National Audit Office

The Ajax programme

Ministry of Defence

REPORT

by the Comptroller and Auditor General

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Key facts

£3.167bn

payments to General Dynamics to December 2021 on the Ajax programme out of a firm-priced contract of £5.522 billion

4 years

increase so far to Ajax's expected in-service date. The Ministry of Defence (the Department) missed its latest target date of June 2021

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Ajax vehicles received by the Army as of December 2021, out of an order of 589 vehicles

Progress on the programme, at December 2021

143	assembled Ajax vehicles at various capability drop standards. Factory acceptance testing has been completed on these. In total, General Dynamics has built 324 of the 589 hulls
21	training systems General Dynamics has delivered, along with training courses and logistic support
7 years 9 months	overlap between the design and manufacture stages, compared with 3 years 4 months that was expected in 2014
1 year	the delay to the programme schedule set in 2019, with production 61 vehicles behind target

Future challenges in delivering the programme

27	limitations of use on Ajax vehicles in September 2021, of which 22 related to safety and 11 were critical to achieving initial operating capability
Late 2022	the Department's estimate of when it will be able to understand and resolve the noise and vibration issues on the Ajax programme
Not yet known	the revised target date for achieving initial operating capability
More than £10 billion	the Department's initial estimate of the whole life cost of the Ajax programme – including the contract cost – although it is still developing its understanding of future support costs

Summary

1 Ajax is an armoured fighting vehicle which should provide the Army with its first fully digitised platform. It will be based on new technologically advanced sensors and communication systems which would transform the Army's surveillance and reconnaissance capability. The vehicles form an integral part of the Ministry of Defence's (the Department's) vision for digital integration across land, air and sea domains, allowing real-time information-sharing and connectivity with other capabilities, such as Lightning II jets.

2 Ajax represents the biggest single order for a UK armoured vehicle in more than 20 years.[1] The Department has a £5.522 billion[2] firm-priced contract with General Dynamics Land Systems UK (GDLS-UK) for the design, manufacture and initial in-service support of 589 vehicles.[3] The programme will deliver six types of vehicle which will perform different roles.[4] At December 2021, the Department had paid GDLS-UK £3.167 billion and, at this point, GDLS-UK had designed the vehicles, built 324 hulls and assembled and completed factory acceptance testing of 143 vehicles. The Department had received 26 Ajax vehicles, as well as associated training systems and support.

3 The programme has encountered significant problems. In 2014, the Department extended its expected in-service date by three years when it set an initial operating capability[5] (IOC) of July 2020.[6] The programme subsequently missed a revised target date of June 2021. In 2021, the Department publicly acknowledged concerns about excessive levels of noise and vibration on the Ajax vehicles, leading the minister for defence procurement to make regular statements to Parliament on the programme's progress and the possible impact on the health of its crews who had been testing the vehicles. These issues remain unresolved, and the Department has not yet set a new target date for IOC.

1 Throughout this report 'Ajax' refers to the Armoured Cavalry programme covering the six types of armoured vehicles. The programme aims to deliver an integrated, multi-role capability (that is, the Ajax family of vehicles) and its training solution into service.
2 All figures in this report include Value Added Tax.
3 This type of contract means that the contractor undertakes the contract for a total, all-inclusive price that will not change irrespective of how long it may take the supplier to deliver, or how much it costs.
4 The six variants are: Ajax (reconnaissance), Athena (command), Ares (protected mobility reconnaissance support), Atlas (recovery), Apollo (repair), and Argus (engineer reconnaissance).
5 Initial operating capability is the minimum level at which the Department can usefully deploy a capability or service and is usually the in-service date. For the Ajax programme, this includes requirements for training and logistics
6 In 2010, the Department's planning assumption was that Ajax would enter service in early 2017. When it awarded the manufacture contract in 2014, this planning assumption was replaced by a formal IOC date of July 2020.

