National Audit Office

Report

by the Comptroller
and Auditor General

Home Office

Upgrading emergency service communications: the Emergency Services Network

Key facts

70%
percentage of Great Britain's landmass, as measured for Emergency Services Network (ESN) purposes, covered by EE's 4G network, July 2016. This needs to be increased to 97% to match Airwave's coverage

£3.6bn
estimated value of the quantified benefits over 17 years resulting from switching to the ESN

£1.2bn
estimated cost of ESN, April 2015 to March 2020. After March 2020 ESN is expected to save money compared to Airwave

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412 number of public organisations using Airwave in 2016 – there are an estimated 328,000 Airwave devices within these organisations

99.9% average availability of the Airwave network between 2010 and 2016

£500 estimated annual saving per device (handheld or vehicle-mounted, used by the emergency services once the transition to ESN is complete

5 months the minimum length of time the programme is currently behind schedule compared to the full business case. The programme considers this will be recovered before ESN goes fully operational

£475 million estimated cost to the taxpayer of a 12-month nationwide delay in the time taken to transition to ESN

Key dates

	Airwave	Emergency Services Network – target dates in August 2015 full business case	Emergency Services Network – actual dates or current targets
2000	Airwave contract signed with BT		
2005	Ambulance trusts in England and Wales sign contract to join Airwave		
2006	Fire and Rescue Services and Scottish Ambulance Service join Airwave		
2007	Infrastructure funds managed by the Macquarie Group buy Airwave		
2010	Airwave becomes a strategic supplier to government. Negotiations with the Cabinet Office to secure discounts in current contracts unsuccessful		
2011			ESN programme begins
2012 (December)	Date at which Airwave contract breaks even on capital investment		
2013 (December)			ESN outline business case approved by programme board
2014 (April)	Programme officials discussed extending Airwave contract with Macquarie, but did not secure a discount it considered sufficient		
2015 (August)			ESN full business case approved by programme board
2015 (September)			ESN contract with Kellogg Brown and Root signed
2015 (October)		Target date for awarding main contracts	
2015 (December)			ESN contracts with Motorola and EE signed
2016 (February)	Motorola purchases Airwave from the Macquarie-managed infrastructure funds Airwave contracts extended to December 2019. They were originally due to expire between September 2016 and May 2020		
2016 (March)		Target date for completing ESN design	
2016 (August)			ESN designs fully complete
2017 (July)		Target date for completing building and testing of ESN	
2017 (September)			Current target date for completing building and testing of ESN. Emergency services to start transitioning onto ESN
2018 (June, July and October)			Peak flow in emergency services transitioning to ESN
2019 (December)	Airwave contracts currently due to expire (can be extended beyond that date)		Current target date for completing transition to ESN
2020 (January)		Target date for completing transition to ESN	
2023 (December)			Date beyond which ESN contracts cannot be extended
2032		End-date for period covered by the ESN full business case	

Summary

1   Modern police, fire and ambulance services (the emergency services) rely on communications between control rooms and personnel in the field. These communications are currently provided by Airwave Solutions Limited (Airwave) through a series of contracts that now expire in 2019. These contracts cover 105 emergency services in Great Britain as well as 307 other public sector organisations.

2   In 2011, the government set up the Emergency Services Mobile Communications Programme (the programme) to look at options to replace Airwave when the contracts expire. The programme is part of the Home Office but is co-funded by the Department of Health, Scottish Government and Welsh Government. The programme's objectives are to replace the Airwave service with one that matches it in all respects and:

- makes high-speed data more readily available to the emergency services to improve their performance;

- provides more flexibility to take advantage of new technologies as they emerge; and

- costs less.

3   The government's chosen option to replace the Airwave service is known as the Emergency Services Network (ESN). ESN will save money by sharing an existing commercial 4G network: the Airwave network is fully dedicated to public sector use. It will also bring better mobile-data capabilities than provided by Airwave.

