Strategic Command

Defence Support

Additive Manufacturing as a Service Challenge

Collaborative Working Groups

1 July 2024

Welcome and Housekeeping

Admin for the day:

- No fire alarm planned.
- Evacuation routes – canteen fire door (on your left), building entrance and at the rear of the building by the toilets.
- Toilets around the back to the left.
- Refreshments available behind you.
- Smoking area – off site.
- No photos.

Strategic Command
Defence Support

Agenda & Objectives for the Day

Edit Barbantan

09:05 – 09:10

Agenda

08:30 Arrival – Tea & Coffee

09:00 Welcome & Housekeeping

09:05 Agenda and Objectives for the Day

09:10 Executive Group Welcome

09:20 *Keynote Speaker*: Chief of Defence Logistics and Support, Vice Admiral Andy Kyte

09:40 Director Joint Support, Major General Phil Prosser – 2* Advanced Manufacturing Champion for Defence

10:10 Coffee break 30 min

10:40 Update from the ITF

10:55 Babcock presentation

11:15 'Fireside chat' with CDLS and DJS

12:15 Lunch 1 hour (ITF working lunch)

13:15 Army Futures presentation

13:30 Annual Survey Review

13:40 Team Defence Info Brief

13:50 WG knowledge share session

14:00 Coffee break 10 min

14:10 Working Groups split

15:40 WG back brief

16:10 Closing remarks

16:30 Close

Aims and Objectives of the Day

Aim: To align working group delivery plans to date to inform plan of activity under Director Joint Support (DJS) as 2* Defence Advanced Manufacturing Champion whilst allowing for future adaptation.

Objectives:

1. Understand the vision and approach of Chief of Defence Logistics and Support and DJS with respect to advanced manufacturing in the Defence.
2. Working Groups to deliver into the Defence Advanced Manufacturing approach based on their expertise and learning on Pj TAMPA and other projects/ activities.
3. WGs have clarity on how they will deliver their elements of the overall DJS plan.

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Executive Group Welcome

Charlotte Robinson & Jon Morley

09:10 – 09:20

Governance Update

AdM Exec Group

Co-Chairs
Charlotte Robinson – (MOD DefSp Innovation)
Jon Morley – (Industry - Babcock)
Sec – Edit Barbantan (MOD DefSp Innovation)

DIPR Representatives – Georgina Bowyer and Nathan Sluman
MTC Representative – Ross Trepleton

Oversight, Direction, Coherence
Attended by Workstream leads/co-chairs

IPR Working Group DSF Commercial

Co-Chairs
Nigel Stewart (BAeS) – (Ind)
Phil Tozer - (DE&S)
Sec – Hannah Weir (MOD)

- Unlock IPR constraints for obsolete/ obsolescent parts
- Unlock IPR for current parts

AdM Certification Working Group

Co-Chairs
Charlotte Meeks (Industry – QinetiQ)
Gp Capt Leonie Boyd (MOD Air Cmd)
Sec – Stu Olden (Industry – TD Info)

- LFE with Aerospace
- Agree standards
- Agree processes
- Agree protocols

AdM Inventory Management Working Group

Co-Chairs
Len Pannett – (Industry – DiManEx)
Jonathan Vranch – (MOD)
Sec – Stu Olden (Industry – TD Info)

- Consider implications for Matl accounting
- Consider if needed to be flagged on Sp IS
- Check fit, form and function alignment with extant NSN

AdM Digital Thread Working Group

Co-Chairs
Shelley Copplestone – (Industry - Babcock)
Lt Cdr Timothy Westmaas – (MOD)
Sec – Edit Barbantan (MOD DefSp Innovation)

- Print file creation
- Print file standards
- Print file storage
- Print file transmission
- Print file exploitation

Integration Task Force – Chaired by Hd PAC, John Motley

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Executive Group Priorities 2024

#	Objective	% Complete	Measures of Success
1	**Complete Spiral 1 & Kick Off Spiral 2**		1. Completion of all 5 Spiral 1 tasks: latest task due to complete Aug 24. RBSL Complete, NP Aerospace imminent. 2. ✓ Kick Off of Spiral 2: Kick Off meetings Mar 24. 3. Delivery of Spiral 2: initial lessons from Spiral 2 by Autumn 24.
2	**Preparing the ground to scale the use of AM within the Defence supply chain**		1. Complete integration task force deliverables: a. ✓ Outline of end-to-end AM process and checklist released b. ✓ Update ILS policies for obsolescence management and Def Standards to accommodate AM 1 Agree & implement, via Defence Hd of Materiel Accounting, the correct capitalisation treatment of AM parts (IMWG) Capture the MOD Inventory onboarding process for AM parts via DE&S Strategy Team (IMWG) 4. ✓ Secure new Pan-Defence AM owner to accelerate adoption of AM and address cross-DLOD issues – DJS secured 2 ✓ Set up AM Info Systems Capability Planning Working Group – Capability Investigation due to deliver Summer 24 ✓ Manage AM Next Steps following EST closure e.g. what next for the Parts Creation Solution
3	**Bring in new stakeholder support from DE&S and international stakeholders to share learning to accelerate AM adoption**		1. ✓ Learning from Experience Event with DE&S Jan 24 2. ✓ DE&S Graduate and Apprentice Day Feb 24 3. ✓ Include DE&S Delivery Team Representatives in all Spiral checkpoint and kick off meetings 4. ✓ DIPR Knowledge Share 26 April 24 5. ✓ Pj TAMPA Briefs at AM in Defence Aerospace and Space Conference (Feb) and TCT 3Sixty (Jun) 3 ✓ US DoD ManTech UK Visit Apr 24, another planned Jul 24 ✓ US DoD ManTech & German Navy integration into WGs
4	**Provide MOD/ Industry collaborative inputs into the pre-Spiral 3 & 4 MOD Decision Point by 31 May**		1. Lessons from Spiral 1 and 2 to date identified 2. ✓ Feedback on Pj TAMPA Framework 3. ✓ Feedback on ideas for future spirals 4. ✓ Feedback from Annual Review 23 and Pulse Survey to date
5	**Maintain & build on the positive relationships & momentum generated last year**		1. Deliver on Annual Review 23 findings & action plan 2. ✓ Build networking opportunities into F2F WG agendas and vary locations around the UK & organisations 3. ✓ Build interactions at least every 2 months in hybrid WG schedule 4. ✓ Information sharing, using Kahootz as means to share artefacts 5. Measure through the Annual Review and Ongoing Pulse Survey

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Defence Support

Accelerating the Adoption of Advanced Manufacturing

1 July 24

Vice Admiral Andy Kyte CB, FCILT
Chief of Defence Logistics and Support

Ministry of Defence

“To protect the nation and help it prosper”

Defence Support

Strategic Command
Defence Support

“Delivering and improving Support to the Front Line – Now, Next, Future”

Support Operations: Responsible for the provision of strategic advice in support of current and contingent Operations; influencing/informing strategic planning; and directing support policy, force development and future capability, as well as leading the delivery of Operational Energy.

Joint Support: Responsible for planning and delivering performance excellence, compliance, and shared services across Support. Joint Support also controls and coordinate how we move people and equipment to where it is needed outside the UK bases and how we bring it back again assuring resilient Defence Supply Chains.

Support Major Programmes: Responsible for a portfolio of work improving the way Support operates. Driving digital modernisation and improved working practices across the Support Function

Defence Support is responsible for assuring the coherence, resilience and performance of the E2E Support enterprise (including the setting of strategy, policy and standards), providing strategic advice for current and contingent operations, and controlling and coordinating any outload from the Strategic Base.

The future battlespace will be
Contested – Competed – Congested across the
Competition – Crisis – Conflict spectrum

Diagnosis

For a generation defined by globalisation and wars of choice, supply chains have been optimised for efficiency, with resilience traded out for VfM. However, the context has changed: the return of great power competition, the COVID pandemic and the war in Ukraine all show us that we must adapt for a new era.

- Lack of industrial readiness and integration with industry
- Vulnerability of Supply Chains & a requirement to reduce demand
- Obsolete Information Systems, poor data
- Insufficient operational stockpiles
- Deterrence not credible if we cannot support the force
- Historic lack of investment in Support
- Commercial Agreements Designed for VfM
- Lack of an Empowered Design Authority
- Insufficient capacity to deploy and sustain a force to meet NATO requirements
- Logistics is congested with allies & contested by adversaries

Support must be ready to sustain high intensity operations. This is a key tenet of credible deterrence and our commitment to NATO.

Defence Support Strategy

Refreshed Vision

Vision

Where Support needs to be by 2035

The overarching Support Vision is that in 2035 we continually enable **Operational Advantage through Support,** by delivering and improving Support to the front line now, next and future. Support will achieve this through the **delivery of resilient Supply Chains** that deliver assured resources to the Joint Force, **Adaptive Logistics** that enables flexibility and responsiveness, enabled by **modernised Support** systems that provide the technology to drive decision making – all underpinned by a professional and adaptable whole-force.

People centric	Information-led	Technology-enabled	Resilient, effective and efficient	Integrated and interoperable

Support

"deterrence without Support is not credible"

"enabling Defence to get to the fight, stay in the fight, and win"

The Support **1-5-1:**
Think, Deliver, Fight

Think!

