

# CFAA

Fabrikazio Aeronautiko Aurreratuko Zentroa  
Centro de Fabricación Avanzada Aeronáutica

*Aeronautics Advanced Manufacturing Center*

## ANNUAL REPORT 2020





# 01 ABOUT US

## The Aeronautics Advanced Manufacturing Center, a new Company-University relationship model

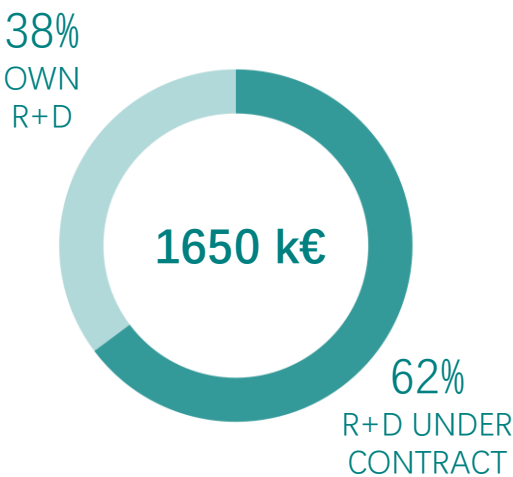
The Aeronautics Advanced Manufacturing Center (CFAA) was created as a new model of relationship between different research levels of advanced manufacturing technologies and machines. This center was promoted and funded by the Department of Economy Development and Infrastructure of the Basque Government and the Provincial Council of Bizkaia with the help of the Technological and Scientific Park of Bizkaia.

This Center is envisioned as a join research center of the University of the Basque Country (UPV/EHU) and a partnership of companies. The main aim is to work and develop 'Manufacturing Readiness Levels' 6-7 projects, in which validation tests in representative environments are required.

New manufacturing processes, machine tools, additive manufacturing, inspection, digital technologies on 4.0 new ideas, and advanced training of all technical levels from vocational training to PhD levels are direct results.

# 02 CFAA FIGURES (2020)

Total budget [k€]:	1650
Funds coming from companies [k€]:	1020
Industrial partners:	83
Number of projects performed:	111
Number of papers published (JCR):	31
Number of researchers / technicians at CFAA:	26
Number of PhD students (Doctorate):	8
Number of MSc students (Master level):	7
Total people visiting CFAA (2020)	65





## 03 PEOPLE

<b>Total “souls on board” (PhD):</b>	<b>53 (17)</b>
Direction (PhD)	2 (2)
CFAA Project Coordinators (PhD):	7 (4)
Researchers (PhD)	8 (2)
Professor, Ass. prof. and Lecturers (PhD):	9 (9)
PhD researchers:	8
MSc students:	7
Administrative:	1
Associate degrees in Dual Program:	6
Undergraduate students:	3
Visiting and academic collaborators:	2



# 03 PEOPLE

some of us...