4   The programme awarded the three main contracts for the provision of ESN in 2015 to Kellogg Brown and Root (KBR), Motorola Solutions Inc. (Motorola Solutions) and EE Ltd (EE). Some related contracts were awarded in June 2016 but others have yet to be awarded. In February 2016, Motorola Solutions bought the incumbent, Airwave, from an infrastructure fund managed by the Macquarie Group. The current plan is that the emergency services will start moving onto the new network in September 2017 and are due to complete this process in December 2019.

Scope of this report

5   This report examines the significant upcoming challenges that the programme will need to manage if it is to be successful, how it is managing them and why it has chosen this approach. This report looks at a live programme early in its delivery phase: it is too soon to assess whether the programme has achieved value for money. This report only looks at the services provided by Airwave that are relevant to the future programme.

6   We have defined good performance as there should be:

- an agreed understanding between the programme, funding organisations and user organisations on the risks they will need to manage to deliver ESN, and similar risk appetites;

- appropriate commercial arrangements in place for ESN;

- best-practice processes in place for managing the delivery of ESN;

- good consultation over a wide range of options before the ESN option was chosen; and

- a business case which is based on strong evidence and reasonable assumptions.

7   We examined programme documentation, interviewed officials and suppliers and held workshops with programme officials and emergency services representatives. We commissioned a report on international provision of emergency service communications, which is available on our website. Full details of our methods are in the appendices.
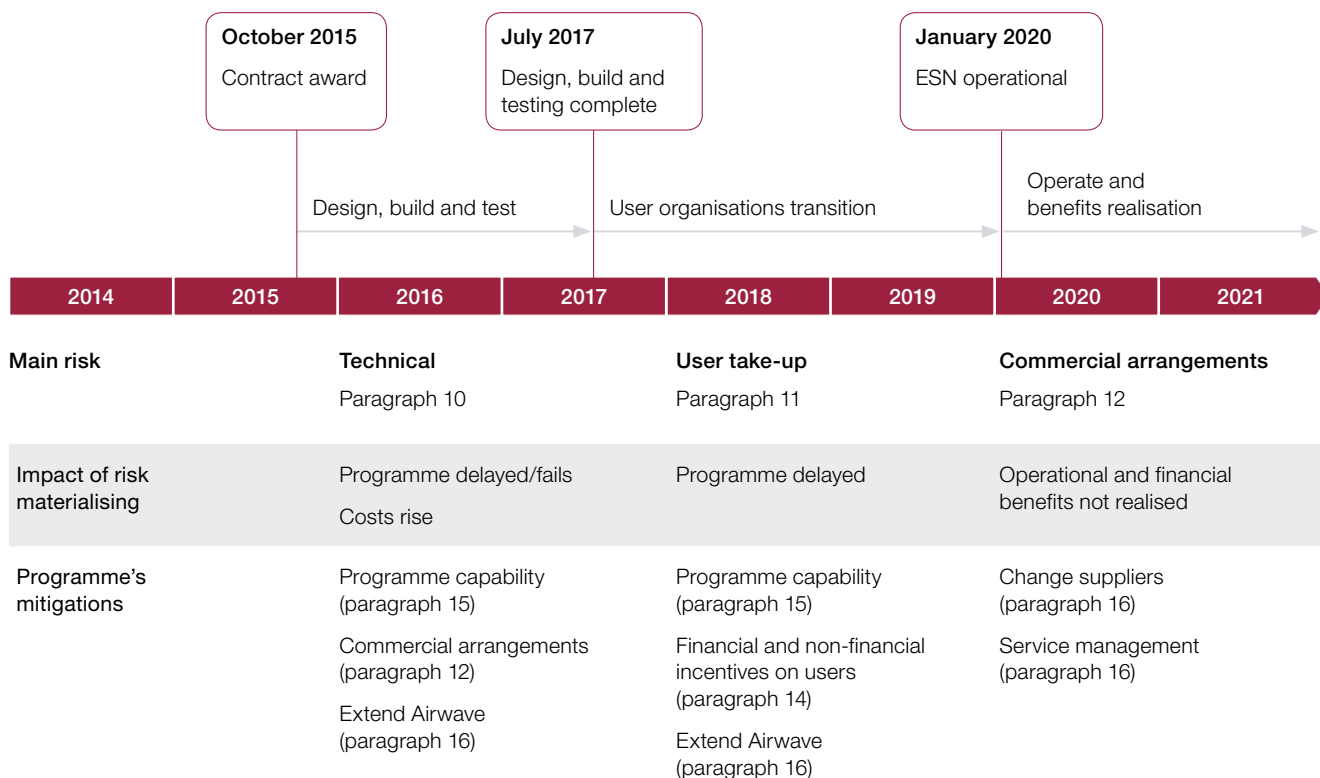
Key findings