Support First

Embedded into the Defence psyche and championed by CDLS, a Support First mindset will ensure **Support is considered and resourced** across the value chain and prominent in Defence decision making.

Deliver!

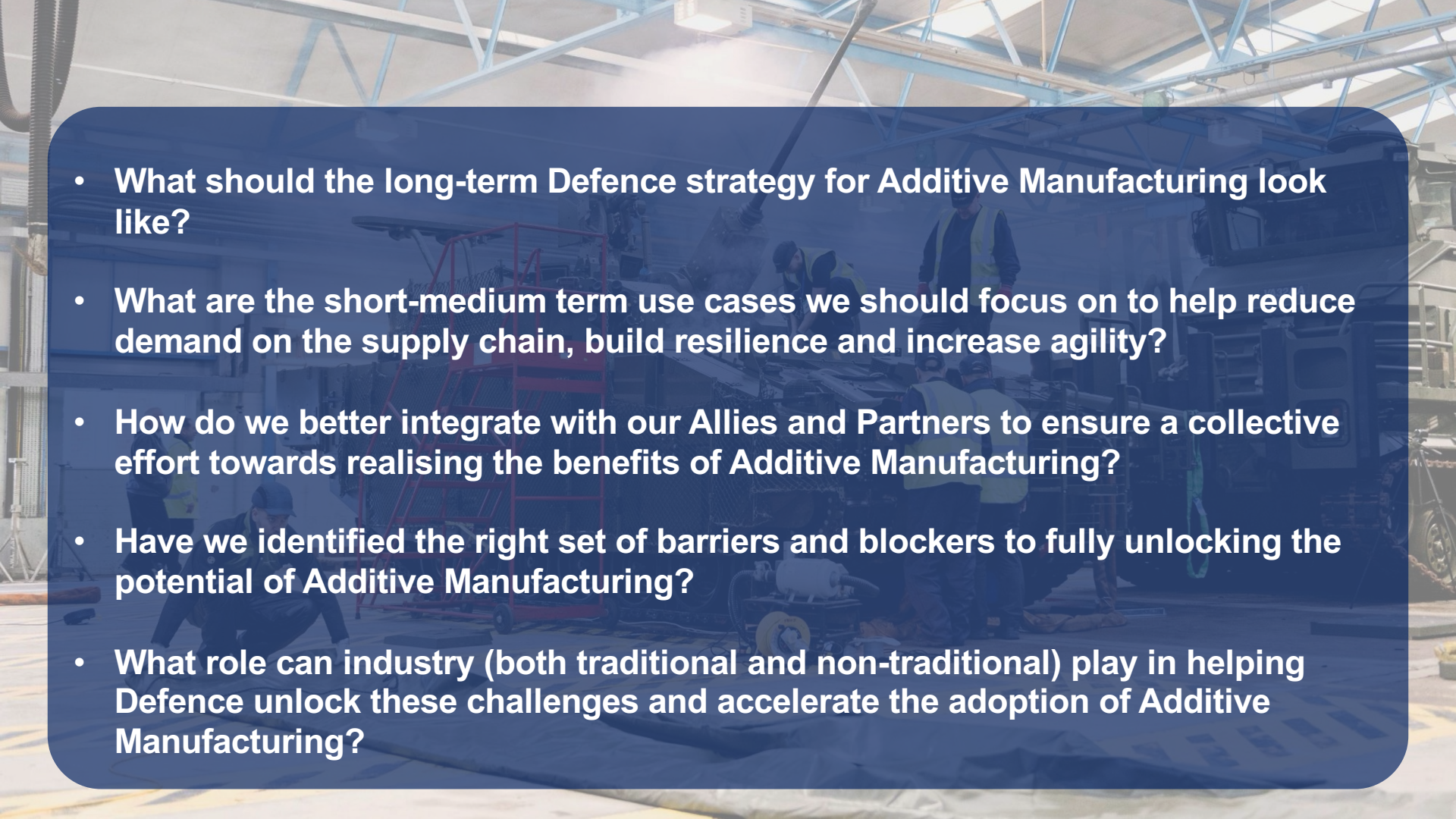
Support will ensure delivery across these 5 critical areas (and others) to provide an **Integrated Support Enterprise**

Fight!

Adaptive Logistics

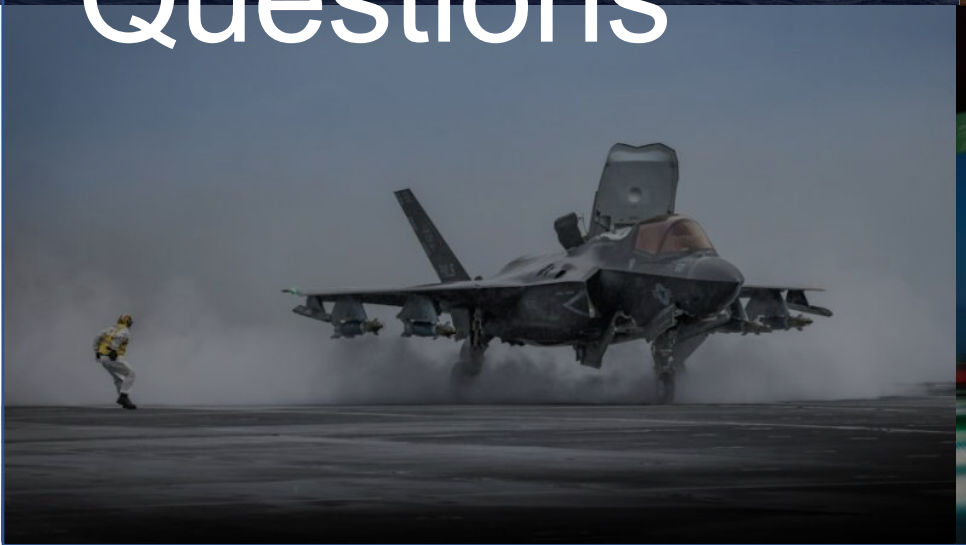
NATO OTAN

By using Logistics to gain and maintain an Operational Advantage, we will deliver and improve Support to the frontline, giving the Joint Commander freedom, options and enablement, and most importantly helping **the warfighter to win.**



- What should the long-term Defence strategy for Additive Manufacturing look like?
- What are the short-medium term use cases we should focus on to help reduce demand on the supply chain, build resilience and increase agility?
- How do we better integrate with our Allies and Partners to ensure a collective effort towards realising the benefits of Additive Manufacturing?
- Have we identified the right set of barriers and blockers to fully unlocking the potential of Additive Manufacturing?
- What role can industry (both traditional and non-traditional) play in helping Defence unlock these challenges and accelerate the adoption of Additive Manufacturing?

Questions



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Defence Support

Strategic Command

Defence Support

Director Joint Support – Advanced Manufacturing Champion for Defence

Major General Phil Prosser

09:40 – 10:10

Priorities

Support to Operations

Golden Thread

A Resilient E2E Supply Chain – digital first, designed for purpose, focussed on outcomes, underpinned by process, risk and performance managed.

Game Changers

The stuff that Jt Sp does that will change Support for the better

1. **Strategic Base Outload (capable & resilient Sp enterprise).** Consolidate our role as the SBO C2 HQ, to be the lead voice (the brain) in the design of the SB, now, next and future, as an E2E capability; assuring its performance to drive defence level improvements, removing duplication, inefficiency and ineffectiveness.

2. **Effective delivery of Sp integrated across the Mil-Industry complex.** By 2030, Readiness will be increased by working in partnership with industry to deliver resilient Support solutions, designing in availability for all future platforms to deliver an improved Sustained Force. Defence will be informed by a "Support Conscience" to enable balance of investment being Support informed across Defence.

3. **SC Resilience - Def SC Capability Programme.** The UK needs to be a productive and attractive place for investment with a more precise definition of the industrial base; onshoring to maintain leadership in high end capabilities. MOD should reform its acquisition system and design supply chains with this in mind.

2* Stewardship

The stuff that others do or will improve Defence

1. **Engagement - #OneTeam**. We are engaging with our stakeholders coherently from Jt Sp and Def Sp, with focus on NATO, FVEYs and Industry (DSF, TDI in that order).

2. **Safety.** Act as the 2* Safety Champ for Def Sp, leading on implementation of an effective SEMS through planning and governance, and ensuring we are responding to notices and actions.

3. **AdM**. As the 2* Champion for AdM, develop a plan in 24/25 to improve adoption across defence, and to move Def Sp activity from Innovation into BAU.

4. **Cap Dev.** Contributing effectively to Cap Dev activity through cohering insights from SB assurance and operations, Sp solution assurance, SC and availability performance management.

Business as Usual

The stuff that helps us run Joint Support

Examples – setting the conditions for Jt Sp to be awesome; deputise for CDLS; leadership courses; governance; leading.