**Norberto López de Lacalle**  
General Director  
*Machining Processes*



**Aitzol Lamikiz**  
Deputy Director  
*Additive Manufacturing*



**José Antonio Sánchez**  
Head of Dept. of Mech. Eng.  
*Precision Processes*



**Asier Fernández**  
Project Director  
*Manuf. Technologies*



**Izaro Ayesta**  
Project Director  
*Non-convent. Machining*



**Adrián Rodríguez**  
Project Director  
*Special Processes*



**Roberto Polvorosa**  
Project Coordinator  
*Machining Processes*



**Octavio Pereira**  
Project Coordinator  
*Machining Processes*



**Silvia Martínez**  
Project Coordinator  
*Additive Manufacturing*



**Iker Cerrillo**  
Project Coordinator  
*Welding Technologies*



**Diego García**  
Researcher  
*Machining Processes*



**Jon Ander Ealo**  
Researcher  
*Machining Processes*



**Jon Ander Iturrioz**  
Researcher  
*Non-convent. machining*



**Sara Sendino**  
Researcher  
*Additive Manufacturing*



**Jun Wang**  
Researcher  
*Non-convent. machining*



**Leonardo Sastoque**  
Researcher  
*Digital manufacturing*



**Mikel Gutierrez**  
Researcher  
*Smart Metrology*



**Ibon Holgado**  
Researcher  
*Additive Manufacturing*



**Aitor Irazabal**  
Researcher  
*Welding Technologies*



**Francisco J. Amigo**  
Researcher  
*Machining Processes*



**Felipe Marín**  
Researcher  
*Machining Processes*



**Ander del Olmo**  
Researcher  
*Broaching & Machining*



**Aner Jimeno**  
Researcher  
*Additive Manufacturing*



**Gonzalo Mtnez. de Pissón**  
Researcher  
*Machining Processes*



**Montse Martin**  
Administrative



**Soraya Plaza**  
Academic Researcher  
*Smart Metrology*



**Naiara Ortega**  
Academic Researcher  
*Smart Metrology*



**Amaia Calleja**  
Academic Researcher  
*Machining Processes*



**Haizea Gonzalez**  
Researcher  
*Machining Processes*



**Eduardo Martín**  
Dual Program Student



**Sheila Sánchez**  
Dual Program Student



**Daniel Fernandez**  
Dual Program Student



