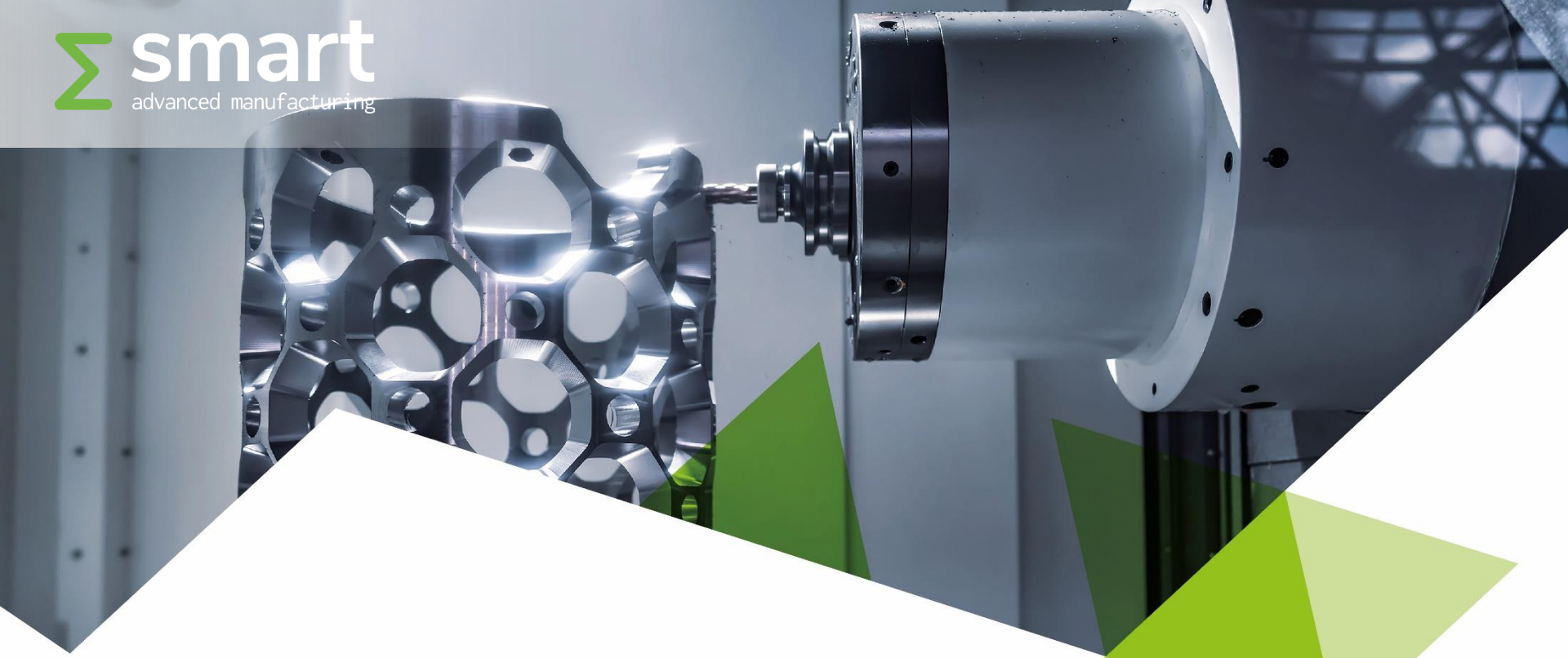
smart
advanced manufacturing



DICOTAAMY

Digitalization of Composites for Advanced Air Mobility

Dichotomy: a division into two especially mutually exclusive or contradictory groups or entities


smart
advanced manufacturing

ORGANISATION PROFILE

Name: Convergent Manufacturing Technologies (Canada)

Personnel: 25 Highly Skilled and Experienced Staff

Products/Services: Digital tools for advanced composites processing

Technical areas and R&D expertise:

- Materials science, composites processing, computational mechanics, numerical simulation, data science and machine learning
- Significant experience in participating and coordinating multi-organizational collaborative R&D programs

PROPOSAL INTRODUCTION (I)

Vision: Air transportation is at the edge of a transformative change with the advent of the Advanced Air Mobility (AAM) sector – a global market that is seen as exceeding $300 Billion with over 28,000 eVTOL[1] aircraft entering service. Standing between this exciting vision and successful execution are many obstacles, **a major one being the need to build aerospace products at near-automotive rates[2].**

80% of AAM vehicle concepts assume a significant use of carbon-fibre composite structures, as the benefits of these lightweight, highly tailorable and unified structures are critical to the success of eVTOL aircraft.

The vision of this project is to develop, integrate, validate, improve, and demonstrate a digital thread from design to full-scale production and certification for AAM.

Motivation: Despite significant advances in the digitalization of composite materials manufacturing and structural design, the reality is that current workflows are insufficiently fast, agile, reliable and cost-effective for the disruptive improvements needed for successful eVTOL production. This **dichotomy** – the need for composites, yet the significant risk in using them to build aerospace products at near-automotive rates, means that AAM needs its own focus: the structure size/complexity and production rates are sufficiently different from other aviation applications that new digital methods and tools are desperately needed.

Content: This project will create one or more demonstrated use cases of an integrated digital platform that will be developed to be directly applicable to representative AAM structures. We will focus on the manufacturing design and production of a complex diaphragm-formed geometry, including forming, curing, machining, and inspection. Digital tools include the manufacturing simulation as well as in-process automation, sensing and control and non-destructive inspection (NDI).

