



NAVY COMMAND: MARCAP

AdM

Additive Manufacturing

NEWSLETTER

Accelerating Development of AdM for Defence Through Knowledge Sharing, Collaboration and Co-innovation

SPECIAL POINTS OF INTEREST

■ COME AND SEE A DEMO OF 3D SCANNING FOR REVERSE ENGINEERING AT LOGNET USING THE LATEST TECHNOLOGY

For further details ask at the AdM sub working group stand



■ RESEARCH

The Defence AM community has secured funding and agreement for continued access for another 12 months to the AM 'lab' at the UWE. Used predominantly by the Future Capabilities Group, to develop cases put forward for its retention through the Defence Logistics Force Development Board forum. As such we expect to receive a paper from FCG on the viability of using recycled material as print stock (to reduce waste) in Apr 20.

Welcome to the 2nd AdM bulletin

Welcome to the second edition of the Additive Manufacturing Bulletin that aims to share MoD and Defence Industry innovation ideas and experience under the governance of the Defence Logistics Force Development Board (DLFDB). Team Defence have again led on facilitating industry participation and I am delighted by the uptake of attendees. This forum is of course open to all industry providers for membership. Our aim remains the same, to use the sub-working group access the broader Defence Support Enterprise to seek out, understand and exploit disruptive and innovative technologies with military potential.

Our next planned meeting is at Airbus Stevenage in April 2020 and this will provide yet another opportunity to understand current activity across the span of Defence providers with Navy, Land and Air Commands all sharing their experience to date.

We are also keen to discuss ideas such as establishing a UK Military Centre of Excellence, potentially on a federated basis. Again, industry views and expertise will be most welcome to contribute to the discussion.

Ahead of that, please do enjoy this addition of the Bulletin and perhaps give some thought to contributing to our next edition.

Cdr Rachael Jewell RN, Chair SWG AdM



International Collaboration at Formnext

November 2019. Ultimaker hosted its first Defence Sector AM specific round table event at Formnext in Frankfurt, which is the largest annual additive manufacturing exhibition and conference in Europe. The event brought together both key military personnel and major players from within the defence AM supply chain from the Netherlands, UK, Germany and Sweden for an open discussion and knowledge sharing half day.

The event was chaired by Paul Heiden (SVP Product Management UM) and included an in depth overview current of AM use plus future roadmap from the Dutch Navy's key 3D printing champion Commander Wanningen. It was a very valuable event for everyone involved including the Ultimaker team as manufacturers and suppliers of AM equipment.

From the conversations during the day and the feedback received since, this 'pilot' event was a great success and so we are already planning

the next event possibly at a NATO site or AMUG 2020 in Chicago <https://www.amug.com/> March 22-26, 2020.

We already have a fairly long list of potential topics for this event including Digital Warehousing, Acceleration of certified G-Code, Topology Optimisation, Materials and the overall roadmap for implementation of AM including hardware options and parts libraries.

Any additional suggestions, further requests and feedback on this are always appreciated.

Jane Gibbons, Ultimaker



AM SUB-WG WORKSHOP STRAND - PEOPLE/CULTURE

Following a workshop at the last AdM SWG the MOD and Industry Col would like to establish work placement exchanges and opportunities for joint training. In order to increase understanding of Additive and the possibilities across the end to end support chain exposing engineers to other environments will help transfer knowledge and understanding. The military will share the challenges of the operating environment while learning about the current and future application of the technology. This collaboration will be mutually beneficial and as individuals return to work and share their experience this will start to embed the knowledge and understanding for adoption and start a cultural shift. If you would like to take part in this scheme providing training, work placement or allowing your personnel to take part please get in touch. The intention is that the costs will be borne by those taking part.

Contact: Steve.green@teamdefence.info

In-Service News

AW159 Widcat helicopter fitted with 3D printed nylon switch panel



Examples of 3D parts manufactured in-service, courtesy of Dutch Navy/ Ultimaker

SEA: Cold Spray

Following our focus on Cold Spray at the Nov SWG there was a follow up focus workshop held at The Welding Institute (TWI) in Feb. The event shared experience and application of cold spray and further explored the use cases for Defence.

The technology is being further explored by the Naval Advisory Group. Phase 1 of the work will;

- Evaluate independently the effect of process and operator parameters on the characteristics and properties of aluminium-based coatings prepared by portable / manual cold spray systems.
- Benchmark the cold spray process characteristics and coating properties against known process characteristics and coating

properties of conventional thermal spraying.

- Produce a coating procedure specification for Phase 2 (which can subsequently be used as the basis of a new Defence Standard for the application of cold spray coatings for corrosion protection).

Progress on this activity will be briefed at LOGNET and the slides from the TWI event are available for download from the TD Info website.



LAND: Army Capability Investigation Update

A rmy has been hard at it over the last few months, primarily in obtaining permission necessary to purchase their tactical 'Makerspace' technology. This was obtained in January. The Makerspaces are due for completed build by the end of March/early

April. In the meantime, the Army has started to turn its attention to safety, and providing an overarching framework for users of 3D printing technology to work within. Army has also conducted a number of bilateral and trilateral meetings, primarily with Dutch and US Additive

Manufacturing leads. This has led to a formalised agreement between UK and US Army's to share information pertaining to Additive Manufacture know as 'Agree to Actions'.

Lt Col Dan Anders-Brown



First AM parts, 3D printed on operations - Royal Engineers - Hospital in Sudan 2018



AIR: Marshall's 3D printing takes flight in military platforms

Marshall Aerospace and Defence Group (Marshall ADG) is one of only a few companies certified to produce flight-ready aerospace parts using the Fused Deposition Modelling (FDM) method of 3D printing.

