

**Centre for
EO Instrumentation**



**CEOI Industry Consultation Workshop
Summary Report (Final Draft)**

“Advanced Manufacturing Techniques for Space Instrumentation”

6th April 2017

London

1. Introduction

New instruments for space are challenging conventional fabrication, manufacturing and assembly techniques. As a result, the space instrumentation sector is evaluating and trialling a wide range of Advanced Manufacturing Techniques (AMT), both to solve existing manufacturing challenges, and to open innovative new design & performance concepts. The space instrumentation sector is not alone in this interest and many of the techniques being researched have applicability across a wide range of other sectors.

The round-table consultation brought together industry representatives from a range of sectors to discuss and provide input on market trends, challenges and opportunities that will inform CEOI's strategy for the next generation of Earth observation / remote sensing instruments.

The meeting aimed to:

- Illustrate how advanced design, manufacturing, assembly, metrology, and quality techniques for Earth observation instruments are developing and the research focus for the next generation
- Brainstorm with industry representatives the wider issues of AMT adoption that CEOI funded projects can learn from or contribute to solving
- Investigate the possibility of brokering relationships with interested parties along the supply chains for promising new applications / markets
- Create opportunities for attendees to network across the different communities

The meeting was held under Chatham House rules; attributions of individual comments were not recorded and the input from the participants has been synthesised into a composite of views from the meeting. This report summarises those views, which will be incorporated, along with the science needs, into the CEOI strategy for the next generation of Earth observation / remote sensing instruments.

The initial round table introductions from the delegates identified a wide range of challenges and application interests for the adoption of Advanced Manufacturing Techniques in instrumentation. These challenges and interests are explored more deeply in the main discussion.

2. Summary of Meeting Discussions

The participants came from a broad cross section of industry, and identified a wide range of opportunities and challenges in adopting Advanced Manufacturing Techniques (AMT). This section synthesises the discussion and summarises the key points raised.

2.1 Summary of Market Interest

Key areas of interest were:

New technologies - to enable the next generation of components for complex and high-performance systems.

New geometries - the ability to create new shapes and geometries (currently not possible) that enable dramatic improvements in performance, cost, size, quality, etc.

Materials – the properties, quality and performance characteristics required of materials used and whether AMT works with different materials such as glass. Also, to understand the role of AMT in composite manufacture, and whether these techniques can be used with other technologies such as sensors to create ‘smart’ structures.

New manufacturing techniques for existing systems – new techniques such as laser sintering and wire arc additive manufacturing to transform manufacture of existing products & systems.

Transforming the Supply Chain – enabling manufacture of spares at the point of use, to transform supply chains in the maritime, defence and other sectors. Understanding whether AMT will integrate into ‘Industry 4.0’ and the factory of the future.

Standards – the new standards required both for advanced manufacturing techniques themselves and for the materials used in the techniques.

A lively discussion covered these opportunities and challenges, highlighting a wide range of areas where further work is required to enable the practical and widespread adoption of these techniques.

2.2 Summary of Technical Challenges and Opportunities

The technical and process issues highlighted during the discussions can be summarised under the following headings:

Challenge/Opportunity	
New technologies	Enable the next generation of components for complex and high-performance systems.
New geometries	Create new shapes and geometries (currently not possible) that enable dramatic improvements in performance, cost, size, quality, etc.
Materials	Clarify the properties, quality, performance characteristics required of materials used. Determine whether these techniques work with different materials such as glass and their role in composite manufacture. Identify whether AMT can be used with other technologies such as sensors to create ‘smart’ structures.
New manufacturing techniques for existing systems	Research how new techniques such as laser sintering and wire arc additive manufacture can transform the manufacture of existing products and systems.
Transforming the Supply Chain	Enable the manufacture of spares at the point of use in order to transform supply chains in the maritime, defence and other sectors. Evaluate how advanced manufacturing techniques will integrate into ‘Industry 4.0’ and the factory of the future.
Standards and Quality	Understand the new standards which will be required both for advanced manufacturing techniques and for the materials used in the techniques



2.3 Conclusions

Advance manufacturing techniques have tremendous potential to transform product design, with new shapes and forms not previously possible. They also have the potential to transform the supply chain, with parts / spares being manufactured at the point of need, when required. However, there are a wide range of design, materials, process, testing & metrology, QA / QC, training, and standards challenges that need to be addressed to enable this vision.

3. Conclusions for a UK Technology Strategy

CEOI will continue to support development of these technologies for Earth observation from space, and to ensure that opportunities are pursued for technology transfer to/from non-space developments. The inputs and conclusions of the workshop, as summarised in this report, will provide an important input into the strategy development process for the CEOI programme.

Further information about this technology and others funded by the CEOI can be found at www.ceoi.ac.uk. You can also contact the CEOI Director, Professor Mick Johnson: Tel: +44 (0)1438 774421 or email: mick.johnson@airbus.com.