

# THE AERONAUTICS ADVANCED MANUFACTURING CENTER, A NEW COMPANY- UNIVERSITY RELATIONSHIP MODEL

---

Minguez Rikardo<sup>1\*</sup>, Barrenetxea Lander<sup>1</sup>, Etxaniz Olatz<sup>1</sup>, Solaberrieta Eneko<sup>1</sup>, Eguiraun Harkaitz<sup>1</sup>, Lizundia Erlantz<sup>1</sup>, Iturrate Mikel<sup>1</sup>

1) University of the Basque Country UPV/EHU, Ecodesign Design Hub, Department of Graphic Design and Engineering Projects, Urkixo zumarkalea, z/g 48013 Bilbao

\*rikardo.minguez@ehu.eus

## **ABSTRACT**

The Aeronautics Advanced Manufacturing Centre (CFAA in Spanish) was created with the objective of developing advanced manufacturing technologies. These developmental level technologies can be quickly transferred to some aeronautical industrial facilities and are highly oriented towards this key sector of the economy. The centre also acts as an intersection of ideas and advancement for agencies and companies with capabilities, interests, and businesses in the aeronautical engines and structural components sector.

The conception of this centre as a conjunction of the University of the Basque Country (UPV/EHU) and the Business Cluster for the Development of Advanced Aeronautics Manufacturing Techniques enables the centre to focus on the end applications of aeronautics production, without forgetting the generation, use and fine-tuning of new knowledge in advanced manufacturing techniques.

Therefore, it is not only an initiation of joint interest as a driving force for technology, but also a new model for university-company relationships.

**KEYWORDS:** Company-University relationship, advanced manufacturing, validation test

## 1. INTRODUCTION AND CONTEXT

The Aeronautics Advanced Manufacturing Centre (Centro de Fabricación Avanzada Aeronáutica –CFAA– in Spanish) was created in 2015, when a cluster of companies –mainly promoted by the ITP Group– and the University of the Basque Country (UPV/EHU) –mainly promoted by the High Performance Manufacturing Research Group at the Faculty of Engineering of Bilbao– signed an agreement to create a mutually benefitting centre. The purpose of this centre is to develop technology that is expeditiously applicable to key processes of the engine component and aeronautic propulsion system sectors.

This initiative is also promoted and sponsored by the Regional Government of Biscay and the Department of Industry of the Basque Government. The centre is located in the Bizkaia Science and Technology Park in Zamudio (Biscay) and is currently considered part of the University of the Basque Country (UPV/EHU). Its activities are carried out with a programme contract with partner companies and projects funded by different calls.

### 1.1. GENERAL OBJECTIVES

The CFAA seeks to promote the development of expeditiously applicable manufacturing technologies for both the partner companies of the project and the general industry.

This approach aims to advance current levels of technological development associated in the sphere of universities (MRL, Manufacturing Readiness Levels 2 to 5) to levels of technological readiness in sufficiently representative environments (MRL levels 6 to 8). These levels of Manufacturing Readiness are closer to the production needs of companies (figure 1).