This approval allows Marshall ADG to produce parts for both for civil and military applications, while complying with the latest safety regulations, along with the capability to make parts for land and naval applications.

The company uses a Fused Deposition Modelling (FDM) method of additive manufacturing, in which an extruded polymer system builds parts in layers from the bottom up by heating and extruding a variety of thermoplastics.

"There are many advantages to additively manufacturing parts, such as rapid

prototyping for de-risking, speed of manufacture, and cost savings, as well significant weight reduction in many cases," said Chris Botting, Materials and Additive Manufacturing Engineer at Marshall ADG.

"This method of manufacture is ideal for low-volume, highly complex parts that would otherwise require long lead times and expensive tooling."

Marshall ADG invested in four Stratasys 3D printers in 2017, which it uses to produce both prototype and final parts using a broad range of thermoplastic materials, including ABS, ASA, PEI, PLA and TPU.

The company was awarded certification from the European Aviation Safety Agency (EASA) in February 2018 and has since produced nearly 50

parts that are now flying on a range of platforms.

Parts include a countermeasure switch housing, safety knife holder and laptop modification panel for the C-130 Hercules operated by a number of air forces. The company also additively manufactures carbon fibre ducts for its deployable shelters for ground forces and tooling for fuel tanks.

The manufactured parts are FST (Fire, Smoke and Toxicity) compliant and have thermal properties that make them ideal for use in non-load bearing aerospace cabin environments.

ADG's 3D printing is frequently used with state-of-the-art laser scanning to reverse engineer legacy parts for which no CAD data exists. Laser scanning is used to create 3D digital models with a high degree of accuracy in form fit



Examples of in-service parts



and function of the selected parts. These are then used to create the final 3D printed parts.

"Military equipment is expected to function for many years but it's often the smallest and seemingly insignificant part that renders it obsolete," said Chris. "It's ideal technology for forces to have with them in remote locations to meet urgent operational requirements for non-load bearing parts, where they can modify and repair their equipment in a fraction of the time it would otherwise need."

Liz Fullick Marshall Aerospace & Defence



Marshall realized major cost savings for this 3D printed prototype, alongside a 63 percent reduction in overall part weight.

ADVANCED MANUFACTURING TRAINING CENTRE, PART OF THE MTC-THE MIDLANDS' LEADING TRAINING CENTRE FOR ADDITIVE MANUFACTURING.



ADVANCING ADDITIVE MANUFACTURING IN AEROSPACE

Additive manufacturing has the potential to revolutionise manufacturing and therefore is an important part of the future of aerospace. The £15 million DRAMA* project led by the Manufacturing Technology Centre (MTC) is encouraging the UK aerospace industry to adopt additive manufacturing and has already got more than 50 supply chain companies on board.

It's an important mission which is why the MAA became a partner on DRAMA from the start. Aerospace primes are looking for ways to reduce costs of manufacture, optimise the functionality of components and increase the sustainability of aviation, all of which put

rapidly.

Unless aerospace supply chain companies begin to embrace these technologies, they risk missing out.

A key development has been the launch of the National Centre for Additive Manufacturing (NCAM) an innovation and knowledge hub based at MTC's Coventry campus. The new hub is leading research, development and collaboration around metal additive manufacturing, developing solutions for advancing the technology. It has state-of-the-art facilities for designing, printing, post processing and inspection of additive manufactured products.

Companies using NCAM are able to gain hands-on

“ Additive manufacturing offers the biggest opportunity since the introduction of composite.” DR KATY MILNE, CHIEF ENGINEER, MTC

additive manufacturing on the radar for future programmes.

Additive manufacturing enables the production of complex components which are often difficult or impossible to make conventionally. Products can be lighter, more efficient to produce, can get to the market faster and be delivered more

experience in the theory and practice of additive manufacturing, with the help of MTC experts.

The MAA has been integral to the DRAMA project, working in conjunction with the MTC and Renishaw to provide training and support for supply chain companies with all levels of

experience.

Getting the right help is vital to the adoption of additive manufacturing. Courses have included everything from practical skills to producing business cases for the technology. A number of practical support packages have also been provided to help companies shape their additive strategies and mature their additive manufacturing processes.

The NCAM has also established an online facility called the 'Knowledge Hub' which is packed with resources, particularly around metal additive manufacturing. It's a great destination for anyone wanting to get up to speed with the technology and enables companies to track their progress through adoption to implementation.

Funding for the DRAMA project comes from Innovate UK supported by the Aerospace Technology Institute (ATI). The partners in DRAMA are the MTG, Renishaw, the MM, ATS Applied Tech Systems, Autodesk, Granta Design, the National Physical Laboratory and the University of Birmingham.

*Digital Reconfigurable Additive Manufacturing facilities for Aerospace

VISIT: [HTTP://KNOWLEDGEHUB.THE-MTC.ORG/KNOWLEDGE-HUB/](http://knowledgehub.the-mtc.org/knowledge-hub/)

**Want to
co-innovate?**

**Submit your ideas for
future collaboration
and co-innovation
between MOD and Industry
stakeholders.**

**Future MOD & Team Defence
Information Events:**

■ 23RD AND 24TH SEPTEMBER 2020
Support Chain Seminar.

■ 23 APRIL 2020
Next AdM Sub-WG



**WANT TO
KNOW
MORE?**

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the Defence Support Network