Ministry of Defence

Defence Advanced Manufacturing Strategy

Accelerating the adoption of additive manufacturing within the UK defence sector

Document information

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Version table

Version No	Description	Date	Author	Approver
1.0	1st Edition	31 March 25	Defence Support Innovation Advanced Manufacturing Lead	Defence Support Innovation Team Leader

Contents

Foreword by the Chief of Defence Logistics and Support

The UK has a great heritage in innovative engineering, often led by the demands of Defence to deliver operational advantage in the face of adversity. This proud tradition continues today and through your determination and innovative thinking we have examined the adoption of advanced manufacturing (AdvM)[1] techniques, predominantly additive manufacturing (AM) [2], to reinforce the defence supply chain. It is therefore, with a sense of great satisfaction that we can issue the first Ministry of Defence (MOD) AdvM strategy. This strategy outlines our intent to embrace AM in new designs, to help resolve obsolescence and to increase our competitive edge through development of expeditious battle damage repair techniques. This exciting technology has been in existence for some time, and defence must now realise the latent benefits it offers, in terms of operational availability, improved supply chain resilience and efficiency.

The evidence to exploit AM is compelling. Defence supply chain AM adoption has been proven to be feasible through the MOD's AM as a Service Challenge (Project TAMPA)[3]. Front Line Command (FLC) efforts to use AM for expedient repair is shortening supply chains and getting platforms moving. The Submarine Delivery Agency (SDA)[4] is driving AM adoption in submarine design and support. AM is used widely in sectors beyond defence, providing intricate designs and rapid production whilst minimising the resources used in manufacture and increasing efficiency through reducing weight. This strategy recognises that it is the pace at which industry can apply AM to our platforms that dictates the pace of benefit realisation, but the rate of adoption will be slow unless we work together to remove constraints. We must ensure that our commercial, financial and through-life policies work in step. We must all make this journey together. We must be bold in our decisions and proportional in our risk appetite. Our key challenge is to ensure we progress in alignment with our industry, international partners and Allies.

For industry, this strategy should be a welcome statement of our intent to facilitate further investment and growth; striving for AdvM to be our new normal. This is entirely consistent with the UK government's commitment to develop a faster, more resilient supply chain, driving economic growth, boosting British jobs and strengthening national security. It is absolutely aligned with experience borne out of Ukraine, by seizing opportunities presented by new technologies whilst also having the potential to have a positive impact on environmental sustainability and prosperity.

This strategy has been socialised widely within MOD and industry. It has attracted much support; now we need to turn that support into action, and I need your help to deliver it. With your support we can get advanced technologies into our DNA and that of future generations of engineers and logisticians.

Vice Admiral Andy Kyte CB FCLIT
Chief of Defence Logistics and Support

[1] Defined as 'production processes that integrate advanced science and technology, including digital and automation, to manufacturing' Advanced manufacturing plan - GOV.UK (www.gov.uk) dated 6 December 2023.
[2] Generally referred to as 3D printing. AM is the process of creating an object by building it one layer at a time.
[3] Project TAMPA, also known as the AM as a Service Challenge (AdMaaS), is a project to accelerate AM adoption within the defence supply chain to alleviate in-service platform obsolescence.
[4] The SDA is an Executive Agency of the MOD.

Introduction

1. Advanced manufacturing (AdvM) covers a wide range of processes and technologies, including additive manufacturing (AM), each bringing their own opportunities. Due to the relatively high technical maturity and the ability to significantly reduce the impact of some current defence issues, the majority of the MOD AdvM effort has been towards accelerating the adoption of AM. Therefore this first iteration of the MOD's AdvM strategy focuses solely on AM. It describes what needs to be done. A subsequent programme of work will describe how the MOD adoption of AdvM will be delivered.

2. Since March 2024, Director Joint Support (DJS) has been the MOD's 2* (or senior) Champion for AdvM, providing for the first time, the authoritative leadership and energy to drive defence wide adoption.

Context

3. As of February 2025, the illegal invasion of Russia into Ukraine moves into its third year and the global strategic outlook continues to deteriorate while also becoming more complex. Hostilities in the Middle East continue to highlight the challenges facing the region, with disruptions in the Red Sea having far reaching impacts on global supply chains. This includes impacting key products, commodities and raw materials and reinforcing the need for resilience and adaptability within the Strategic Base. In response to these and other challenges, the refreshed Defence Support Strategy (DSS)[5] sets out five outcomes:

    a. A capable and resilient Defence Support Enterprise[6];
    b. Enhanced decision making across the Defence Support Enterprise;
    c. Effective delivery of a resilient Defence Supply Chain, integrated across the military-industrial complex;
    d. Optimised force development and experimentation for Support;
    e. Our people enable future performance.