Background, Aim and Intent

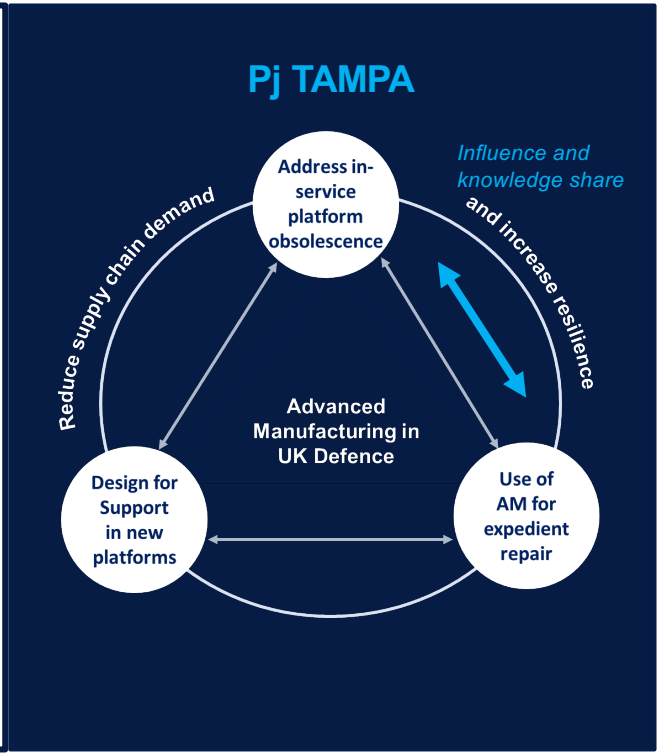
Background: Pj TAMPA was created by the Chief of Defence Logistics & Support in 2021 to accelerate the use of Additive Manufacturing technologies within the Defence Industry.

Aim: to contribute to a step change in platform and equipment availability and readiness.

Intent: Four areas were highlighted as priorities for improvement to accelerate the adoption of AM:

- Certification
- Digital Thread
- IPR/ Design Rights
- Inventory Management

Collaborative working groups were established with industry in 2022 to assess and recommend ways to overcome these constraints.



Vision for High Value Manufacturing in Defence

Strategic Command
Defence Support

Design Sources

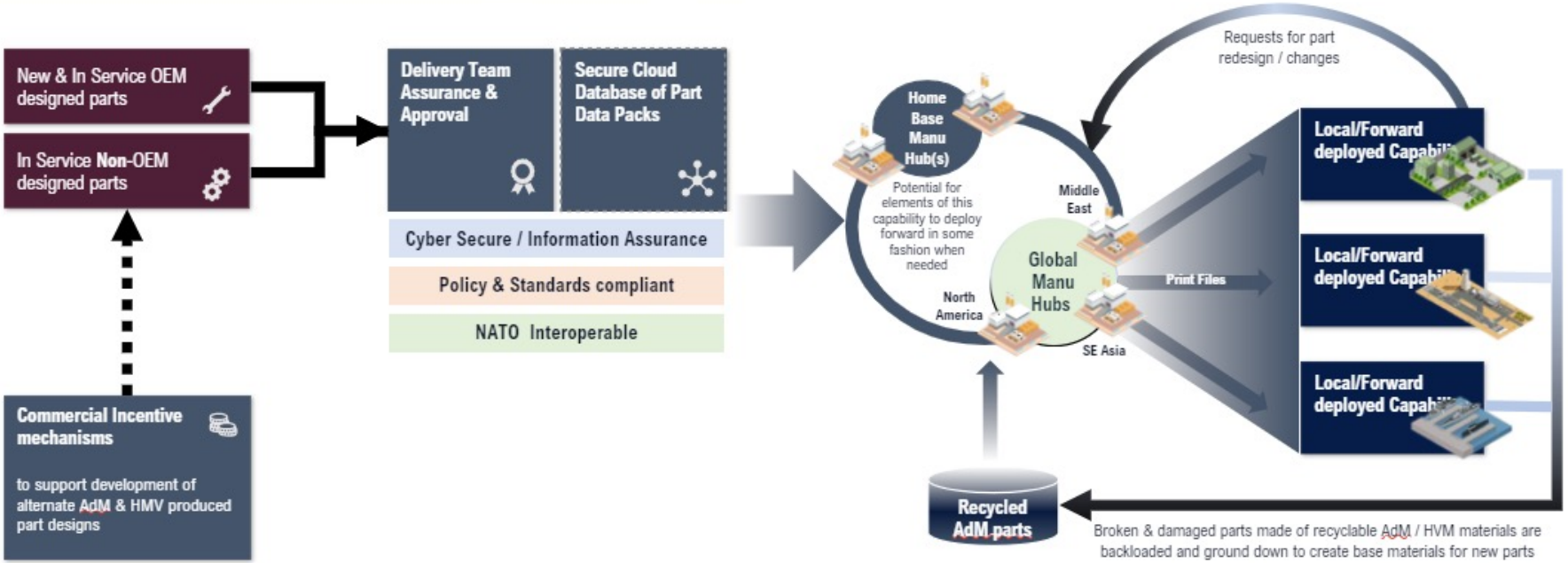
Early focus on Obsolete and long lead time items in the MOD Inventory (inclusive of medical parts)

Assured Digital Thread

Certified Capability against national/COTS standards

Provides core expertise & supply of parts and Digital Data Packs

Certified Capability (at a lower level of capability vs. central hub)