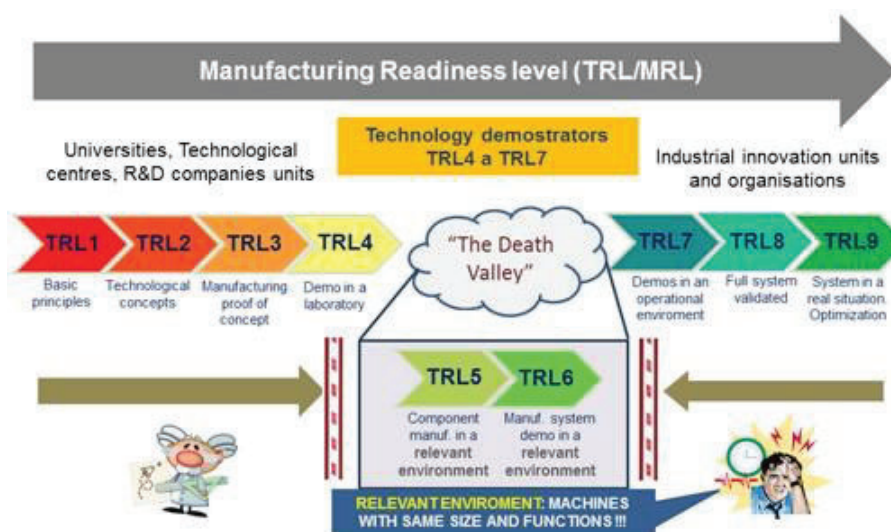


Figure 1. Manufacturing Readiness level (Source: CFAA)

Current activities performed by the CFAA:

- The demonstration and application of new horizontal technology developments for measuring, machining, tooling, etc. in the field of advanced industrial manufacturing, to accelerate the introduction of new products into manufacturing.
- The industrial validation of projects to reduce risks and deadlines, enabling the demonstration of the technical and economic feasibility of investments before their implementation into production.
- The design and validation of specific aeronautical equipment with the aim of carrying out machining tests on parts; the validation of the performance of machines and improvements in the manufacturing processes of these parts.
- The promotion of postgraduate education and PhD theses towards specialization in the field of advanced manufacturing technologies, performed in close collaboration with the companies and sectors linked to the centre.
- The opening of new lines of R&D in the field of advanced manufacturing technologies in collaboration with companies and sectors involved in the centre, which contributes to the development of projects for the European Horizon 2020 research and innovation programme.

## **1.2. TECHNOLOGIES**

New advanced aeronautical manufacturing technologies will be developed at the Centre. The definitions of these technologies are quite broad, given the fact that the modern process now includes aspects of manufacturing, control, monitoring, and planning technologies.

Cutting-edge machine tool technology has a prominent presence at the Centre, as it is a sector of strategic importance. Therefore, it is of the utmost importance to create efficient, highly robust, reliable, and precise processes.

Machine manufacturers will also be motivated by the improvement in their production processes, because they will have a testing laboratory for new designs, concepts, and machine tool capabilities.

These machines and technologies can be categorized into the following groups:

- High-performance machining processes, incorporating concepts of multi-axis machining, multitasking, precision and high speed machining.
- Non-conventional processes, such as EDM and Laser mechanisms.
- Metal additive manufacturing.



- Special robotized welding processes.
- Inspection and measurement.
- Grinding and finishing processes.
- Advanced integration of models, simulation, monitoring and results prediction of the processes. Virtual manufacturing.
- Integration of the information in line with the so-called industry 4.0 initiative

## **2. SCOPE OF OUR RESEARCH: DIGITIZATION AND INSPECTION**

Extensive control requirements on manufacturing processes together with quality requirements to accomplish by the aeronautical components require the application of rigorous controls of its processes in order to achieve full control over them.

In this scenario, the use of inspection systems in order to control the integrity of the piece is vital. The CFAA has a digital radiography station where the researchers from the Product Design Laboratory (PDL) work on 3D digitizations and inspections in components that have undergone welding, micro-milling or additive manufacturing among others, as well as on the detection of possible defects associated with each manufacturing processes is also possible.

The CFAA incorporates a computerized tomography (CT) machine which is a Real-Time X-Ray Inspection System. The model is GE Seifert X|CUBE Compact 225. This station has an inspection volume of 600 x 900 mm and maximum workpiece weight of 100 kg with a power of 160 KV.

## **3. RESEARCH GROUP**

Here are all the members of the research group working in digitization and inspection at the CFAA collaborate within the Product Design Laboratory ([www.ehu.eus/PDL](http://www.ehu.eus/PDL)) of the Department of Graphic Design and Engineering Projects at the Faculty of Engineering of Bilbao:

Rikardo Minguez –Associate Professor–, Lander Barrenetxea –Associate Professor–, Olatz Etxaniz –Assistant Professor–, Eneko Solaberrieta –Assistant Professor–, Harkaitz Eguraun –Assistant Professor–, Erlantz Lizundia –Assistant Professor–, Mikel Iturrate –Assistant Professor–