4. Underpinning the DSS, the Defence Support Sustainable Support Strategy[7] explicitly states that defence should embrace AM.

5. While efforts are being made to address poor availability, productivity and efficiency across UK defence, these challenges are made more difficult due to reductions in the sizes of the Armed Forces and supporting Civil Service, reducing fleet sizes and aging equipment. Experience in Ukraine has also demonstrated that 'speed of repair'[8] is as

[5] Defence Support Strategy Refresh, Summer 2024. The 2024 refresh of the DSS complements, and where noted, provides an update to the April 2022 release of the DSS.
[6] The Defence Support Enterprise comprise the over-arching functions which direct the strategic conceptual ambition for Defence Support and therein the Defence Support Network (DSN). It sets common policy and performance standards to be applied across the DSN, shapes the development and delivery of the capabilities that are both supported by the DSN and required by it and interfaces with the significant industrial and stakeholder landscape required to effect its operation.
[7] Sustainable Support Strategy 2022 (GOV.uk).
[8] Alongside innovation, iteration, and prototyping.

vital as ‘speed of delivery’. Because of this, UK defence need to consider new manufacturing methods that can address these issues, especially for hard-to-source items and replacements for obsolescent parts.

6. In pursuit of resilience, AM facilitates dispersed production using networks of competent and qualified suppliers, reinforced, where feasible and necessary, by military capability.

Vision

7. Based on the findings and evidence derived from Project TAMPA and FLC unit experience, the Chief of Defence Logistics and Support (CDLS) endorsed the MOD’s vision for AM adoption in 2022. The vision emphasises supply chain resilience, achieved through a dispersed supply network and the ability to respond quickly to reduce lead times, obsolescence and improve sustainability.

> *Additive manufacturing boosts supply chain resilience and provides a step change in platform and equipment availability and readiness.*
>
> **Additive manufacturing vision**

8. The MOD’s AM vision has four interconnected pillars comprising: design sources; a digital thread and; certified production capabilities, typically in industry that meet international standards; supported by mobile production capabilities that are closer to the point of consumption, but which have less capability than those that meet international standards. Taking each pillar in turn:

    a. The design sources are where the information required to manufacture a part is generated. The part is either designed for AM from the outset; or reverse engineered to enable a part that is no longer available to be additively manufactured. There are new policies in place (or changes to existing policies) to incentivise the adoption of AM and appropriate commercial mechanisms to achieve this. These AM parts have the same assurances and liabilities as those parts made via traditional manufacturing. During the in-service phase of an equipment lifecycle, the demand for parts continues to be made by the end-user and/or repair organisation.

    b. The digital thread enables the secure transmission of the information required to manufacture a part, from a design library to the production capability. The digital thread enables requests for change from the production capability and end-user to be transmitted back to the source of the design. The digital thread is cyber secure and provides assurance that the information received is entirely consistent with that which was sent. The information from the digital thread enables the part to be certified as fit for purpose and accepted into service. Where permissions are agreed, the digital thread allows interrogation

of the design libraries, enabling common users of equipment to derive the inherent benefits of AM.

c. The certified production capabilities are typically found in industry and qualified against international standards to achieve production of fully certified AM parts. Not all of these certified production capabilities are in the UK, providing a network of global manufacturing 'spokes' enabled through information sourced from designs delivered through the digital thread.

d. Alongside these 'spokes' are mobile production capabilities with less capability than those provided by the certified production capabilities but are able to produce parts closer to point of consumption. Common to all AM part production is a return loop to enable recycling of material suitable for reuse as part of a circular economy.

9. A visual representation of the MOD's AM vision depicting the opportunity AM offers to create dispersed networks of supply is shown at Annex A.

Rationale and benefits

10. AM offers a range of strategic and operational benefits, such as smarter supply chains, flexibility through exploiting digital manufacturing[9] and design freedoms. If appropriately applied, AM adoption has the potential to produce a paradigm shift in the way components are designed, developed, manufactured and supplied.