Accelerating the adoption of Advanced & Additive Manufacturing

Resourced Programme

Manufacturing Rights

Circularity

Collaboration with Allies

Repeatable accessible processes

Strategy

Commoditisation

Strategic Partnering

Benefits/ Value Articulated

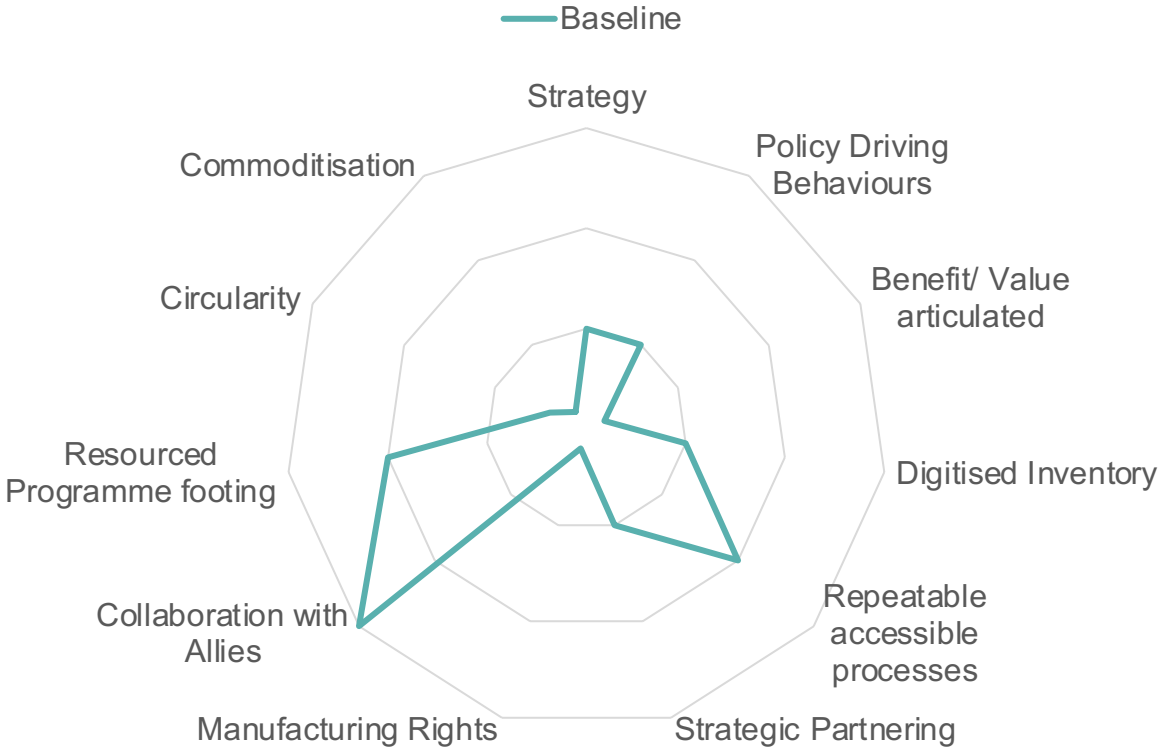
Policy Driving Behaviours

Digitised Inventory

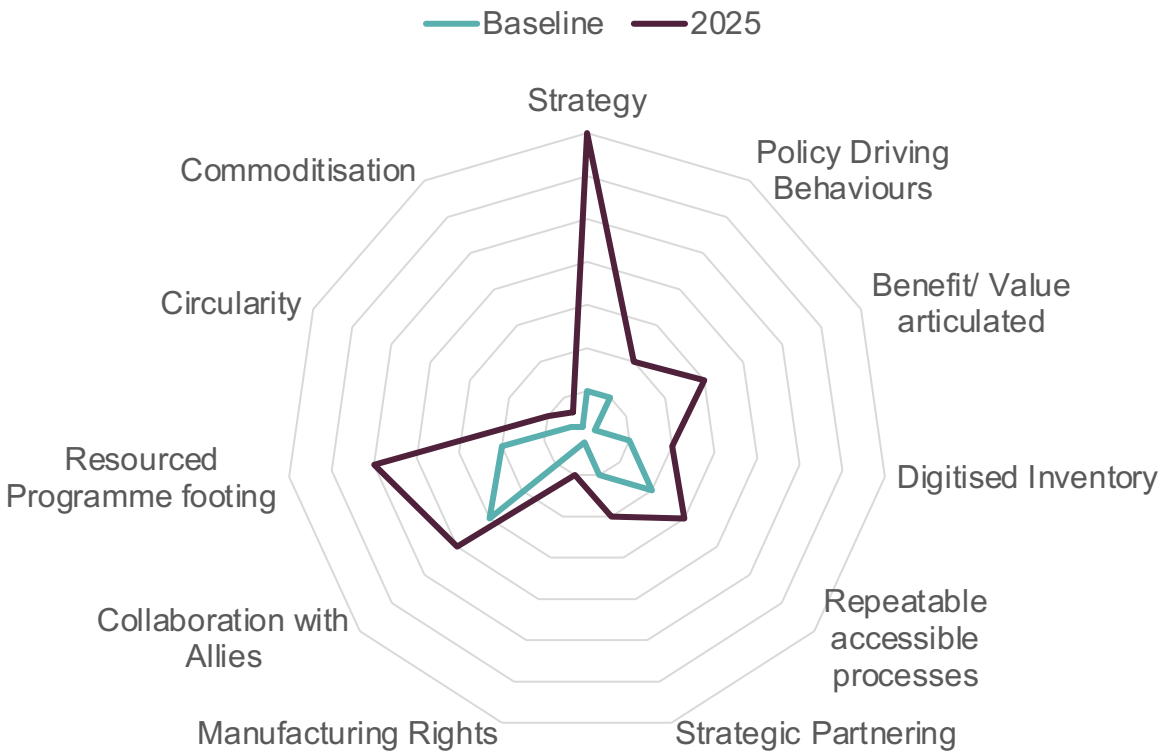
Baseline

Analysis against these dimensions paint a relatively bleak picture

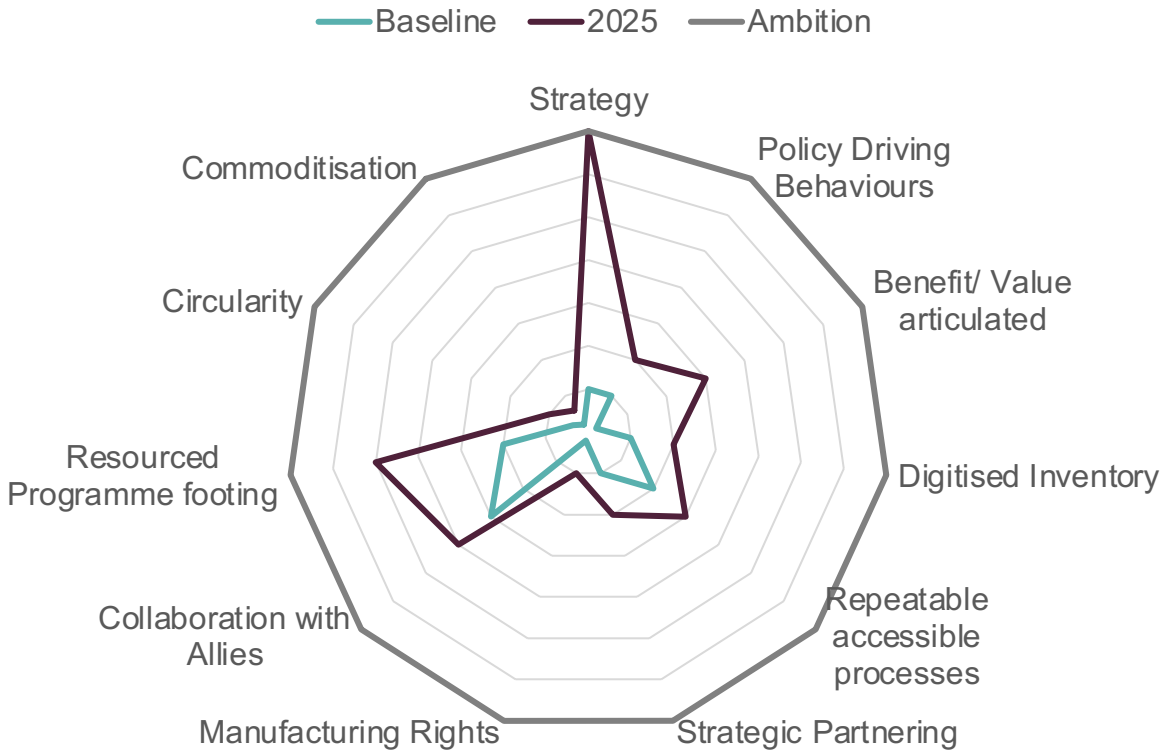
But loads of opportunities



2025 progress



Ambition


Baseline
2025
Ambition
Strategy
Policy Driving Behaviours
Benefit/ Value articulated
Digitised Inventory
Repeatable accessible processes
Strategic Partnering
Manufacturing Rights
Collaboration with Allies
Resourced Programme footing
Circularity
Commoditisation

Accelerating the adoption of Advanced & Additive Manufacturing

AM enables critical Defence Support priorities:

1. Supply Chain Capability
2. Adaptive Logistics
3. Sustainable Support
4. Towards Self Sufficiency
5. Digitisation of Support

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Pulse survey ->

Coffee Break

10:10 – 10:40

Slido: www.slido.com
& code #1690740

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Integration Task Force - SWOT Analysis

Jonathan Eaton

10:40 – 11:55

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Defence Support

Advanced Manufacturing in UK Defence SWOT Analysis

1. Mature relationship between MOD and Primes
2. Primes' processes aligned to MOD standards
3. Primes operate similar processes to each other & MOD
4. Primes are influencers
5. MOD can lead Primes to innovate
6. MOD can be AM global leader supported by smaller scale
7. Key event driven demands for land, sea & air identified
8. Pj TAMP
   supply ch
9. MOD mo
   & cohere
10. Platforms
11. MOD-cre

1. Evolve MOD standards to accommodate & adapt to AdvM
2. Use smart toolsets for efficiency, traceability & IP protection
3. Interoperability with & between Primes & allies
4. Reduce supply chain complexity & increase resilience
5. Lead AdvM process in NATO
6. Maximise UK Prosperity - exportability, competitiveness

disposal

rtability

ustry

Summary

1. A lot of key points are not AdvM specific; there are wider benefits of addressing them
2. Risk of overpromising or making negatives seem worse than they are
3. Prioritise flexibility, adaptability and neutrality to enable maximum collaboration
4. Focus on the delivery of strategic benefits to Defence, rather than spread too thin
5. Work together with allies and industry partners to use resources wisely and interoperate by design

1. Clarity or
2. Current p
   AdvM tec
3. Maturity
4. Complex
5. Cohesion
6. Availability of quality supply chain data
7. Management of data, IP, configuration & security accreditations
8. AdvM supply chain adoption
9. Availability of digital designs
10. Myopic view of cost and value (capitalisation)
11. Misaligned incentives
12. Organisational knowledge transfer (onboarding)
13. AdvM understanding, knowledge & skills
14. Workforce limitations, skills and succession management

ATO)
ctiveness

5. Reduced level of urgency, damaged reputation or lack of cohesion or drive slows adoption
6. Supply chain vulnerability if unmanaged
7. Counterfeit parts enter supply chain (FLCs or malicious actors)
8. Inefficiency from uncontrolled spend/ activity
9. Multi sector demand for engineering skills
10. Misconceptions or lack of skills stop or slow adoption

Babcock's AM Journey – Challenges and Learnings

Tom Galloway

01/07/24

Babcock

- Specialists in Supply Chain and MRO for low volume military equipment, across all domains

- “Babcock’s AdM metallic part fitted to a Land T2 platform” – November 2022

Learnings

1. Defence supply chain is far bigger and more complicated than most realise
2. Confusing and complex landscape for AM – lots of different areas that need to combine, but the focus must be on the parts
3. Finding the right parts for AM is difficult. Anything can be printed, but…
4. Justifying AM parts on value instead of cost is hard
5. Certification of parts if you are not the OEM/DA is convoluted and complex, a position unique to Babcock as we are not an OEM for the supported equipment
6. Appetite and support for AM from DTs is limited
7. Commercial and business processes to get AM parts into service are limited

Tampa

Key questions:

- A need to refocus?
- Compete but collaborate?
- Using the supply chain appropriately?
- Technical working groups, but what about business or commercial?

So What?

- Lots of positives that we need to keep on doing!
- A need to reflect and pivot:
  - Solid demand signal
  - Financial and commercial positioning of AM
  - Process

“*Supply chain obsolescence is the single biggest threat to defence operations*” – CDLS Gen. Wardlaw, DSEI 2021

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Defence Support

Fireside Chat with CDLS and DJS

11:15 – 12:15

Meet the panel

Meet the panel

Chief of Defence Logistics and Support, Vice Admiral Andy Kyte

Director Joint Support, Major General Phil Prosser

Jon Morley, Programme Director - Material Availability Service Babcock

Kieron Salter, Founder & CEO DMC

Steve Catt, AdM Technical Lead Thales

Steven Barnes, AM Process and Capability Lead BAE Systems

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Defence Support

Pulse survey ->

Lunch Break (+ ITF Working lunch)

12:15 – 13:15

ARMY FUTURES

SETTING THE AIMING MARK. DRIVING CHANGE.