8   **Airwave has delivered a communication service that has served the emergency services effectively in dealing with life or death situations.** The Airwave network covers 97% of Great Britain, including nearly all roads and a small number of aircraft. The network has averaged 99.9% availability since April 2010 and provides capabilities for emergency service personnel to cooperate with those working in different regions or services. These capabilities exceed those available in all but two of the other G20 countries at the current time (paragraphs 1.2 to 1.8).

Risks with delivering ESN

9   **ESN is inherently high risk and such an approach has not yet been used, nationwide, anywhere in the world.** There are three main categories of risk associated with ESN: technical; user take-up; and commercial arrangements. These roughly align to the three major phases of the programme: design, build and test; transition; and operate. There is also an overarching risk due to the ambitious nature of the timeline adopted by the programme. Only South Korea is currently seeking to deploy a solution similar to ESN nationwide, but starts from a better base with significantly greater 4G coverage (**Figure 1** overleaf, paragraphs 2.1 to 2.3).

Figure 1
Main ESN risks and mitigations

	October 2015 Contract award	July 2017 Design, build and testing complete		January 2020 ESN operational	

		Design, build and test →	User organisations transition →		Operate and benefits realisation →
2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**

	Technical Paragraph 10	**User take-up** Paragraph 11	**Commercial arrangements** Paragraph 12
Main risk	Technical Paragraph 10	User take-up Paragraph 11	Commercial arrangements Paragraph 12
Impact of risk materialising	Programme delayed/fails Costs rise	Programme delayed	Operational and financial benefits not realised
Programme's mitigations	Programme capability (paragraph 15) Commercial arrangements (paragraph 12) Extend Airwave (paragraph 16)	Programme capability (paragraph 15) Financial and non-financial incentives on users (paragraph 14) Extend Airwave (paragraph 16)	Change suppliers (paragraph 16) Service management (paragraph 16)

Note
1   Dates are those planned in the full business case. The main contracts were actually awarded in September and December 2015.

Source: National Audit Office analysis

10   ESN is technically cutting edge. There are some significant technical challenges to delivering ESN.

- **Increasing the percentage of Great Britain's landmass covered by EE's network** from 70% (as at July 2016) to 97%. The work to do this is shared between EE and the programme and their current projection is that sufficient coverage will be available by September 2017.

- **Developing handheld and vehicle-mounted devices that will work with ESN** as no suitable devices currently exist.

- **Developing new push-to-talk software** to enable 'radio-like' communications between emergency services personnel and control rooms.

- **Implementing the software and protocols that are needed to give emergency services personnel priority** over commercial users of EE's network.

Delivery by the programme against these technical challenges is by no means certain and, while total failure seems unlikely, there remains a risk that the programme will not be able to overcome these challenges for the cost or timetable proposed in the full business case, or to the satisfaction of users (paragraphs 2.3 and 2.4).

11   The programme's success depends on the emergency services and other users choosing to take up ESN and make full use of it. The programme is not intending to force the emergency services to transition to ESN but has instead assured them that they can stay on Airwave until ESN is 'at least as good as Airwave'. Defining this is complex and leaves room for disagreement, particularly over where is covered by the ESN service. There are also some elements of the functionality of Airwave where it is unclear how they will be matched in ESN. If even a small number of the emergency services and other users choose to delay transition, this will reduce benefits compared to the full business case. The full benefits of ESN rely on the emergency services exploiting high-speed data services by changing their operational behaviour, but supporting this is not part of the programme's scope and the government is not yet clear on what support it may need to put in place (paragraphs 2.5 to 2.8, 4.18).