11. For the operational commander, AM provides a choice of sources of supply. These benefits are not unique to the UK. The US Department of Defense (DoD)[10] and the Australian Defence Force[11] have released AM strategies setting out their intent. Alongside these, NATO have committed, via the NATO Logistics Committee, to a critical logistics initiative for AM with the UK as the lead nation.

12. For the MOD, the benefits of AM lie in addressing the immediate shortfalls in the supply of inventory items. Shortfalls caused by either technical or commercial obsolescence, and inventory items for which the lead-time is excessive.

13. In 2021 the Defence Science and Technology Laboratory (Dstl)[12] recognised obsolescence as the number one supply issue. Obsolescence continues to plague old and new platforms.

14. The MOD has an inventory that currently exceeds 1.3M items and the opportunity for AM to provide an alternative source of supply for obsolescent items is large. This is even once we accept that not every one of these inventory items will lend themselves to

[9] Digital manufacturing is an integrated approach to manufacturing that is centred around a computer system.
[10] Department of Defense Additive Manufacturing Strategy, January 2021.
[11] Additive Manufacturing Operationalisation Strategy. Defence Logistics Enterprise, Australian Govt DoD, April 2022.
[12] Logistic Technology Investigations Work Package 3c Supply Problems, March 2021.

being additively manufactured. Whilst all these inventory items are sourced from industry, there is currently no compulsion for industry to accelerate the adoption of AM as a means of improving the supply position.

15. At the macro level, an improvement in the supply of inventory items should see a marked improvement in platform and equipment availability. Alongside this operational benefit, a report commissioned using Defence Innovation Unit (DIU)[13] funding, identified that if 15% of the defence inventory were additively manufactured, the net financial benefit to the MOD would be £110M over the next 15 years, with a net value per year thereafter of £35.5M.

16. These figures are indicative and deliberately cautious. Whilst they are based on a small snapshot of platforms, and require further validation across a wider data set, they clearly signal the potential benefits of a more determined approach to AM adoption.

17. The key to unlocking this benefit lies with industry and the pace at which they adopt AM. The motivation to do so should be provided by the MOD. It is the pace at which this change can be delivered that has a direct bearing on the pace of benefit generation. Hence the motivation from the MOD should also seek to accelerate adoption of AM within defence industry.

18. Apart from the delivery of financial benefits, AM facilitates the development of a more agile and dispersed network of supply. Such a network could provide increased resilience and improved speed of supply[14]. The network would consist of a series of 'hubs' and 'spokes' where the hubs would be both the originator of the engineering information and production spokes. Industry has proven this model. Project TAMPA has provided evidence that this approach could work for UK defence and confidence that the notion of a global 'hub and spoke' network of supply[15] is feasible. It is the role of our Allies, the MOD and FLC units within this model that requires further examination and experimentation.

Current endeavours

19. The MOD has experimented with AM for some time. There was an early MOD Concept Note[16] and a notional MOD AM Strategy[17] issued by Defence Equipment and Support (DE&S).

20. The FLCs have made significant progress in pioneering and prototyping AM technology since at least 2016[18]. Working independently, FLCs and subsequently other MOD units have established AM centres. These have improved AM awareness, through regular

[13] Defence Innovation Unit (DIU) is a policy and strategy unit within the Defence Innovation Directorate that coheres and enables innovation activities.
[14] Predicated on reduced lead times for manufacture and choice over proximity of production to point of need.
[15] The US DoD is expanding its development of Regional Sustainment Frameworks into EUCOM which seeks the same outcome.
[16] MOD AM Concept Note, August 2018.
[17] The MOD Enabling Strategy for AM, June 2018.
[18] The Royal Engineers conducted the first known operational AM in the Land domain in South Sudan during Op TRENTON 5 in 2018, that proved to be decisive for completing the Level 2 Hospital in Bentiu to Initial Operating Capability.

deployments, exercises and successful interventions in low volume expedient or Battle Damage Repair (BDR)[19]. There are also examples where FLC and other MOD unit designs have been fed back into DE&S for them to be adopted by the Original Equipment Manufacturer (OEM)[20]. However, each FLC and MOD units has mainly worked independently, developing their own AM policy, processes and digital thread(s)[21] to provide the requisite degree of assurance to their work.

21. Alongside these efforts, the Atomic Weapons Establishment (AWE)[22] are using AM to produce complex parts. More recently, DE&S Defence Electronics and Components Agency (DECA)[23] have been prototyping parts, and other areas of the MOD have been using AM to support operations; but their emphasis is on satisfying specific user requirements rather than resolving platform availability. Throughout, the UK's High Value Manufacturing Catapult[24] have been engaged to provide independent expertise and advice, and this relationship continues.