Mil Cap Plans - AdM

Landscape

Army has been looking at AM on how it can be used for military application for about 6 years.
Pockets of success incited the need for AM to become an establish department and Army HQ are now the coordinating authority.

This includes;

- Strategy.
- Cataloguing Army wide capability.
- Running trials and projects to develop AM Capabilities.

AM in the Army

- Deployment of capabilities is a military ambition.
- AM for Army should have low user requirements in the field.
- Minimal post processing.
- Quick print times.
- Suitable for expedient testing and assurance.

What are the problems we are looking to solve?

Support the supply chain.

- Sustaining the supply chain and assist with long lead times.

Obsolesces.

- Many platforms are old and manufactures no longer make the parts

Innovation.

- There are many opportunities to improve efficiency or quality of life with tools/jigs/fixtures.

Expedient Maintenance

- A level 2 repair with a temporary part to sustain equipment.

ARMY FUTURES

Capabilities

Deployable AM

- Polymer Printing.
- Metal Printing.
- Trials and Experimentation.

Supporting Activity

- AR Assistance and Inspectio
- Engagement with Industry.

Supporting Process and Polic

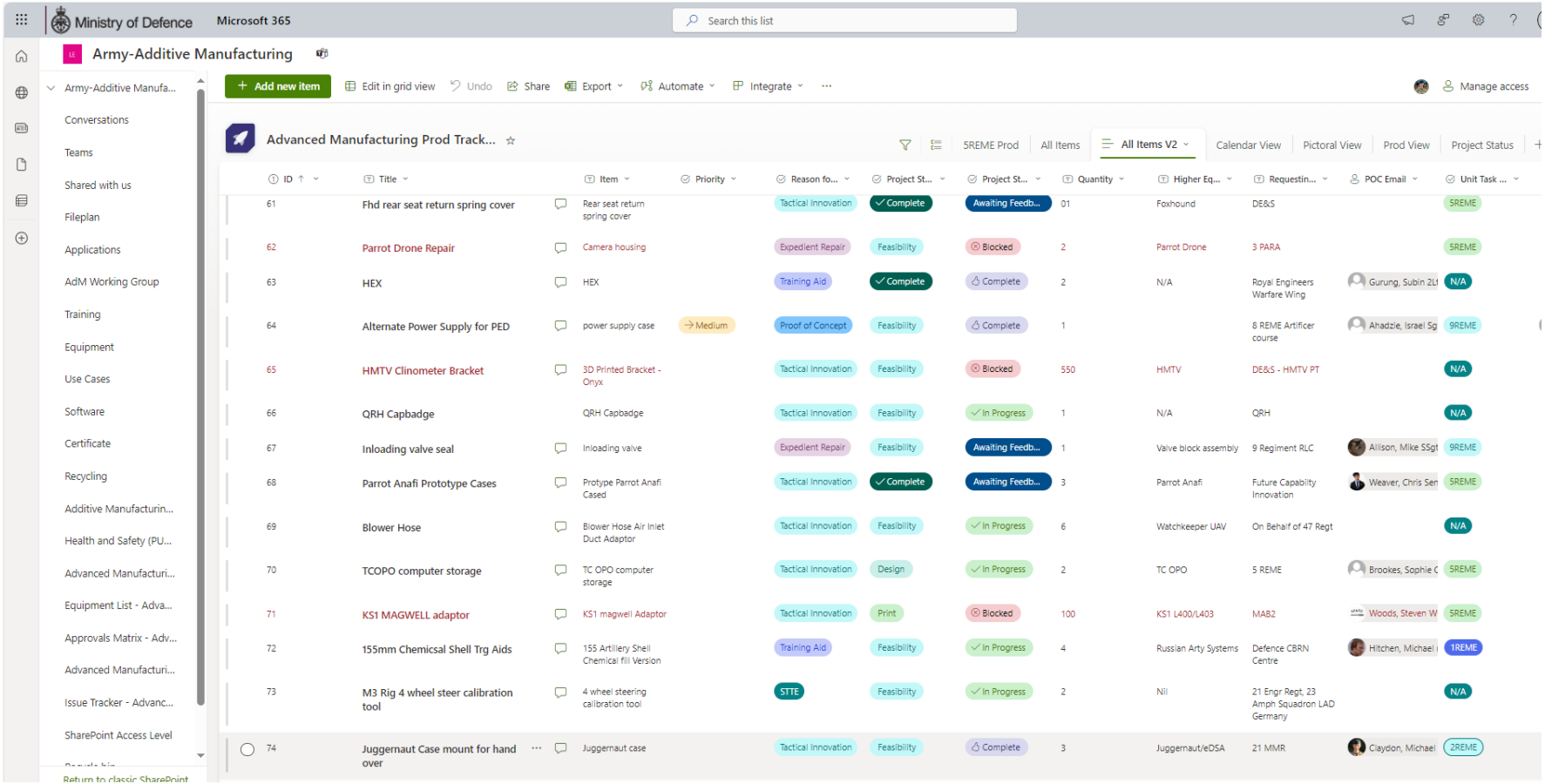
- AdM Network.
- Digital Repository.
- Expedient Maintenance.

3D printers get army's ageing, damaged fleet back to front


Welcome: Digby Gill
28/06/2024
Advanced Manufacturing Work Request
Work Request
Digital Repository
Request Proformas
My Requests
V 2.0

ARMY FUTURES

Advanced Manufacturing Prod Tracker



Purpose: To hold the minimum information to expediently assess and print a repeatable part. The TDP is generic guidance of good process to follow to provide engineering information to conduct a repair.

The information required to provide:

- **What it is**. Information to understand the purpose or function of the part.
- **Size/Dimensions/Weight.** Will it fit your capability.
- **Material.** Can you fabricate with this material or use something similar.
- **Authority Needed.** What are the risks involved and who should own them.
- **Machining Requirements.** Will this be compatible with your capability.
- **Print Files.** Basic CAD files that can be adjusted depending on the fabrication capability.

Expedient Maintenance AdM Technical Data Pack		
Engineering Assurance	**Design Data**	**Supporting Files**
ERA v3.3 (pdf) • Part Description and information. • Risk • Authority	Design Pack v1.1 (pdf) • Material Selection • Heat Treatment • Machining	Technical documents (pdf)
Assurance Review v1.0 (pdf) • Assurance and Authority	CAD Model (sldprt)	Photo/Video
	Mesh model (stl, step)	Customer feedback
	Manufacturing files (.amf, .dxf)	Inspection and Test Plan
	Technical drawings (pdf) • Tolerances • Threads • Surface finishes • Dimensions • Weight	
	Standalone Design Reviews (pdf)	

Documents highlighted have templates provided.

The more of these documents and engineering information that can be provided in each TDP will raise the quality and confidence in the part. Each TDP level can be different and it is the decision of Engineering Authorities to accept parts based on the information provided.

ARMY FUTURES

ERA

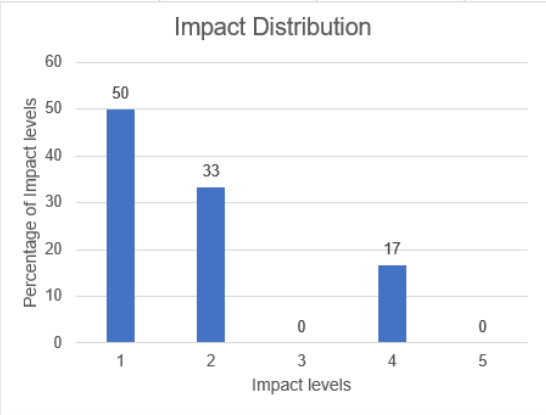
Category	Criteria	Impact Y/N	Identify the hazard and who/what could be harmed	Associated Impact Score
Impact to Equipment Specifications	Can this part impact the **fuel** system			
	Can this part impact the the **electrical** system			
	Can this part impact the the vehicle **armament** system			
	Can this part impact the the vehicle **ancilliary** systems			
	Can this part impact the the vehicle in an area that hasn't been covered above (miscellaneous)			
	Any significant increase or exceeding of the vehicle gross axle weight, GVW or GTW			
	A changing to weight distribution, centre of gravity or additional forces and bending moments			
Impact on Legislative Changes	Any impact upon vehicle control, handling or performance characteristics of the vehicle including speed and vision			
	Adjustments to the maintenance criteria required for the vehicle			
	Additional equipment requiring power, any power take-off which doesn't utilise a simple insertion on a current harness.			
Impact to Special to Role Capability	Any change to the location, loading of or use of cranes and winches			
	Any change to the use of vehicle recovery points			
	Any attached items to the exterior of the vehicle where there is risk that the item may fall outside of the vehicle envelope, becoming debris or flying objects around other road users			
	Anything that effects the protective aspects of the vehicle, such as ballistic protection or mine blast			
	Any other Special to Role capability impact - please explain.			
	Is there an emergency escape route compromised, this includes intrusions into gangways, door changes from manual to automatic and anything obstructing doorways			

Impact		Definition (Health Safety and Environment)
		• environmental sensitivity (scarce/ valuable) requiring months of remediation. • Single incident causing significant environmental impact.
2	**Moderate**	• Multiple injuries requiring first aid. • Moderate damage to an area, and that can be remedied internally. • Multiple incidents causing minor environmental effect.
1	**Minor**	• An Injury requiring first aid • Limited short-term damage to an area of low environmental significance/ sensitivity • Incidents causing minor environmental impacts