12   The commercial arrangements for ESN have separated the operational responsibilities of the emergency services from the commercial levers, which are held by the programme and therefore the Home Office. This separation has two elements. First, the majority of the cost of ESN will be paid for centrally. Second, emergency services will not have their own contractual arrangements for the full scope of ESN. Instead, they will have a call-off arrangement with one of the ESN suppliers, EE, but the terms of this are more limited than the contract they currently have with Airwave. For example, their contract with EE will give them very little direct recourse for poor service. Nor will they have a contract with most of the other ESN suppliers. Programme officials consider that, in practical terms, the arrangements under ESN are similar to those under Airwave. We have observed that under Airwave the emergency services make use of a wide range of supplementary communications services and the business case for ESN assumes these stop being needed. We consider that the commercial arrangements under ESN therefore create a risk that the emergency services feel they do not have sufficient control over the service they receive and may continue to make use of supplementary services, leading to a reduction in the benefits of ESN (paragraphs 1.14, 2.9 to 2.16).

13   Despite the inherently high level of risk, the programme has adopted a timeline for delivering ESN that is very ambitious. Programme staff and emergency services personnel all saw delivering ESN in line with the timeline in the full business case as very difficult. Programme officials told us that the current timeline contains no contingency during the design, build and test phase. Programme officials consider that it does have contingency, however, in the transition period. Emergency services personnel do not agree and told us that the transition period from September 2017 to December 2019 already gave them limited opportunity to plan or learn lessons from each other (paragraphs 2.17 to 2.22).

The programme's approach to managing these risks

14   **A 12-month delay to ESN could cost up to £475 million so the programme has put in place commercial and funding mechanisms that are designed to manage this risk.** The programme's commercial arrangements pass many elements of the technical risk to suppliers because, in the opinion of programme officials, they are best placed to manage these risks. While this is true if the risk materialises on a small scale, we consider that these arrangements could be detrimental to the overall commercial relationship between the programme and its suppliers if there are high cost increases or long delays. During transition, programme officials consider that most of the cost of delay, and benefit of achieving the existing transition plan, will fall on the emergency services, which will incentivise emergency services to transition without unnecessary delay. However, this is not certain as budgets beyond March 2020 have not yet been set (paragraphs 2.8, 2.14 to 2.18).[1]

15   **In general, the programme has a positive delivery-focused culture that has helped it retain staff and manage issues as they have emerged.** In contrast with other programmes that we have examined recently, the ESN programme has benefited from stability in staffing at both senior and junior levels. In interviews and workshops we consistently heard positive comments about the programme's culture and focus. Staff on the programme have a strong record of delivering other projects. These factors have helped the programme manage challenges that have arisen to date. They also mean that it is well respected among stakeholders who were, for example, willing to approve investment in the programme despite wider government spending constraints. During the course of the study, the programme made changes in response to comments from us and other reviewers (paragraphs 3.2 and 3.3).

16   **Nevertheless, the programme's management of its key risks needs to improve if it is to deliver ESN successfully.** For example:

- **The programme's approach to technical assurance and testing needs to be better.** The programme board lacks independent telecommunications expertise and the panel the programme set up to provide such assurance has not systematically analysed the risks. Furthermore, the programme's testing plans are currently high level and there are differences of opinion between programme officials and suppliers on the scope of, and roles and responsibilities for, testing. In a programme this complex some assurance that is independent of suppliers, the programme and the emergency services would be beneficial (paragraphs 3.5 to 3.9).

- **User engagement could be better, particularly with police and non-emergency service users of Airwave.** Emergency services representatives agreed that engagement over requirements had been good but perceptions were more mixed since then. Some emergency services representatives were unsure of the benefits of ESN to them, possibly because Airwave is currently largely paid for centrally. Some emergency services representatives also told us how programme officials do not always listen to challenges that they raise (paragraphs 3.10 to 3.13).