22. MOD's AM endeavours have mainly sought to overcome shortfalls of inventory at the point of need. For example, through low volume expedient supply or BDR rather than trying to create a separate supply chain that produces inventory parts. This distinction is deliberate as there are a range of technical, commercial and financial issues that currently preclude the MOD taking responsibility for large scale manufacture. However, AM provides the opportunity to think about the design of a future network of supply and to clarify the role of the MOD and FLC units within that design.

23. There are programmes within the SDA that are, or are planning to, exploit the benefits of AM: In Service Submarines (ISS), Dreadnought, and Ship Submersible Nuclear (Attack) (SSN(A))[25]. ISS have begun to exploit AM in support of component/system enhancement, the delivery of maintenance periods, and to enhance supply chain resilience that will consequently improve submarine availability. There are several lessons emerging from the SDA's experience of retrofitting AM into legacy platforms. AM also provides the ability to assist with the SSN(A) programme with increasing the rate of platform production. The emerging SDA AM strategy, whilst driven by the particular needs of that enabling organisation, remain complementary to the wider MOD strategy and cross-cutting components.

24. In terms of the technology and processes that comprise AM, the MOD is essentially a follower of industry. However, in terms of research and development, the MOD, through Dstl, continue to act as a leader for defence sector specific AM applications. Dstl's work continues to explore the boundaries of material science relating to areas including high temperature, high performance and testing. Whilst these areas are low in terms of technology readiness, they are also niche in respect of military platforms, and whilst

[19] This should not be confused with high volume production of inventory.
[20] In this document the OEM is the Defence industry that manufactured/s the equipment/ platform/ item.
[21] The digital thread is a data-driven architecture that enables the collection, transmission, and sharing of data and information between systems across the product lifecycle to enable real-time decision making, data gathering, and the ability to iterate on the product design.
[22] AWE – Nuclear Security Technologies.
[23] Defence Electronics and Components Agency, declared as an operating centre within DE&S on 1 April 2024.
[24] The High Value Manufacturing Catapult are a network of seven centres that help UK manufacturers to innovate, grow and compete globally. Our focus has been the National Centre for Additive Manufacturing.
[25] Also known as AUKUS. For the UK it is the replacement of the ASTUTE class of submarine.

they fall outside the immediate scope of this strategy, they remain important areas for MOD to retain leadership.

25. The MOD's understanding of the opportunities presented by AM has developed further since 2021 when CDLS commissioned Project TAMPA. This project has provided evidence that MOD incentivisation of industry to adopt AM is key; but that this incentivisation needs to be strategically targeted in a way that delivers greatest effect. The greatest long-term effect might be achieved through Designing for AM (DfAM)[26]. Whilst in the short to medium-term AM should be exploited to address in-service shortfalls, especially obsolescence, Project TAMPA has also provided an opportunity to harvest learning from experience (LFE) and evidence of constraints that need to be addressed to deliver this strategic intent.

Constraints

Supply chain

26. Project TAMPA has provided evidence that the MOD needs more agile routes to and from market, especially for sourcing obsolete parts, if it is to enjoy the benefits of reduced manufacturing lead times. Alongside this, the MOD also needs to understand the dynamic capabilities within the UK AM market.

27. There is a need for appropriate preparation of defence contracts up front, alongside amendments to existing contracts and processes to enable the agility permitted by AM. Or the creation of separate supply chains for AM parts that avoid the lag that seems to affect parts produced through traditional means via the existing supply chain[27]. There is no benefit to defence if the reduced manufacturing lead time and speed of response that AM offers is lost in the part supply processes.

Policy and process

28. There is no clear policy direction to use AM to improve operational outcomes. Adoption of AM within defence industry has been variable and there is no 'customer clamour' or demand signal emanating from the MOD to encourage further or longer-term investment. This needs to be addressed with clear policy direction that seeks adoption of AM at the design stage and consideration of AM during in-service support.

29. Within MOD, adoption has been equally ad-hoc, creating a perception that it is uncontrolled and risks creating inventory parts that have not been subject to the same controls as those produced by industry. This is not the case, and any additively manufactured item being accepted into the defence inventory will need to pass the same levels of scrutiny as those produced via traditional methods.