**Endika Miguel**  
Dual Program Student



**Unai Quintela**  
Dual Program Student



**Ander Salvador**  
Dual Program Student



**Jorge Calvo**  
Dual Program Student

# 04 INDUSTRIAL PARTNERS

FULL MEMBERS:	22
ASSOCIATED MEMBERS:	56
COLLABORATORS:	8

Full members: Type A



Full members: Type B



Full members: Type C



Associated Members

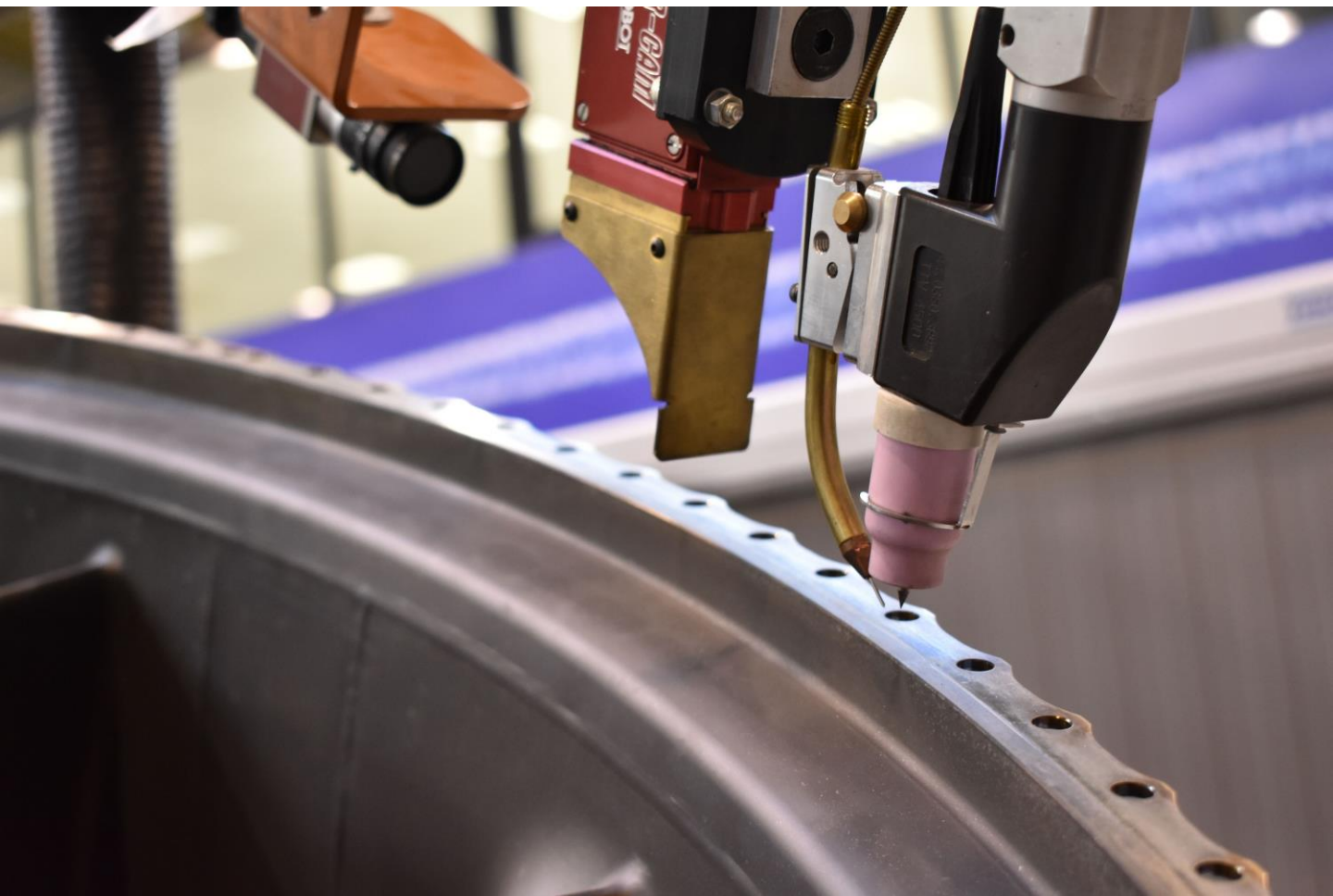


Collaborators



# 05 TECHNOLOGIES

MACHINING	(Multitasking, turning, milling, hole making,...)
CUTTING TOOLS	(Tool life, wear mechanism, edge design, parameters,...)
EDM	(Wire & Die-Sink Electro Discharge Machining)
ADDITIVE	(Laser Powder Bed Fusion, Laser Metal Deposition)
METROLOGY	(Multicontact, non-contact & optical metrology)
INSPECTION	(X-Ray, tomography, Ultrasonic inspection,...)
WELDING	(TIG, MIG, Plasma, Spot and Laser Welding)
FINISHING	(Robotic cell and polishing lines)
BROACHING	(Broaching, tool design and process technology)
DIGITALIZATION	(Machine learning, Industry 4.0, Digital twins,...)
GREEN MANUF	(Advanced lubri-coolant technologies, LCA, ..)





# 06 EQUIPMENT



GMTK  
GEMINIS VL2.4



DANOBAT  
TV-1500



IBARMIA  
THR16 Multiprocess



HERMLE  
C52U MT



MAZAK  
Integrex i-200



RENISHAW  
AM400



RENISHAW  
AM500

Coming Soon!



GETTING  
KUME Dbr PE203



ONA NX7



ONA AV35



Ekin A 218  
New acquisition 2020!



GE  
X/CUBE compact 225



KUKA  
KRC 16 HW



TRUMPF  
TruLaser Cell 3000



MITUTOYO  
CRYSTA APEX S 9106



MITUTOYO  
CRYSTA APEX C162012



SOUDAX  
Spot Welding  
New acquisition 2020!



ZOLLER  
smarTcheck 600

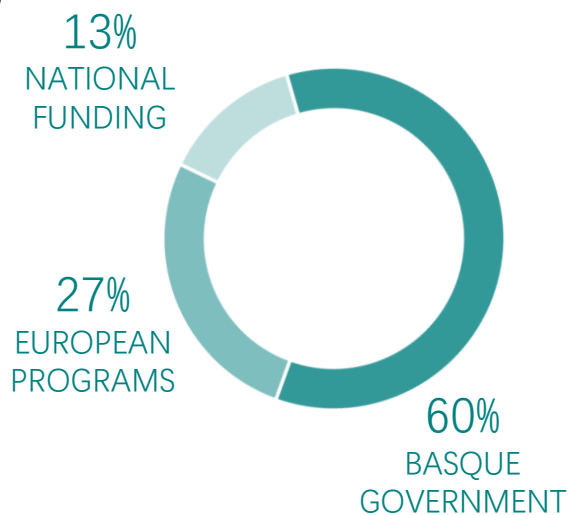


ALICONA  
IF G5



MITUTOYO  
Formtracer SV-C3200





## 07 FRAMEWORK

### EUROPEAN FRAME-PROJECTS

#### [HUC] Development and validation of a powder route for high temperature Astroloy to manufacture

##### Clean Sky 2 (H2020-CS2-CFP07-2017-02)

A new process for production of big turbine casings by new Ni-Co alloys, using hot isostatic pressing technique