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1   Unless stated otherwise the financial numbers used in this report are based on estimates provided by the programme, which we have converted into current prices using our own methodology.

- **The circumstances in which the Airwave contract will be extended need to be more clearly set out.** The programme has a clear contingency, to extend Airwave, and has agreed a cost for doing so. However, there is limited detail on how and when this contingency will be invoked and for how long. As a consequence, we found that there was not a shared understanding between programme officials, emergency services representatives and other stakeholders about contingency plans and how any delay will be funded (paragraph 3.4).

- **The service management arrangements once ESN is operational need to be more clearly articulated.** At the moment it is unclear who in the Home Office will be responsible for ensuring ESN delivers its predicted benefits once it is operational. It is also unclear what governance will exist between that party and the emergency services to ensure that ESN continues to meet user requirements. The length of the new ESN contracts are much shorter than the Airwave contract and give the programme flexibility to change suppliers during the life of the business case (paragraphs 2.11 and 3.17).

17 **The programme is behind schedule compared to the full business case and has responded by squeezing the time available rather than extending the overall time frame.** The programme awarded contracts two months later than it expected in its full business case. Since contract award the programme delivered detailed designs three months late and has delayed the delivery of some elements of functionality by eight months. Overall, it is therefore between five and ten months behind the full business case. Programme officials consider that it has missed milestones due to factors outside their control. It has so far been reluctant to extend the Airwave contract and has instead reduced the time available to move the emergency services onto ESN by three months and introduced a more gradual approach to building and testing. In August 2016, the programme expected to turn off Airwave in December 2019, one month earlier than targeted in the full business case (paragraphs 2.17 to 2.22).

18 **Overall, the programme, the Home Office and other sponsor bodies appear to be underrating the seriousness of the risks ESN poses.** The emergency services demonstrated to us a low risk-appetite when it comes to deciding whether to transition to ESN. For example, they talked to us about plans to independently test ESN coverage because they were not convinced by the programme's plans. By contrast, technology was not one of the top three risks raised with us by programme staff. Since the beginning of 2016, the Home Office has downgraded the risk of delivering ESN twice because it considered the risks to be under control. This meant that by June 2016 ESN did not feature on the list of risks escalated to the Home Office's management board. We consider that, despite the programme's mitigations, ESN remains an inherently high-risk programme that will require the highest levels of senior oversight throughout its lifetime (paragraphs 3.5 to 3.9, 3.18).

Why the programme chose to adopt these risks

19   ESN is the right direction strategically and the programme's planned approach to delivery, if successful, will maximise benefits. Airwave is an expensive communication system costing £1,300 per handheld or vehicle-mounted device per year. Setting up ESN will cost an estimated £1.2 billion to March 2020 but after that ESN will cost an estimated £500 less than Airwave per device per year. ESN will have better data capabilities than Airwave, which should allow the emergency services to operate more effectively, and the commercial arrangements under ESN should make it easier to transition to newer technologies, such as 5G, when they arrive. From 2010 the government had a deteriorating commercial relationship with Airwave and considered that Airwave's owners had an unsustainable debt position. Taken together, programme officials considered these factors created a strong case for moving to ESN as quickly as possible. All parties that we have spoken to, including Airwave, agree that ESN is the right long-term direction (paragraphs 1.13, 2.11, 4.2 to 4.6, 4.10 to 4.17).

20   However, we consider that in seeking to maximise benefits the programme's planned approach to delivery has also maximised risk. The programme's option appraisal shows that ESN carried the highest level of risk among the options it considered in detail. Further, the programme's option appraisal did not cover options for a slower implementation of ESN to allow more time for build, testing and transition. No country yet uses 4G mobile technology for its emergency service communications and countries that are looking to implement it are planning to take a lower risk approach than that adopted by the programme. For example, South Korea, whose approach is the nearest comparator to ESN, is planning to use dedicated mobile spectrum for its emergency services communications rather than, as in Great Britain, sharing spectrum with commercial users. Australia is planning to use commercial 4G services for data first and moving to using it for voice later. All other options would have resulted in fewer benefits than the programme expects from ESN. Analysis, planning and procurement activities undertaken since inception of the programme have given programme officials more confidence in their ability to deliver ESN to time, quality and cost than when the option was agreed in 2013 (paragraphs 2.2, 4.7 to 4.9).