[26] DfAM is design for manufacturability as applied to AM.
[27] Of note, the SDA have considered creating separate supply chains for AM parts to avoid this lag.

Intellectual Property Rights (IPR)

30. IPR is often cited as a blocker to AM. However, as with all types of manufacture, IPR can only prevent the MOD (or third parties working on its behalf) from manufacturing a part when it does not have the necessary rights in any extant patents or designs which cover the part. The MOD has a duty to obtain value for money for the taxpayer and will seek to do this by exploiting: the rights it has acquired through its contracts or other arrangements; or time expired patents and designs.

Technical challenges – interoperability

31. The challenges associated with interoperability are generally overlooked. Project TAMPA has proven that print files[28] are relatively unique. The pace of technological developments and increasingly versatile printing machines using combinations of AM and traditional manufacturing techniques are such that a print file can quickly become obsolete.

32. Even if the same AM process is used, different vendor's machines produce different results, challenging repeatability. This will have a bearing on the design of a future supply network utilising AM.

33. Project TAMPA also exposed the range of AM standards that exist. Notably this engagement has resulted in ASTM International[29] working to improve access to the standards it has created.

Technical challenges – MOD capability

34. Most of the AM machines in use by MOD units (less AWE) lack any through-life provision of support, a training pipeline, reference to qualifications and have ad-hoc access to consumables. These issues need to be addressed if FLC and MOD units are to be considered as viable, qualified production facilities for low-risk inventory items. These qualified production facilities could form a dispersed network of supply, where the parts are manufactured and immediately used to resolve an operational demand.

35. 'Commoditisation[30]' might prove to be part of the solution, alongside strategic partnering[31]. Commoditisation could provide training, equipment supply, consumables, and support as core provision rather than through innovation or stand-alone funding.

36. Strategic partnering would see FLC, MOD units and agencies team up with relevant industry colleagues to share learning, provide support and potentially, develop 'trusted agent' status. Such a status, if achieved, could allow MOD units to undertake

[28] Derived from the technical design of the part, the print file converts the design into a machine readable format that allows the part to be produced layer by layer on a specific machine type or process. An example is the AM File format (AMF) covered by ISO/ASTM 52915/2020.
[29] Formally known as the American Society for Testing and Materials.
[30] The analogy is with welding, another manufacturing process where common tools, training to industry standards and access to consumables exists.
[31] The term is used to describe a mutual informal relationship pursuing a shared endeavour rather than one that is underpinned on a commercial or contractual basis.

manufacture initially of low-risk[32] inventory parts, underpinned by a degree of industry assurance, that would provide a more robust expedient repair than otherwise would have been possible[33]. This would also facilitate measured progression into production of higher-risk inventory parts.

Digital thread

37. AM is initially enabled by having a digitised inventory, recorded in a digital library, and an ability to securely transmit this information to allow production of parts. There are several ways to achieve this, and each has cost implications.

38. There are many solutions being used within industry and developed by nations and Allies. It is easy to be distracted by the latest solution being offered, but what is needed is clarity over the design of a supply chain which exploits the advantages of AM (remote, dispersed, and close to point of need production).

39. Further clarity is also required over the extent to which the MOD wishes to retain control over a digital inventory and library:

    a. One that is extensive including all, or the most critical, AM inventory parts; or

    b. One that includes only the expedient, low volume and BDR parts.

40. Concurrently, the MOD is implementing a major change programme called Business Modernisation for Support (BMfS)[34]. It seeks to deliver one robust, evergreen, integrated set of digitally enabled services that deliver world class support information services for UK Defence. Further investigations will be required to explore the potential for BMfS to provide part, or all, of a digital thread solution.

41. The degree to which we can link MOD digital libraries[35] with industry libraries and even linking industry libraries with each other, will have a bearing on the range of benefits delivered through AM. This linkage will enable rapid transfer of, or access to, information and requests for services, and equally will have a bearing on the cyber risk to be mitigated.

Cost of AM parts

42. Project TAMPA has exposed the reality that within the MOD, cost comparisons continue to be made back to the traditionally manufactured part. Often produced many years ago, they do not account for wider lifecycle costs, or the costs of non-availability of the parent platform/ equipment. This needs amending through:

[32] Generally non-safety critical parts.
[33] It is to be noted that it is only the industry certification of such parts that drive this approach. If the MOD, as the ultimate responsible owner, are content to sign off such parts, then such industrial reliance is not mandatory - noting that in many cases it may be preferable.
[34] BMfS is an MOD programme modernising existing Defence logistics information systems.
[35] Including those of Allies.

a. consistent application of the MOD's policy for capitalisation[36];

b. industry working to reduce the costs of manufacture;

c. consideration of the cost of loss of availability against the cost of a part.