4 The long-running Ajax programme has evolved from previous attempts to replace the Army's reconnaissance vehicles, dating back to 1992. We covered the early stages in our 2011 report, finding that the Department's approach to renewing its core armoured vehicle fleet did not represent value for money.[7] This report assesses the causes of the problems that the Ajax programme has encountered since 2011 and considers the challenges that the Department now faces in delivering the intended capability. We set out:

- an overview of the Ajax programme, including the Army's vision and objectives **(Part One)**;
- our assessment of the underlying causes of difficulties on the Ajax programme **(Part Two)**; and
- the challenges that the Department faces in delivering the programme **(Part Three)**.

Key findings

Programme vision and objectives

5 The Army's vision for its armoured vehicles is now more dependent on Ajax despite the Department reducing the number of vehicles on order in response to affordability pressures. When delivered, Ajax should provide significant technological enhancements and is central to the Department's vision for digitally connected capabilities. However, in 2014, in response to wider affordability pressures, the Department ordered 589 vehicles out of an optional 1,328. This was below the Army's required fleet size at that time of 686 vehicles, which the Army accepted could restrict its ability to train. Despite this, subsequent strategic defence reviews – which set out the government's approach to national security – have resulted in the Army becoming more dependent on Ajax. The 2015 Strategic Defence and Security Review expanded Ajax's number of roles, and the 2021 Integrated Review envisaged a future force centred around Ajax and the Boxer mechanised infantry vehicles. In November 2021, the Army set out new transformation plans, with Ajax playing a significant role in future operations (paragraphs 1.3 to 1.5).[8]

7 Comptroller and Auditor General, *The cost-effective delivery of an armoured vehicle capability*, Session 2010–2012, HC 1029, National Audit Office, May 2011.

8 Army, *Future Soldier Guide*, November 2021. By 2025, the Army plans to use Ajax in its two close combat Armoured Brigade Combat Teams and as part of its Deep Recce Strike Brigade.

6 The Department does not know when Ajax will be operational and has already extended its expected in-service date by more than four years. In 2010, when the Department awarded the demonstration contract to GDLS-UK, its planning assumption was that it would have a deployable capability in 2017. It subsequently replaced its forecast date with an IOC date of July 2020, which it then pushed it back to June 2021 but missed. The Army also redefined the requirements that vehicles must meet at IOC and accepted some technical constraints, most notably on the weapon system and armour. The Department will not set a new target date for IOC until it has agreed with GDLS-UK on how to resolve the noise and vibration issues. It has not yet changed the target for full operating capability (FOC) – April 2025 – even though it has no confidence that this is achievable (paragraphs 1.21 and 2.16).[9]

The causes of the programme's difficulties

Programme set-up

7 The Department's commercial approach to the programme may not protect it from further expenditure. In 2014, the Department and GDLS-UK agreed a firm-priced contract to deliver 589 Ajax vehicles. The Department transferred the contract's financial risks, including the risk of inflationary cost growth caused by any delays, to GDLS-UK. The Department has maintained that it will hold GDLS-UK to deliver the intended Ajax capability within the terms of the firm-priced contract. However, it has not managed schedule and performance risks effectively. Ajax will be delivered late, leaving the Army to operate with ageing armoured vehicles, which are expensive to maintain. There remains a risk that it will need further funding to deliver and maintain the armoured vehicles capabilities that it needs (paragraphs 1.10 and 3.3).

8 The Department's original requirements were highly specified, and its management of design changes has led to disputes and delays. The design of Ajax is based on an existing platform, but the Department's requirements have, in effect, made it a bespoke technology which is more complex than other armoured vehicles. Ajax was highly specified, with around 1,200 capability requirements for each of the six vehicle types. However, the Department and GDLS-UK did not fully understand some components' specifications or how they would be integrated onto the Ajax vehicle. For example, the initial design of some technologies, such as the cannon, was immature when the Department awarded GDLS-UK the manufacture contract.[10] It could not describe the characteristics of some systems in sufficient detail, which subsequently led to consequential changes to the overall design. The extent of these technical changes led to disputes between the Department and GDLS-UK, and the time taken to agree changes contributed to programme delays (paragraphs 2.2 to 2.4).