21   The benefits of ESN should be substantial but we consider that the business case may be overly optimistic in its valuation of these. The programme has estimated that the benefits of ESN will be worth £3.6 billion between April 2015 and March 2032. Valuing benefits is always difficult but we consider that a number of the assumptions that the programme has made in valuing these benefits may be optimistic. For example, in calculating how much ESN will save, the programme has assumed that Airwave will continue to cost the same in the future as it has done to date due to the difficult relationship they had with Airwave. Historically, however, the cost of Airwave has included designing and building the network which will not need to be repeated and we therefore consider that at least some discount should have been assumed (paragraphs 4.10 to 4.18).

Conclusion

22 The communication systems used by our emergency services can literally make the difference between life and death for members of the public and the services themselves. The existing system, provided by Airwave, works but at £1,300 per device is expensive. The need to save money and exit a difficult commercial relationship with Airwave has led the government to try and move to an approach that is not yet used nationwide anywhere in the world and carries significant implementation risk. ESN is the right direction strategically but we are concerned that the risks with getting there are under rated in the Home Office and elsewhere.

23 On the positive side, the programme has an energetic, delivery-focused culture that has helped it retain staff and manage issues as they have emerged. The programme needs to put in place more independent testing and assurance regimes for its technical solution and urgently improve its approach to engaging with the emergency services, on whose cooperation the programme depends.

Additional text requested by the Home Office

The Home Office has asked us to record that they have adopted their approach to equip the emergency services with the modern data communications capabilities they need and so welcomes the report's key finding that ESN is the right direction strategically. The Department has also accepted the key recommendations. However, the Home Office does not agree with the NAO's judgement about the Department's acknowledgement of the programme's risk, on incentives on users to transition, or the scale of benefits in the business case, considering that the programme and commercial approach are designed to maximise value for money and comply with procurement law.

Recommendations

For the programme

a   **The programme should improve the independence of the technical assurance arrangements it has in place.** The programme should seek to recruit some external telecommunications expertise onto its programme board to provide more independent challenge of the programme. It should also look to ensure more independent testing assurance of ESN prior to transition.

b   **The programme needs to urgently develop a detailed contingency plan.** So that the programme, the emergency services and suppliers can be clear on the circumstances in which Airwave will be extended and respond effectively to any problems, the programme should develop a detailed plan that considers some likely scenarios and responses, including funding requirements and sources.

c   **The programme needs to improve communications with the emergency services and other users of Airwave.** To minimise the risk of unnecessary delay the programme should do more to engage with emergency services and other users. It could also do more, working with its sponsors, to clarify uncertainties around the extent to which future savings will benefit the emergency services to encourage them to move to ESN as quickly as it is safe to do so and ensuring the benefits of ESN are maximised.

d   **The programme needs to work with the Home Office, other sponsors and users to develop the service management arrangements for when ESN is fully operational.** How the ESN service will be governed, managed and evolved during its life is currently unclear and this leads to a risk that user requirements will not be met.

For the Home Office and wider government

e   **The Home Office and other sponsors should work together to protect the programme from unnecessary staff turnover.** The programme has benefited from stability in senior and junior roles. Lack of stability has been a problem for similar programmes in a number of our recent reports. All sponsors have a role to play in helping to maintain this. For example, they can reduce staff rotation requirements.

f   **When designing and approving commercial arrangements, departments and the Cabinet Office should carefully consider what will maximise the chances of successful delivery.** The commercial arrangements for ESN are complex and, in our opinion, allocate risk to suppliers that they may not be best placed to manage. This has increased the risks that the ESN programme faces.