Circularity

43. Recycling of polymers has proven to be a feasible method of creating feedstock for a limited range of AM applications. Recycling of high-end scrap metals has also proved to be a technically and financially viable opportunity to develop AM powder feedstock[37] to potentially reduce reliance on supplies sourced from outside the UK. This should be explored further, as should wider opportunities to improve environmental sustainability[38].

Strategy

Overview

44. The strategy has three inter-related components that seek to unlock the benefits of AM through addressing the constraints and facilitating implementation to achieve the vision of a global network of supply:

    a. **Incentivise industry** to invest further in adopting AM technology, either directly or through new AM partnerships. This includes embedding AM in current and future designs to enhance capability and supportability of the MOD's future platforms and equipment and digitising strategically important inventory items.

    b. **Unlock the constraints** by adapting support, financial and commercial policies and processes that preclude speed of response to enable more resilience and agility within the supply chain.

    c. **Design and create networks of supply** for AM technology to be brought into the supply chain, including considerations of distributed networks, in which the role of Allies, Permanent Joint Operating Bases, FLCs and MOD units is clarified.

45. Sitting underneath these three areas there are a series of strategic priorities[39]. Achieving these priorities requires the combined efforts of the MOD and its scientific and industrial base.

[36] Financial Accounting and Reporting Manual (Joint Service Publication (JSP) 472)
[37] TEMPEST has utilised recycled material sourced from Tornado parts to produce an additively manufactured part for the engine. Report Reference Tempest to Tornado PROJECT 708978450 dated April 24.
[38] Sustainable circular economics for Defence concept note - GOV.UK.
[39] Derived mainly from the Project TAMPA Working Groups (WGs) Strength, Weakness, Opportunities and Threats analysis June 2024, Project TAMPA lessons and FLC/MOD unit experience and signposted by Director Joint Support at the Project TAMPA working group on 1 July 24.

Incentivise industry

46. **Policy that drives behaviours.** The development of unequivocal policy direction reinforced with robust assurance mechanisms to encourage AM adoption in the design of new capabilities (i.e. DfAM) for performance and cost enhancements as well as to improve in-service availability and supply chain resilience. This should encourage innovative designs to improve capability and supportability.

47. **Circularity.** Improve environmental sustainability and reduce the dependency on external providers for the provision of raw materials.

48. **Digitised Inventory.** Create policy that drives the generation of a strategically selected digital inventory by clarifying how to securely transmit this information from industry to FLC and MOD units, that are considered as viable and qualified nodes within an expanded 'hub and spoke' network of supply.

Unlock the constraints

49. **Accessible cross-functional processes.** Work with MOD enabling organisations[40] and industry to create easy to access cross-functional processes that adhere to the updated policies and drive behaviour towards greater AM adoption. Improve access to knowledge and enable understanding through creation of a knowledge hub. Consider creating separate supply chains for AM parts that facilitate agile production.

50. **Benefits articulated.** Develop metrics and measures of success to enable financial and non-financial benefit tracking including environmental sustainability and track delivery of these benefits.

Networks of supply

51. **Commoditisation.** Cohere MOD AM endeavours through consideration of a standardised range of equipment, enduring training provision to achieve industry standards and qualifications, and consumables, which is accessible through normal supply channels.

52. **Strategic partnering.** Encourage strategic partnering between industry, FLCs and MOD units to enable rapid learning and build trust with a view to gaining 'trusted agent status' as part of an extended 'hub' and 'spoke' network of supply. Incentivise strategic partnering between different industry bodies, including across sectors where this builds resilience and delivers efficiencies and improved capabilities. Establish and maintain a strategic partnership with the UK High Value Manufacturing Catapult to deliver cross-sector efficiencies and UK industrial base benefits.

53. **Collaboration.** Work with NATO Allies to test and develop interoperability standards to facilitate global manufacturing 'hubs' and 'spokes' in a distributed network of supply.

[40] Primarily DE&S and SDA.

54. **Manufacturing rights.** Seek to exploit: the rights MOD has acquired through its contracts or other arrangements; and time expired patents and designs.