9 Full operating capability is the level of military capability which is intended for a project.
10 The Department supplied the cannon, and its integration into the turret is managed through a separate contract between GDLS-UK and a subcontractor.

9 The Department and GDLS-UK did not understand the scale of work or technical challenge, resulting in insufficient contingency in the programme schedule. As we have seen many times on other government programmes, the Department and GDLS-UK under-estimated the scale and sequencing of work which meant that the programme schedule was over-optimistic.[11] It took longer than expected for GDLS-UK to undertake design work, complete testing, resolve defects and manage supply chain disputes. GDLS-UK told us that this was because the Department's acceptance criteria and standards were not fully defined and subject to change. The Department disagrees and repeatedly found GDLS-UK's safety documentation insufficient. As a result of all these factors, the programme quickly used up the contingency in the schedule, leading to missed milestones and a four-year slip in the demonstration phase. This meant the overlap between the demonstration and manufacture stages was much greater than originally anticipated, which made addressing design issues more complex and added risk because of the need to manage complex delivery and retrofitting schedules (paragraphs 2.12 to 2.14).

Programme implementation

10 The Department has not managed the programme effectively. It did not establish effective governance arrangements or the necessary resources to manage the programme. There were multiple lines of reporting and complex assurance arrangements; insufficient senior management time; a high turnover of senior staff; an under-resourced programme management team; and an ineffective programme board. We also found that the Department had weak project controls with an over-emphasis on achieving its IOC target date, which meant that it prioritised time and cost over capability. As a result, it pressed ahead with the programme without resolving performance issues. The governance weaknesses also meant that programme risks and results of trials were not escalated in a timely manner or sufficiently visible to senior personnel (paragraphs 2.5 to 2.11).

11 The Department and GDLS-UK reset the contract in 2018, but this did not resolve the programme's underlying problems. By 2017, the Department and GDLS-UK faced disputes over the handling of technical design issues and significant schedule slippage. They therefore negotiated a contract reset, which took 15 months to agree. This led to some positive changes, including the resolution of some technical issues. However, work on the programme slowed during this extended period of renegotiation, compressing the programme's schedule, and the reset added complexity with multiple build standards and vehicles from early capability drops having to be upgraded. The programme continued to encounter technical and safety issues, and the revised schedule was based on over-optimistic assumptions which did not adequately reflect the time needed by GDLS-UK and the Department to complete and sign off safety reviews that met the Department's requirements. Consequently, GDLS-UK missed its first 11 revised milestones, and by December 2021, 18 out of 36 critical milestones were outstanding, 10 of which were six months or more late (paragraphs 2.15 to 2.19).

11 National Audit Office, *Framework to review programmes*, April 2021.

12 The Department knew of noise and vibration issues before soldiers reported injuries but was not aware of the severity of potential problems. Noise and vibration are common problems on armoured vehicles. The Defence Science and Technology Laboratory (DSTL) had been warning Defence Equipment & Support (DE&S) of concerns about Ajax's potential compliance with legislative requirements since 2014. Reporting of issues identified in trials was limited and slow, meaning that safety concerns were not shared or escalated by the Army or DE&S. The Army's trials team began reporting injuries from July 2020 onwards, having raised concerns about vibration since late 2019. But excessive noise and vibration levels – and potential injuries – were not reported to the senior responsible owner (SRO) until September 2020. The Army and DE&S had signed off safety documentation – provided by GDLS-UK – that, with some limitations on use, the vehicles were safe to commence training in August 2020, one month after reported injuries. Briefings for the minister for defence procurement did not mention noise and vibration until November 2020, after he had given evidence to the House of Commons Defence Committee. Quarterly programme reports did not mention noise and vibration problems until March 2021 (paragraphs 2.20 to 2.26).