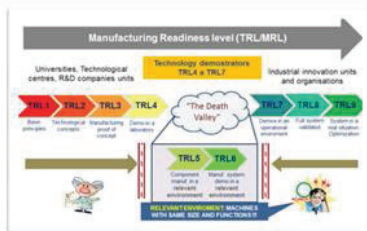
**THE AERONAUTICS ADVANCED MANUFACTURING CENTER, A NEW COMPANY-UNIVERSITY RELATIONSHIP MODEL**

Minguez Rikardo<sup>1\*</sup>, Barrenetxea Lander<sup>1</sup>, Etxaniz Olatz<sup>1</sup>, Solaberrieta Eneko<sup>1</sup>, Eguiraun Harkaitz<sup>1</sup>, Lizundia Erlantz<sup>1</sup>, Iturrate Mikel<sup>1</sup>  
1) University of the Basque Country UPV/EHU, Ecodesign Design Hub, Department of Graphic Design and Engineering Projects, Torres Quevedo Ingeniariaren Plaza, 1 48013 Bilbao  
\*rikardo.minguez@ehu.eus

**1. CONTEXT**

The Aeronautics Advanced Manufacturing Centre (**Centro de Fabricación Avanzada Aeronáutica –CFAA–** in Spanish) was created in 2015, when a cluster of companies – mainly promoted by the ITP Group– and the **University of the Basque Country (UPV/EHU)** –mainly promoted by the High Performance Manufacturing Research Group at the **Faculty of Engineering of Bilbao–** signed an agreement to create a mutually benefiting centre.

This initiative is also promoted by the Regional Government of Biscay and the Department of Industry of the Basque Government. The centre is located in the **Bizkaia Science and Technology Park in Zamudio** (Biscay) and is part of the University of the Basque Country (UPV/EHU).



**2. OBJECTIVES**

The CFAA seeks to promote the development of expeditiously applicable manufacturing technologies.

This approach aims to advance current levels of technological development associated in the sphere of universities (Manufacturing Readiness Levels 2 to 5) to levels of technological readiness in sufficiently representative environments (MRL levels 6 to 8) which are closer to the production needs of the partner companies and the general industry.

**3. CURRENT ACTIVITIES PERFORMED BY THE CFAA**

- ✓ **New horizontal technology developments** for measuring, machining, tooling, etc. in the field of advanced industrial manufacturing, reducing risks and deadlines of new products into production, and enabling the demonstration of the technical and economic feasibility of investments.
- ✓ Design and validation of **specific aeronautical equipment** with the aim of carrying out machining tests on parts. Validation of the performance of machines and improvements in the manufacturing processes of these parts.
- ✓ **Postgraduate education and PhD theses** towards specialization in the field of advanced manufacturing technologies.
- ✓ **New lines of R&D in the field of advanced manufacturing technologies** in collaboration with companies and sectors, which contributes to the development of projects for the European Horizon 2020 research and innovation programme.



**4. MACHINES AND TECHNOLOGIES**

- ✓ High-performance machining processes, incorporating multi-axis machining, multitasking, precision and high speed machining.
- ✓ Non-conventional processes, such as EDM and Laser mechanisms.
- ✓ Metal additive manufacturing.
- ✓ Special robotized welding processes.
- ✓ Inspection and measurement.
- ✓ Grinding and finishing processes.
- ✓ Virtual manufacturing.
- ✓ Integration of the information (industry 4.0 initiative)

**5. SCOPE OF OUR RESEARCH: DIGITIZATION AND INSPECTION**

The CFAA has a digital radiography station where the researchers from the **Product Design Laboratory (PDL)** work on **3D digitizations and inspections** in components that have undergone welding, micro-milling or additive manufacturing among others, as well as on the detection of possible defects associated with each manufacturing processes.

The CFAA incorporates a **computerized tomography (CT) machine** (GE Seifert X|CUBE Compact 225). This station has an inspection volume of 600 x 900 mm and maximum workpiece weight of 100 kg with a power of 160 KV.