Selected Likelihood Score	2

AdM ER Level	Definition	Regulatory	Legislative	Safety	ERA	Design Pack	Assurance review	Likelihood Score
1	The use of AdM at this level requires for a part to be qualified by an external specialist certification authority (1710 NAS, 71 Sqn), the DE&S PT, Fd Army Eqpt, Army Safety Centre and Chief Engineer (Army). Parts qualified at ER Level 1 are deemed to meet legal, regulatory and safety requirement and can therefore be considered permanent.	Essential	Essential	Essential	Essential	Essential	Essential	1
2	Qualification of a AdM part is within the remit of the ES Functional CoC where it is deemed that the required competencies are held. Additional procedures to existing Expedient Maintenance policy must be followed to validate that the AdM part is of sufficient quality. Parts are classified as temporary, to be replaced with an original or Level 1 part at the earliest opportunity. The target will be to meet all regulatory and safety standards but where not achievable the ES and Operational CoCs must consider relevant factors and associated risks when choosing to use a Level 2 part. Parts will be restricted to operations and exercise use only unless they have no impact on road safety and regulatory standards.	Desired	Desired	Desired	Essential	Essential	Desired	2
3	The use of AdM parts for level 3 will naturally be limited due to the inherent time taken to manufacture AdM parts. Where AdM can be used it is acknowledged that it will be done so for the minimal amount of time with the part removed at the earliest opportunity. Additional procedures to existing Expedient Maintenance policy must be followed to validate that the AdM part is of sufficient quality as the part will have minimal or no qualification and therefore a higher level of risk associated with its use. As a minimum the extant basic Expedient Maintenance policy and procedures are followed.	Desired	Desired	Desired	Desired	Desired	Desired	3

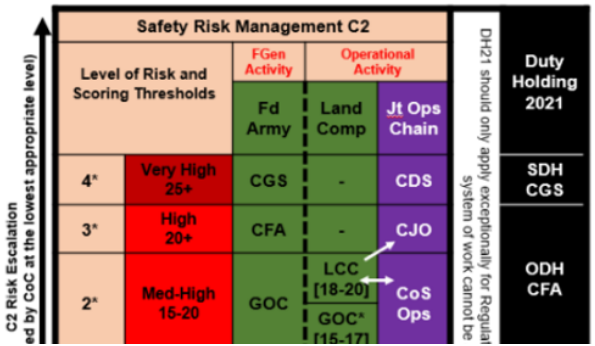
Impact accumulation		
Level	Frequency	Percentage
1	3	50
2	2	33
3	0	0
4	1	17
5	0	0



	Impact	Likelihood	Risk	ES CoC - Engineering Assurance	Op CoC - Risk Authorisation
Highest Risk Score	4	2	8	LAD Comd	CO

Assessor Name	Number	Rank	Unit	Date

30. **OF3 Thresholds**. AHSEC 1/23 endorsed the Field Army SRM model and a proposal to empower junior commanders by increasing the risk exposure threshold for OF3s. The OF3 risk threshold has been increased from Very low (1-3) to Low (4-6); the OF4 risk exposure threshold has been adjusted accordingly to Med-Low (7-9). These new threshold levels are shown in Figure 4.



Challenges

- Training - Deployable AM likely operated by soldiers, how do we ensure the right training to operate the mix of AM equipment effectively as the spectrum of expertise is substantial. Delivering training at a correct level to adopt this technology effectively.
- Deployed Assurance – Ability to inspect and test parts in Operational and War Fighting contexts.
- Design Library continuity – Many different levels of information provided for parts and files. What is the standard of data? DTWG

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Annual Survey Review

Edit Barbantan

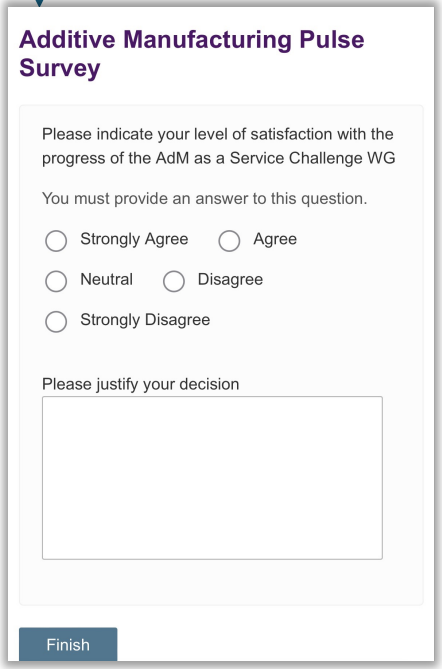
13:30 – 13:40

Feedback methods and approach

Feedback methods and approach:

- **Pulse Survey** disseminated by TDI at events since Aug 2023 but remained open in between events.
- **Annual Review Questionnaire** disseminated Oct 2023.
- 6 individual Annual Survey responses.
- 44 Pulse Survey responses.

	Question
1	What do you consider has been the key achievement(s) between Jan 23 and Jan 24 (actual and anticipated) for the Additive Manufacturing as a Service Working Groups?
2	Have you been able to make progress in all areas as expected? Please identify what has progressed well and what has presented a challenge and what may have been the blockers/ causes behind those challenges?
3	Can you identify one stand-out negative aspect to progress so far? Why was this significant to blocking progress and how did you overcome it, if you did?
4	Can you identify one stand-out positive aspect to progress so far? What made this successful?
5	What Learning From Experience (LFE) can, or should, we take forward into future additive manufacture spirals and other activity?
6	What might your WG aspirations and key targets be for the next 12 months?
7	On reflection, what do you think the WGs can do more of, or better, to add even greater value to the exploitation of AdM in Defence?
8	Any other comments.



Findings: Themes

Identified themes:

1. Standards
2. Qualification and certification
3. Frontline focus
4. Technology insights
5. Slow progress and impact of delays
6. Working Group feedback loop not closed
7. Potential ideas for Spirals 3 & 4
8. Land parts dominance
9. Communications and Misinformation
10. Knowledge sharing
11. Project framework arrangement
12. Networking and collaboration opportunities
13. Metal AM focus
14. Wider AM adoption

These themes will be split between those for things that went well (1, 2, 3, 4, 9, 10, 12) and things that could be improved (1, 2, 5, 6, 4, 7, 8, 9, 11, 13, 14). The latter category will be followed by an action plan to mitigate these.

Note that most of these themes are interconnected, therefore some feedback points will touch on multiple themes.

Note:
AM = Additive Manufacturing

Findings: Main things that went well

Annual Questionnaire

1. Release of ISO/ASTM 52920:2023.

3, 9 & 12. The Collaborative effort throughout the year improved communication channels with end-users, which fosters support for frontline operations.

2, 4 & 10. Insight into software management and qualification route.

12. TDI commended for efforts to increase interest and attendance of WG participants.

Pulse Survey

12. Pj TAMPA has provided great networking opportunities as it creates a very useful forum for SME's to contribute to the defence sector.

12. Good to see the number of event attendees grow and the stakeholder list growing wider.

10. The sharing of LFEs is improving all areas of defence.

Notes:
LFE = Learning From Experience
SME = Small and Medium Enterprises
TDI = Team Defence Information
WG = Working Group

Overall Themes

1. Standards
2. Qualification and certification
3. Frontline focus
4. Technology insights
5. Slow progress and impact of delays
6. Working Group feedback loop not closed
7. Potential ideas for Spirals 3 & 4
8. Land parts dominance
9. Communications and Misinformation
10. Knowledge sharing
11. Project framework arrangement
12. Networking and collaboration opportunities
13. Metal AdM focus
14. Wider AdM adoption

Findings: Main things that could be improved

Annual Questionnaire

7 & 13. Request for shift in focus from metal AM to polymer, due to its wider proven range of use in defence.

14. No clear path for AM implementation long-term.

1. Importance of standards and compliance in AM not emphasised enough.

7 & 11. Current framework arrangement limits progress of both MOD and industry.

7 & 9. Criticism regarding change of DEFCON shortly before the closure of framework competition.

2. Absence of a document to act as control mechanism on IPR, control of assets and certification.

Pulse Survey

5. Very slow progress overall in Spirals and WGs.

1, 5 & 6. WG discussions focus is on the minimum quality of work required rather than higher assurance, which could impact all Services. WGs as talking shop.

7 & 8. Land domain parts prominence overshadows other domains.

