcherite free market vision, and was exemplified by the Levene reforms which emphasised the need to deliver Value for Money for taxpayers through arms' length competition. This, in turn, led to a determination on the part of the MOD that the prime contractor should shoulder a greater burden of the risk in delivery of the system within the agreed price.

Unfortunately, VDS was ill-prepared to take on this role. The company itself reflected the down-sizing the Defence Industrial Base and the sale by the government of some its former nationalised assets (ie the Royal Ordnance Factories). At the same time, it was attempting to transform itself from a relatively low technology "metal bashing" company to one which created value through the integration of the best in breed equipment from around the world. However, it is clear that the early stages of the CR 2 procurement reflected the lack of preparedness for the challenges of the new roles in many areas of the company and these were reflected in the poor quality of the initial production tanks.

Nevertheless, after considerable readjustment, including the reduction of some 50% of the workforce and the closure of the Leeds factory, the company was able to improve its performance across the board, and CR2 proved its worth as a key element of the Army's orbat in March 2003.