13 The Department did not create effective mechanisms or incentives to resolve safety issues. The Department's approach to safety testing is complex, with multiple layers of testing and uncertainty around roles and responsibilities. For example, as advisers, DSTL lacked authority to ensure that the Department gave due consideration to the safety issues that it raised. There was a lack of clarity about the level of evidence required for safety cases, which meant GDLS-UK had to provide additional evidence, necessitating additional resources to complete the work. The Department believes that the contract also incentivised GDLS-UK to prioritise production milestones over the quality and performance of the capability. In December 2021, the Department published its own lessons learned review and made 20 recommendations for change (paragraphs 2.25 to 2.27).

14 The Department is taking steps to resolve the noise and vibration issues, but they continue to represent a significant risk to the programme. The Department and GDLS-UK disagreed on whether the levels of noise and vibration in Ajax vehicles breached contractual requirements. As a result, the Department commissioned trials to provide an independent dataset on the scale of the issues. But these trials did not provide evidence on the cause, test the impacts on personnel in an operational scenario nor identify potential solutions. GDLS-UK has undertaken its own analysis and argues that the vehicles are safe to operate with appropriate hearing protection. GDLS-UK claims that noise levels are higher when using the Army's headsets than the headsets used by its own crews.[12] The Army has been aware since at least 2019 of problems with these headsets, which have been used in some operational armoured vehicles. GDLS-UK has identified potential design changes to minimise the impact of vibration on the crew. Further independent trials in early 2022 will test these modifications and will include more vehicle variants. But the effectiveness of these mitigations has not yet been proven or accepted by the Department. As such, there remains a risk that additional work will be needed to resolve issues, including retrofitting solutions for vehicles that have already been built or integrating alternative headsets. The Department and GDLS-UK continue to disagree on the safety of the vehicles, and it is likely to take until late 2022 to agree on solutions, adding further to schedule and cost pressures (paragraphs 2.21 to 2.24).

15 Other safety and technical risks remain unresolved. By December 2021, the Department had imposed 27 limitations of use on the Ajax vehicles, of which 22 related to safety and 11 were critical to achieving IOC. DSTL was also tracking 136 'concerns', only four of which related to noise and vibration. GDLS-UK told us that it was unaware of DSTL's concerns as it progressed work on vehicle design. While a programme of this scale and complexity will inevitably need to resolve design issues, the Department's management of the programme means it still has a high level of unresolved technical issues (paragraph 2.28).

Future risks

16 The programme faces significant challenges, and it is not yet clear whether the issues are resolvable. The pressure on the programme has significantly increased over the past year. It is a year behind the revised schedule, trials involving Army crews have been stopped, noise and vibration issues remain unresolved, and GDLS-UK has continued production without receiving any payment in 2021 – with the Department having paid GDLS-UK £1.1 billion less than scheduled at December 2021. The two parties remain in dispute over unresolved contractual, safety and technical issues. The programme team is exploring how to recover the programme but will not agree a revised target date for IOC until noise and vibration issues are resolved. The Department will need to consider carefully whether the programme can deliver the intended capabilities but does not expect to be in a position to do so until late 2022 (paragraphs 3.2 to 3.4).

12 The headsets used by GDLS-UK crews are ear defenders.

17 The Department also recognises that it needs to strengthen its programme management. It is seeking to:

- revise governance arrangements and ensure the programme has appropriate resources. It has made improvements, such as appointing a full-time SRO, and the programme board has started to provide stronger oversight. The Department has recognised that the programme needs strong leadership and decision-making, with clear accountabilities and better management information on progress and issues;
- ensure the commercial arrangements create the right incentives to deliver the required capability, including meeting safety requirements. To date, payments have been driven by achieving production milestones; and
- develop a realistic, agreed schedule to IOC and FOC. The Department and GDLS-UK do not have an agreed timeline. The Department cannot set a new target date for IOC until it has agreed with GDLS-UK how to resolve the noise and vibration issues (paragraphs 3.5 to 3.11).