Notes:
AM = Additive Manufacturing
IPR = Intellectual Property Rights
WG = Working Group

Overall Themes

1. Standards
2. Qualification and certification
3. Frontline focus
4. Technology insights
5. Slow progress and impact of delays
6. Working Groups not efficient
7. Potential ideas for Spirals 3 & 4
8. Land parts dominance
9. Misinformation
10. Knowledge sharing
11. Project framework arrangement
12. Networking and collaboration opportunities
13. Metal AdM focus
14. Wider AdM adoption

Addressing your feedback – Part 1

Theme	Feedback point example	Response and Action(s)
1. Standards	Importance of standards and compliance in AM not emphasised enough.	Project TAMPA experience has confirmed that Industry understand the range of standards that apply but also acknowledge that the standards landscape is congested. The Certification WG were asked to look into this and provide a starting point to be used by all. As a result, a series of workshops were run in 2024 to understand the standards landscape and a standards consolidation guide produced. The *AdM Component Guidance Document* is now on Kahootz for feedback and comment, and it includes reference to relevant standards, and suggest means of part classification for means of certification compliance, example case studies and relevant domain points of contact.
2. Qualification and certification	Absence of a document to act as control mechanism on IPR, control of assets and certification.	There is sufficient guidance produced by Defence IPR to understand the degree to which access can be exercised. Configuration control has been identified during Spiral 1 as an issue to be addressed as part of the 'onboarding' process of AM parts and is being offered to the Inventory Management WG to resolve. For certification guidance, please check the AdM Component Guidance Document. Certification by TAMPA firms is very well understood and evidence has been provided to confirm parts have been or could be certified.
5. Slow progress and impact of delays	Very slow progress overall in Spirals and WGs.	Delivery agency moved from DE&S' Future Capabilities Group back to the Innovation team to reduce organisational barriers to progress (e.g. finance transfers) and speed up framework contract task delivery. As we rely on the voluntary contribution of members in the WGs, progress can be stunted at times as WG membership is a secondary role. However, there has been great progress in all WGs which we need to highlighted better through improved communications at face-to-face WG events. This will be captured within the 2* Champion Advanced Manufacturing Comms Plan. Commercial X have been commissioned to support the pre-spiral 3 and 4 decision point in Oct 2024.
6. Working Groups not efficient	WGs as talking shop.	This is a risk with all large WGs; however, this has been individually mitigated by each WG leadership team. The Certification WG has decided to create a sub-working group (SWG) with a smaller number of key players, which has resulted in quicker progress and decision making. A similar activity is under consideration by the Digital Thread WG leadership. Although smaller SWGs have been setup to speed up progress, these still refer back and consult the wider WG to ensure the widest possible peer review and comment on activities undertaken.

Addressing your feedback – Part 2

Theme	Feedback point example	Response and Action(s)
8. Land parts dominance	Land domain parts prominence overshadows other domains.	Spiral 2 has put an emphasis on Air domain parts in order to ensure land parts are not the sole category being researched. Maritime parts are already included in Spiral 1. Spirals 3 and 4 will also consider the land domain bias.
9. Misinformation	Criticism regarding change of DEFCON shortly before the closure of framework competition.	We will actively clarify any misconception we are made aware of. Additionally, we will widely communicate the bidding arrangement for S3 and 4.
11. Project framework arrangement + 7. Potential ideas for Spirals 3 & 4	Current framework arrangement limits progress of both MOD and industry.	The re-opening of the framework will be considered for the Oct 2024 decision point as will enabling increased tempo of Spiral activities. Commercial X have been commissioned to support the pre-spiral 3 and 4 decision point in Oct 2024.
13. Metal AM focus + 7. Potential ideas for Spirals 3 & 4	Request for shift in focus from metal AM to polymer, due to its wider proven range of use in defence.	Polymer AM will be considered for inclusion in future spirals during the Oct 2024 pre-spiral 3 and 4 decision point.
14. MOD AM implementation	No clear path for AM implementation long-term.	The closure of the Engineering Support Transformation Programme in Nov 23 led to the loss of a more enduring adoption strategy for AM in Defence and championing and coherence of AM within the MOD and the Defence Support Enterprise. However, over the past 5 months, great efforts have been put into identifying a new long term “home” for AM, which has been identified as 2* Director Joint Support.

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Team Defence Update:
- AdM Component Certification Guidance
- Surveys & Virtual Networking Decks

AdMaaS WG - 1st July 2024

AdM Certification Guidance

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- Cert SWG formed to focus discussions and progress an output
  - MoD, OEM, SME, Catapult & Regulator input
- Meet monthly (MS Teams) & regular updates/discussions via email
- Focused on producing guidance for the certification of AdM components on Defence platforms (Air, Maritime & Land)
- Developed and agreed AdM Certification stakeholder map at last AdMaaS WG (Sheffield)
- Developed DRAFT 'AdM Component Certification Guidance Document' and circulated to wider Cert WG in early June:

Aim: to provide **guidance to industry** and to outline **general principles** for achieving certification of an additively manufactured component across the service domains. The intention is **not to replicate or replace existing standards**, but to provide a **handrail** for parties wishing to achieve compliance, outlining the expected effort and process required by the regulator(s).

- Aim is for document to be open source, within 'MoD AdM Adoption Strategy'
- **Currently on Kahootz (scan QR code to review & comment):**

SCAN ME

AdM Cert Stakeholder Map

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MoD

- Dir Jt Sp*
- Strat Comm
  - Defence Sp
- DE&S
  - DTs
  - FCG
  - iLog
  - Commercial
  - LSOC
- FLCs (9 Bn REME,), RCO ASTRA
- SDA, DIPR, DOSG
- Dstl, 71 (IR) Sqn 1710 NAS, Chinook DT

Industry

- OEMs
  - Marshalls
  - Boeing
  - Lockheed Martin
  - BAeS
  - Leonardo
  - GKN
  - QinetiQ
- SMEs
- Trade Associations (AMUK, TD-Info)
- Research (MTC, TWI)

Regulator

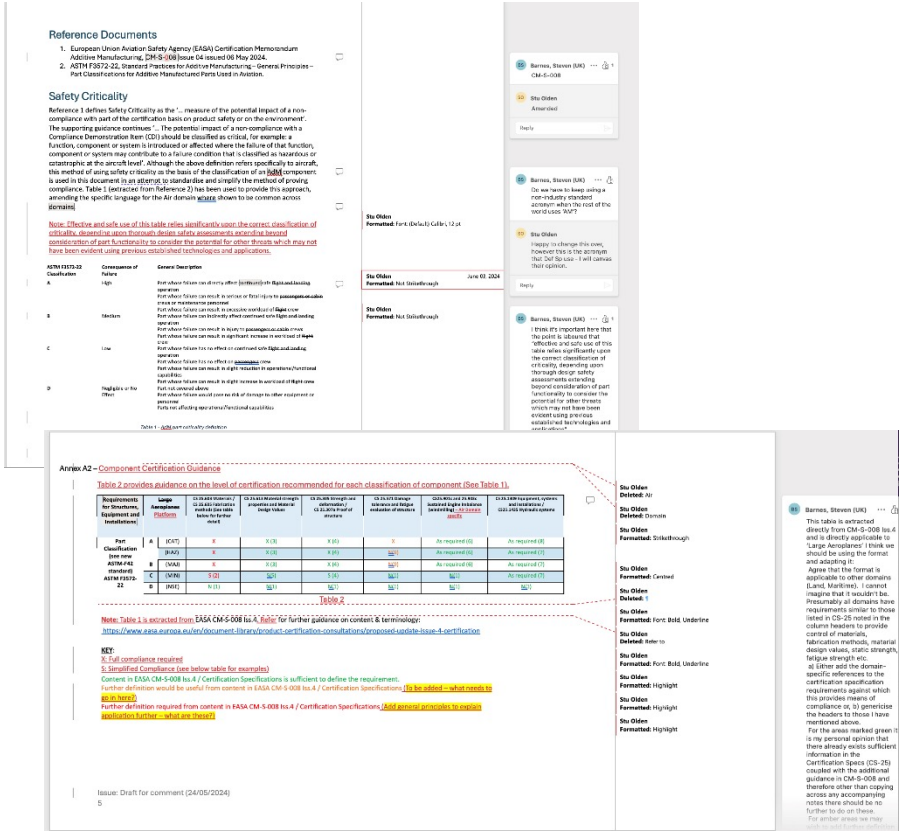
- MAA
- UKNCB
- Land
- Maritime

Academia

- Nottingham
- Cranfield
- Lincoln

Outline of Guidance Document

- 10 to 15 pages:
  - Introduction / Aim (outlining general principles of achieving certification of an AdM component across domains)
  - Use of Safety Criticality (danger to personnel); F3572-22 Table 1 used to try to generalise across all domains
  - Reference Documents:
    - EASA CM-S-008 Iss4
    - ASTM F3572-22
  - Domain Pathways: areas of divergence / key notes
  - Example Case Studies (Land, Maritime, Air)
  - Useful contacts (regulators etc.)
  - Annex:
    - Use of component certification guidance (EASA CM-S-008, Issue 4) for common approach where possible.