Delivery

55. These strategic priorities will inform a programme of work that will require concerted effort from the MOD, industry and the research community to deliver. This programme of work will detail the outputs, delivery responsibilities and resources required.

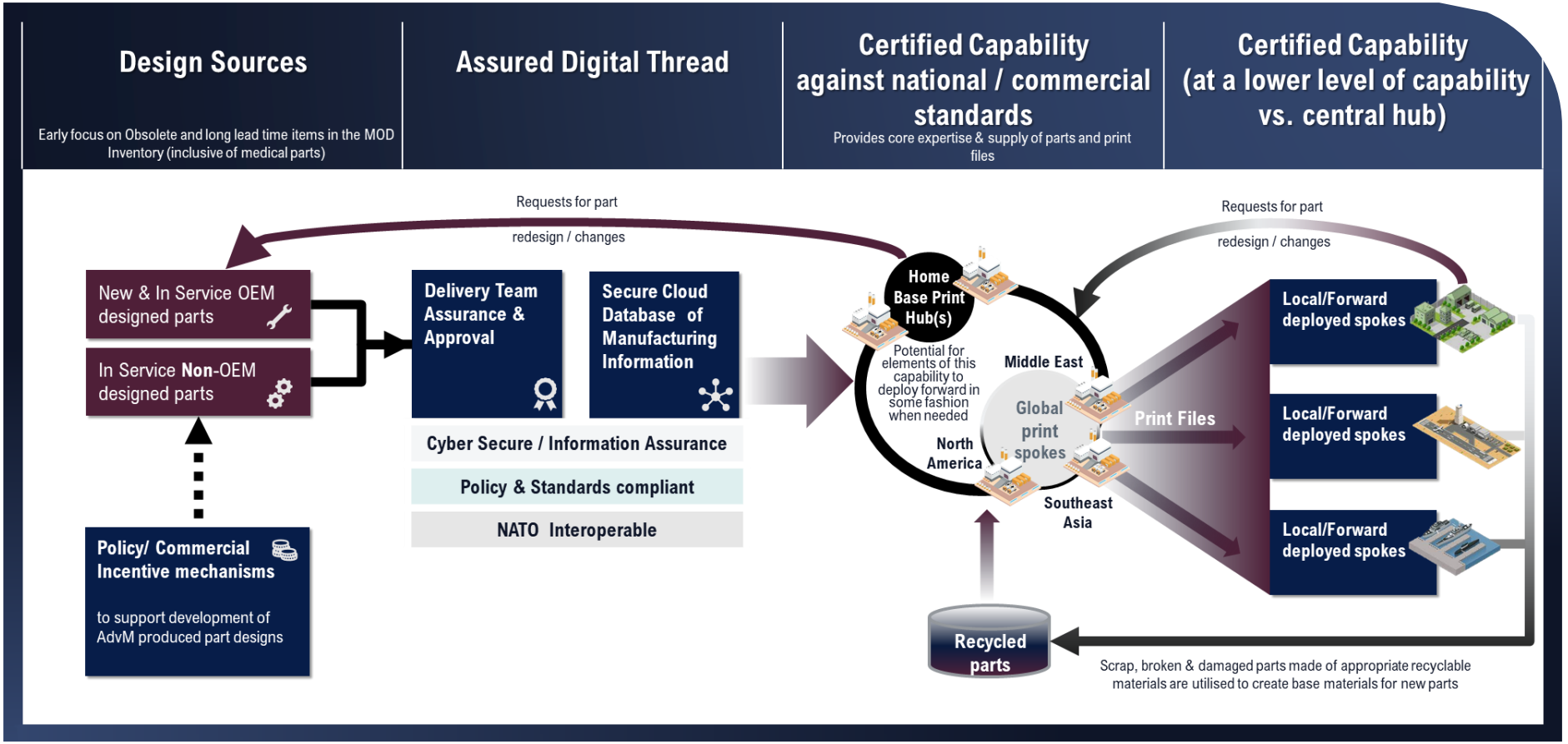
56. Further engagement across other government departments will seek to align efforts where it makes sense to do so. Alongside this, areas for collaboration, on a joint or multinational basis will be explored to ensure opportunities are maximised.

Governance

57. This strategy derives its authority from the DSS and explicitly from Defence Support's Sustainable Support Strategy. Rather than create a new governance regime it is intended to place governance for the resulting programme of work under one of the MOD's extant steering groups to oversee delivery.

Annex A

The MOD's AM Vision



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