18 The Department also faces significant challenges in developing the enabling capabilities that will allow it to use Ajax as intended. Delivering the full Ajax capability will depend on the Department delivering supporting programmes, including new communication systems, training facilities and infrastructure projects to store the vehicles. In particular, the Department is planning to enhance Ajax's digital capability through the delivery of the Morpheus programme – also partly supplied by General Dynamics – which will improve communications. However, this programme has had significant cost increases and is running at least three years late. Ajax will not have the full level of enhanced digital capability until new radios are delivered under this programme. The Department has also encountered delays and difficulties on other enabling programmes, including developing infrastructure, designing training courses and providing operational ammunition (paragraphs 3.12 to 3.14).

19 The delays to developing Ajax will have important operational and financial impacts for the Army. The Army's plans rely on delivering a network of digital capabilities by 2030, centred around Ajax, Boxer and Challenger 3 armoured fighting vehicles. But the delays to the Ajax programme mean it is not clear how the Army will achieve its planned restructuring by 2025. The Army accepts it will not deploy Ajax as early as planned, relying instead on the ageing Warrior armoured infantry vehicle and Challenger 2 main battle tank. If Ajax continues to be delayed, the Army may need to keep Warrior in service for longer, or delay upgrades to some Challenger vehicles, so that more are available for operations. The Army will also need to manage the financial consequences of keeping old capabilities in service, which will add to wider affordability pressures (paragraphs 3.10, 3.11 and 3.15 to 3.17).

Conclusion on value for money

20 The Department expects Ajax to improve its armoured vehicle capability significantly. So far, it has insisted that GDLS-UK will deliver 589 Ajax vehicles for the agreed contract price of £5.522 billion. But the in-service date has already increased by four years and the Department does not know when it will be able to start using the vehicles. The programme continues to face significant problems and there is not yet agreement on the causes of critical safety issues or how these will be resolved. There are other technical issues which still need to be addressed and wider problems in developing the enabling capabilities that will allow Ajax to achieve full capability. These problems mean that the Department has not demonstrated value for money on the £3.167 billion it has spent so far through this contract.

21 The Department's and GDLS-UK's approach was flawed from the start as they did not fully understand the scale or complexity of the programme. A series of programme management failures have since led to missed programme milestones and unresolved safety and technical issues. The two parties remain in dispute over unresolved contractual, safety and technical issues. The Department faces a significant challenge and difficult decisions if it is to deliver the programme, with a risk that the problems might prove insurmountable. To deliver value for money from the programme, the Department must introduce the capability that it set out to achieve, without costs escalating or further delays in introducing the capabilities. We have seen similar problems on other defence programmes, and the Department must ensure that it learns lessons to prevent a reoccurrence of failings across its £238 billion equipment programme.

Recommendations

22 Our recommendations are intended to help the Department create the necessary conditions to deliver the programme and, in doing so, apply the lessons across its other armoured vehicle programmes. It should:

Delivery schedule

a **agree a credible delivery plan to IOC and FOC with GDLS-UK**. In doing so, it should consider what contingency it needs to resolve existing issues and manage unknown risks and ensure that the timetable is realistic. It should assess whether the FOC target date is achievable and re-assess this as the programme progresses;

Governance

b **reassess the way the programme is governed and resourced** – focusing on the role of the programme board and interfaces between the Army, DE&S and the bodies involved in trials and managing the interdependencies. Duty holders should have sufficient authority to perform their roles, and the governance structure needs to support clear and timely decision-making to provide the necessary approvals and manage programme risks;

c **improve the management information to provide more real-time visibility on progress, risks, and dependencies**. This should allow all parties to have a single view on progress against milestones and budgets, clarity on risks and when action is needed;

Commercial incentives

d **ensure that the contract incentives are focused on outcomes and align the need to deliver to time with an increased focus on developing the capability**, by ensuring technical issues are addressed in a timely manner; and

Safety issues

e **ensure that there is a clear mechanism and accountability for implementing the recommendations of its safety report**. As part of this, the Department should consider the scope for streamlining the safety trials process and ensure that duty holders have sufficient authority to report and escalate findings. There is a need to ensure that the advice provided by DSTL, or any other advisory body, is given due consideration in a timely manner, and a complete record is kept of actions taken against the advice.