Next Steps

- Feedback welcomed from all AdMaaS WG members
- Regulator engagement / feedback – July 2024
- Incorporation into MoD AdM Adoption Strategy – Q4 2024

Surveys & Virtual Networking

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- Defence Inventory Survey (AdM parts on in service platforms):
  - 10 respondents, 171 components
  - Babcock, RBSL, Thales, BAE Systems (Air), Leonardo, Parker Hannafin, QioptiQ, NP Aerospace, Cookson Additive, AMFG

- AdM Capabilities Matrix (UK based AdM capabilities):
  - 5 respondents
  - JRM Advanced Engineering, Metron Advanced Engineering, MTC, 71(R) Sqn RAF, DEEP Research Labs

- Virtual Networking Elevator Pitches (promotion of capabilities to UK MoD & OEMs)
  - 19 organisations
  - Alloyed, Meltio, 3T-AM Beamit Group, AddUp, AFD, Desktop Metal, Dyndrite, Enable, JRM Advanced Engineering, LAS, Metron, MLS, DMC, Apworks, Polar Technology, QinetiQ, TWI, Wayland, Xerox
  - Requesting updates and new submissions for Spirals 3 & 4

- **Access to surveys and virtual networking submissions via Team Defence Information website.**

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Thank You

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Working Groups – Knowledge Share

13:50 – 14:00

WG Summaries

- **Digital Thread WG** – Shelley Copplestone and Tim Westmaas
- **Certification WG** – Leonie Boyd and Charlotte Meeks
- **Inventory Management WG** – Len Pannett and Joe Vranch

• Certification WG

- Sought to better understand standards and processes
  - Sharing of LFE / knowledge cross WG
  - Wider stakeholder engagement across industry, academia, MoD & Gov't Agencies

- Have developed draft Additive Manufacturing Part Certification Guidance Document
  - Provides handrail to navigate standards & stakeholder engagement
  - Attempts to provide common approach pan Domain
  - Includes pathway across all aspects from materials to inspection
  - Example case studies and points of contact

- Next steps:
  - Further development of guidance document, specifically opening up to wider stakeholder scrutiny, including regulators
  - Looking for test case to use guidance document for check of relevance/accuracy/completeness
  - Investigating open source 'home' for document

• Digital Thread WG

The working group's objective is to explore the creation, distribution and integration of digital information, to enable additive (*and advanced*) manufacturing.

The 5 challenges the group were set out with were:

- Print file creation
- Print file standards
- Print file storage
- Print file transmission
- Print file exploitation

Our goal through 2024 was to tackle at least 2 of the above bullet points, starting with 'Print File Creation' and 'Print File Standards'. These are both currently underway and go hand in hand.

The outcomes of this industry and Mod investigation of print file creation and standards are [drafted] in a Technical Data Pack document, which will be distributed to key stakeholders and the AdM Exec once finalised.

- **Inventory Management**

•Consider implications for Matl accounting
•Consider if needed to be flagged on Sp IS
•Check fit, form and function alignment with extant NSN

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Pulse survey ->

Coffee Break

14:00 – 14:10

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Procedure for Working Groups Session

Edit Barbantan

14:10 – 15:40

Task: agree on order of importance and priority of each SWOT analysis item

Keep the following questions in mind:

- What do you promise to deliver in the next 12 months?
- What do you need help with from DJS?

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Working Group back brief

WG co-chairs

15:40 – 16:10

WG Summaries

- **Digital Thread WG** – Shelley Copplestone and Tim Westmaas
- **Certification WG** – Leonie Boyd and Charlotte Meeks
- **Inventory Management WG** – Len Pannett and Joe Vranch

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Digital Thread Working Group SWOT Analysis

Strengths

1. Community includes Digital and Data SMEs
2. Early engagement from MoD (proactive)
3. Collaboration, experimentation opportunities, proofs (CWIX 24) – Industry and Defence
4. New 2* champion
5. Recognition of importance of Digital/Data across Defence

Opportunities

1. Business Modernisation for Support
2. Exploitation of early experimentation/engagement by MoD
   a) Project Despatch (MoD owned file sharing database – not currently supported) and H4MOD MoD Level AM Sharepoint site
   b) Digital library population of important parts
3. Concept testing and development & education – TAMPA is a safe space. Use TDP as a starting place to assess how appropriate it is for all methods
4. Increasing comms with TLBs/formalise integration with TLBs
5. Industry willingness to integrate
6. Feedback on performance of AM parts to DT and OEM (e.g. fatigue) which can provide more options to suit need.
7. Further identification and understanding of key dependencies (e.g. through other TAMPA WGs, TLB WGs, Rapid-e, EDA's AM Village, CWIX, SSN-A) to fully capture Defence/Industry/NATO AM landscape and address x-cutting themes, etc
8. Provision of a Defence Advanced Manufacturing 'demand signal' to fully adopt for Defence purposes

Maximise

Exploit

Weaknesses

1. Lack of Defence higher level actionable strategy & objectives
   a) Lack of awareness of AdM/importance and complexity of DT
   b) Generally voluntary/part time
2. Lack of authority to mandate change
3. Work does not feed into longer term resourced options – Unknown exploitation path beyond Experimentation (Pj TAMPA) – Should this be in Strategy/Policy?
4. Lack of representation from wider Industry stakeholder base
5. Defence technical understanding (Master Data Set/Technical Data Pack)
6. Liability of parts manufacture not yet addressed (diff manufacturing capabilities, control of E2E manufacturing process allows OEM to accept risk, loss of control introduces complexity on who owns the risk)

Minimise

Mitigate

Threats

1. DTWG Defence co-Chair gapped UFN
2. Incoherent Defence DT development (duplication?)
   a) TLB development still immature
3. Failure to sieze IS modernisation opportunities (BMfS)
   a) Failure to consider wider Advanced Manufacturing potential (Just Deployed Support?) should we expand our focus outside of deployed support AM?
4. Failure to engage with wider Defence/Industry (Key Design Authorities, Delivery Teams/DE&S, Wider Support)
   a) Including financial compensation model 'baked in'
5. Failure to maintain momentum, exploit engagement/experimentation
6. Consequence chain not fully considered. E.g. part manufactured would need to be 'logged' for replacement with OEM part or OEM would need quality and governance satisfaction if OEM takes risk on non-OEM manufactured parts
7. MoD IT does not support use of Advanced Manufacturing in-house (CAD, storing, sharing software licences, etc)

Certification WG

Strengths

- WG formed single delivery focus across the whole of defence ensuring broad applicability.
- Development of sub-working groups which focused actions and accountability from group members and led to deliverables being achieved.
- Broad range of volunteers to working group from industry, academia, supply chain and MoD.
- A strong determination to progress activity to provide a much needed guide to certification of AdM components within Defence.
- Alignment with allies on certification approach (safety criticality based).

Weaknesses

- Large number of participants interested at the start of the WG led to wide discussions but limited agreement, direction or actions.
- Limited DE&S DT engagement to date.
- Incoherence of Industry and FLC approaches to delivering effect with AM
- Engagement with the TAMPA projects has been limited preventing direction from WG into projects or lessons from the projects supporting the WG.
- The cessation of the Parts Creation Framework is seen as a lost opportunity to advance AdM within Defence supply chain.

Opportunities

- Broader engagement of companies within WG into TAMPA to enable companies to contribute to whole qualification process.
- Output from WG will provide guidance to companies new to AdM or Defence supply chain broadening supply base.
- Broad engagement has formed a large AdM Defence network which could be developed across other links/industries with comms tool.
- Output would support AdM adoption strategies.
- Learning from US and EDA certification community.
- Online publication of Certification Guidance Document (open source).
- Linkage to DTWG Technical Data Pack (TDP) within Certification Guidance Document, outlining data requirements.

Threats

- Lack of alignment across MoD wrt AM strategies/intent
- Current MoD frameworks limit buy-in from industry, a generic sign-off from MoD customer to accept AdM parts is required to increase industry opportunities.
- Identifying an owner and open source online ‘home’ for the Certification Guidance Document.
- Delaying publication of V1.0 of the Certification Guidance Document.

Inventory Management WG

Strengths

- Focus is on adjusting existing policy and processes as far as is practicable, accelerating their deployment
- Broad range of volunteers to working group from industry, academia, supply chain and MoD
- A strong determination to progress activity to expand use of AdM components within Defence

Weaknesses

- UK is beholden to NATO policies on application of NSNs to AdM parts
- Lack of clarity of consumption/demand data from DTs, hindering the development of AdM business cases
- Procurement focus on cost per part rather than other factors
- Cost of digitisation, testing, etc of designs will significantly distort the comparison of traditional vs AdM paths
- AdM being used in FLCs in somewhat haphazard ways
- Many DTs appear not to be familiar with how to introduce AdM alternative parts into inventory/procurement systems
- Current procurement processes (quotes) delay lead times where AM is the clear preferred option

Opportunities

- Many lessons available from outside of Defence sector
- Complete the amendments to obsolescence management and local manufacturing policies (subject to staff availability)
- Potential of labelling AM as “Battle Damage Repair” to expedite use
- Finalise the activation of the AdM flag on CSIS
- Expand awareness of MoD’s intent to expand AdM in the Defence sector beyond Tier 1s
- **Identify specific sections in existing support contracts that enable challenge of long lead and low VfM quotes**
  - Potential for redesign items to reduce weight, lead times and/or improve functionality, and consequential potential to improve KPIs in support contract
- Use of distributed digital manufacturing increases resilience and stock availability
- Mapping FLC AM capability to increase its VfM
- Creation of an obsolete parts database within MoD
- Potential for smarter sourcing frameworks across Tiers to reduce lead times and increase parts availability

Threats

- Lack of momentum to finalise the completion of policy adaptation
- Lack of strategy and policy on AdM results in bad examples of AdM use that reduces credibility and trust
- Lack of FLCs compliance with policies results in misuse of AdM
- Lack of strategic risk management of AM technologies and feedstock
- Loss of AM expertise in Industry supply chains

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Closing remarks

Charlotte Robinson

16:10 – 16:30

THANK YOU!

babcock™

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