1. **e**lectric **V**ertical **T**ake **O**ff and **L**anding
2. Aerospace rates are typically 1 vehicle every 3 days at best – near-automotive rates are multiple vehicles per day

PROPOSAL INTRODUCTION (II)

Expected outcome: Digital tools (both hardware and software), including manufacturing simulation software, in-process automation, sensing and control solutions, and non-destructive inspection (NDI) that are optimized and demonstrated to be ready for use in AAM manufacturing design and production. **We will focus on the manufacturing design and production of a complex diaphragm-formed geometry, including forming, curing, machining, and inspection**, as this is a promising manufacturing route. As a result of this project, validated digital tools (both software and hardware) will be available to reduce risk, cost, and time to develop new AAM structures, and ensure that their production is indeed aerospace quality at near-automotive rates.

Impacts: The market impact of this project will be the de-risking of the manufacturing challenge facing the emerging $300B+ AAM sector. Materials suppliers, manufacturing equipment and tooling suppliers, AAM structure designers and manufacturers will have access to a first set of an integrated set of digital solutions enabling appropriately fast materials development, product development, certification and cost-effective rapid production. This first set is directly useful as we have chosen a highly relevant manufacturing process, but it will also be a guide to further development of digital tools optimized for the AAM sector.

Schedule: Start and end dates TBD. Duration 36 months

PARTNERS

Current

- Confirmed
  - Convergent Manufacturing Technologies (Canada)
  - National Research Council Aerospace Manufacturing Technologies Center: Advanced Machining Group (Canada)
  - National Research Council Aerospace Manufacturing Technologies Center: Composite Products Group (Canada)

Partner search:

- AAM eVTOL companies
- In-process instrumentation and sensor companies
- NDI companies
- Other simulation companies

- Being contacted directly
  - Hexcel (Belgium, Germany, Spain) materials supplier
  - Toray (Germany) materials supplier
  - Solvay (Belgium) materials supplier
  - Dassault Systemes (UK, France, Canada) Simulation company (PLM – CATIA, ENOVIA, DELMIA, SIMULIA)
  - DLR (Germany) research organization

CONTACT INFO

Contact info:

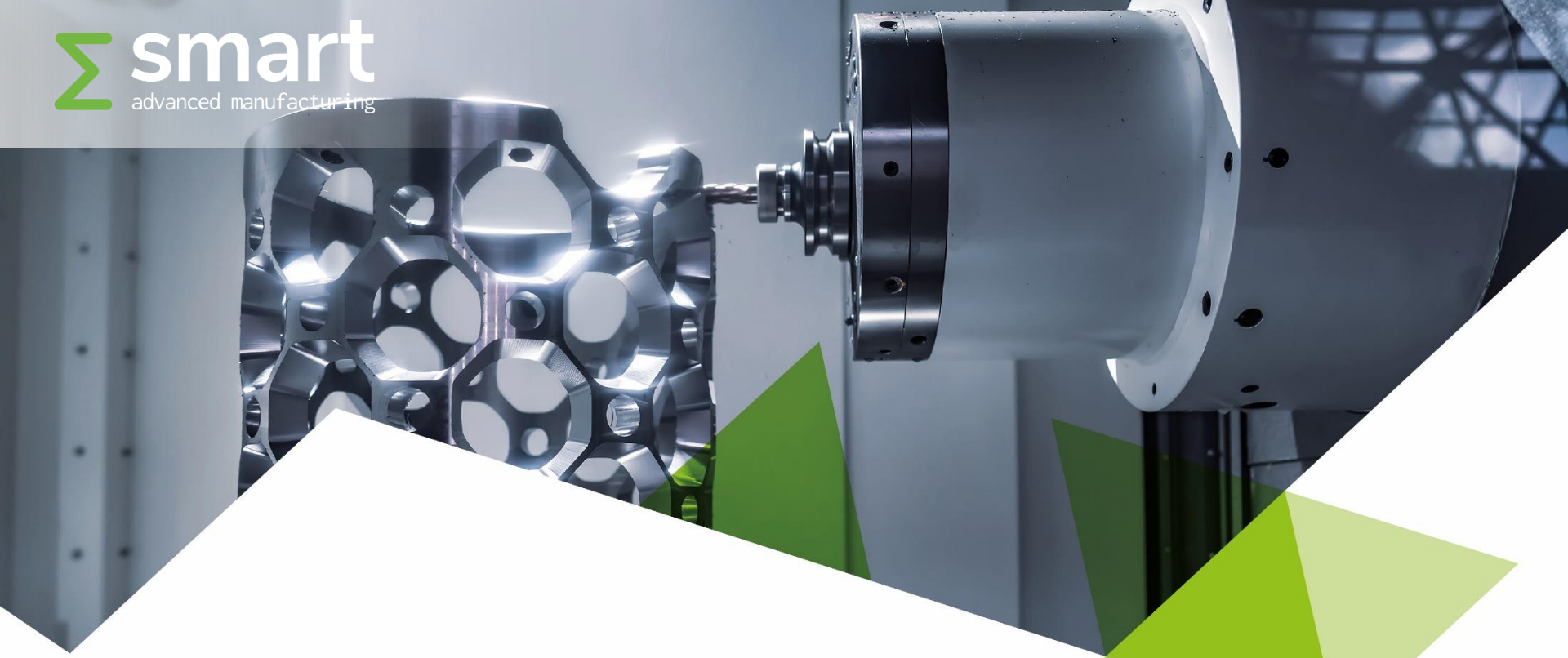
Anoush Poursartip,

Director of Research and Development

Convergent Manufacturing Technologies

anoush.poursartip@convergent.ca

smart
advanced manufacturing



www.smarteureka.com