

**Written Evidence Submitted by Professor Brian Collins, CB, FREng
(RFA0103)**

My comments are organized against the committee's questions

- What gaps in the current UK research and development system might be addressed by an ARPA style approach?

The non defence current UK research and development system centers around UKRI, a relatively newly established joining of the independent research councils to form a more coherent body supplying research funding to the University sector via grants. Another component of the current system is the remaining laboratories which came from the Next Steps agency programme

https://link.springer.com/chapter/10.1007/978-1-349-23899-6_4 of the late 1980s and 1990s when all of the government funded laboratories were privatised or semi-privatised. They collectively are known as the Association of Innovation, Research and Technology Organisations AIRTO <http://www.airto.co.uk/about/> and mainly fund development activity closer to market than that which occurs in the funding from UKRI. The two systems are relatively incoherent with respect to each other and have been scrutinized by GCSA and mentioned in his paper of November 2019 as needing attention, recommendations 3 and 4.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/844502/a_review_of_government_science_capability_2019.pdf

It is also worth considering the context in which DARPA in the USA sits. There are 19 fully funded government research and development laboratories which are funded by DARPA DOD, and other USA Government Departments. These laboratories are very large organisations and have existed for decades. They have a considerable depth and breadth of expertise in a very wide range of relevant topics. Furthermore, they fund using DARPA finance work in American universities and indeed in British universities in order that the best of breed thinking and technological solutions are made available to DARPA. It is also worth noting the scale of activity in the United

States, because of its very much larger size and its very much larger budget, enables it to carry out much riskier activities than perhaps would be the case in the UK.

It is therefore quite difficult to articulate what the gaps are in our current system when compared with United States because the structures within which DARPA sits is very different from what a hypothetical ARPA would sit in in the UK. It could be argued that establishment of a stronger link between AIRTO and university research laboratories and UKRI together with a program integration office, which is largely what DARPA does, (DARPA does not have any laboratories of its own, it funds work in a very wide range of laboratories and in universities as mentioned already) to give a much more coherent national strategy for research and development using the excellent skills and knowledge that is available in universities in industry and in the AIRTO facilities. This will have the advantage also of that research being carried out in close proximity to the teaching activity in universities thereby improving the rate at which skilled people from universities enter into the more commercially oriented research and development activity that such a structure would encourage.

This in fact is not very different from what existed in the defence research laboratories in one of which I was the Deputy Director in the mid 1980s and was known by DOD in the USA as the DARPA of the UK. Whilst an improvement in the effectiveness and efficiency of those laboratories was certainly needed, the next steps agency programme essentially destroyed and removed their research capability within 5 to 10 years of that programme being initiated, to the great detriment to the UK in my view.

- What are the implications of the new funding agency for existing funding bodies and their approach?

If an ARPA was set up along the lines of the United States it will almost certainly cause considerable friction with both UKRI and with AIRTO, the two bodies that it would need to interface to. Without a national conversation being held prior to an ARPA being set up is unlikely in my view that the structure would be in any way as successful as DARPA has been in the USA. Collaboration between funding bodies and researchers and developers is going to be essential especially post-covid when our economy needs to recover. We need to ensure that there is absolutely no waste of expertise and resource in delivering what is needed for the country to prosper again.

- What should be the focus be of the new research funding agency and how should it be structured?

The implication of this question as it is worded is that there is to be a new research funding agency. It could be argued that an extension of UKRI and a re-organisation of AIRTO could provide the research programme integration function that DARPA operates. Whether a new funding agency as such is needed I think is arguable given the lack of the large-scale research laboratories that the DARPA model is predicated upon. Therefore I consider it to be worthy of public examination that a model of using the existing structures and enlarging and modifying them to deliver the purpose of the proposed ARPA structure in the UK context would be a better use of the resources in this governance development phase than establishing a brand-new and radically different structure from scratch. Such a radical initiative would take a decade in my view to start delivering outcomes, whereas using existing structures and adapting them could be done in a couple of years

- What funding should ARPA receive, and how should it distribute this funding to maximise effectiveness?

Again, this question presupposes the existence of ARPA in the UK. Whilst an uplift of money to support strategic research aimed at nationally significant objectives is undoubtedly needed as has been indicated by GCSA in his paper of November 2019 (ref above) it is not self-evident that a new agency is needed in order to justify and achieve that objective. Certainly a programme office that handles and coordinates nationally strategic programs is needed but whether the UK needs a separated budget or a different organisation or whether it can be achieved within the existing organisation I think is worthy of open debate.

- What can be learned from ARPA equivalents in other countries?

There are few other countries that have ARPA-like organisations in their midst to the best of my knowledge. Countries such as Singapore and South Korea and to some extent Australia may be worthy of examination but the culture of research development and how the interaction between universities, government funded research and commercially funded research is orchestrated and governed are so different in each country that making it fit culturally is very special. We would have to carry it out in such a way that the most creative people who would work in such a space prosper and deliver new and worthwhile ideas and that is an essential part of putting together any new structure. Therefore copying what is in other places may not be worthwhile (this was thought about when Catapults were being created and a view was taken on how relevant Fraunhofer institutions were in Germany. Whilst

some aspects were taken on board it was realised then that copying was not appropriate). So the idea that other countries have concepts and approaches which are utilizable has to be viewed with some caution

- What benefits might be gained from basing UK ARPA outside of the 'Golden Triangle' (London, Oxford and Cambridge)?

DARPA is a distributed organisation and it already spans the totality of the USA. Because it funds work through the 19 laboratories which are also statewide distributed across the whole of the USA the idea that copying it would allow the concept of the perceived dominance of the golden triangle in London, Oxford and Cambridge to be an inhibitor to what a UK ARPA might do is completely fallacious. In order to get the best from the work of the universities and other laboratories that exist in this country the concept that geography matters is not immediately relevant. What does matter is that the outcomes of the research are used appropriately and in a manner that is geographically and socially relevant. Were that to be away from London, as it is likely to be, then the proximity of the research and development to those outcomes being utilised is relevant. That may help the case for some aspects of the work being carried out in those parts of the UK where it is most likely to be exploited. However, ab initio the work has to be excellent and wherever the excellent capacity is is where the work should be done.

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