**Main results:** A new industrial process with direct impact in use of vertical lathes

**CFAA partners involved:** UPV/EHU, ITP Aero

#### [INTER-Q] Interlinked process, product, & data quality framework for zero defect manufacturing

##### H2020 FoF-11-2020

Digital solutions, intelligent systems, hybrid digital twins and AI-driven optimization tools to assure the quality in smart factories

**Main results:** use of blockchain and radical quality testing techniques

**CFAA partners involved:** Ideko-Danobat, ITP Aero, UPV/EHU,

#### [PARADDISE] A productive, affordable and reliable solution for large scale manufacturing of metallic components by combining laser-based additive and subtractive processes with high efficiency

##### H2020-FoF13 (H2020 – FOF - 2016 - 723440 )

Hybrid Additive and Subtractive manufacturing.

**Main results:** CAX, database and monitoring for hybrid manufacturing.

**CFAA partners involved:** Ibarmia, UPV/EHU

#### [TRANSFRON3D] Trasfrontier 3D printing

##### UE Interreg- POCTEFA

Analysis and comparison of metal additive manufacturing technologies for automotive and aerospace sector.

**Main results:** combination of DED and PBF processes for the manufacturing of complex parts.

**CFAA partners involved:** Mizar Additive, UPV/EHU

#### [ADAM^2] Analysis, Design, And Manufacturing using Microstructures

##### H2020-FETOPEN-2018-2019-2020-01

It is proposed a unified manufacturing pipeline that will focus on all stages involving Analysis, Design, And Manufacturing using Microstructures produced by multi-material 3D printers.

**Main results:** The results of this project will lead to scientific-technological development that impacts CAD and tool manufacturing European markets and are expected to reduce the exploitation of heavy materials between an order of magnitude to two orders, in volume.

**CFAA partners involved:** UPV/EHU

# 07 FRAMEWORK

## NATIONAL FRAME-PROJECTS

### [TASTE] Aerodynamic technologies for next generation of geared turbofans

**Retos colaboración, Ministry of Science and Innovation 2020-2023**

Rigs, compressor and turbine components for next testing programs of high-speed engines

**Main results:** designs and processes for components to be used at CTA and LIFT

**CFAA partners involved:** ITP Aero, UPV/EHU

### [JANO] Joint Action towards Digital Transformation

**CIEN Strategic Programme, CDTI, Ministry of Science and Innovation 2019-2022**

Apply digital transformation for the development of key technologies oriented to put into action the Digital business, the Intelligent factory and Connected product.

**Main results:** Digital twin, Process predictive models, predictive maintenance

**CFAA partners involved:** ITP Aero, Danobat, ONA, Renishaw, Trimek, Nippon Gases

### [NEWMINE] Advanced tractor systems for application in large scale mining

**Retos Colaboración, Ministry of Science and Innovation 2017-2020**

Development of innovative components for big-size machinery. Improved performances and provide a solution to the main problems of the sector.

**Main results:** Novel manufacturing processes for advanced components

**CFAA partners involved:** UPV/EHU

### [ENVIDIA] Virtual environment for design and Manufacturing of aero turbines

**Retos Colaboración, Ministry of Science and Innovation 2017-2020**

Virtual simulation and data processing from manufacturing processes. Digital twins of welding and machining processes.

**Main results:** EBW virtual model

**CFAA partners involved:** ITP Aero, UPV/EHU

### [FANTOMIC] A new family of cutting tools with improved micro-geometry for increased productivity of next generation injection system components

**Centre for the Development of Industrial Technology (CDTI) – Eureka Network 2020**

Develop approaches for proper selection of the best cutting edge radius value for the cutting tools used in machining processes.

**Main results:** Advanced knowledge on cutting edge geometries

**CFAA partners involved:** Wolco, Bosh, Primus, Maxima

### [ITENEO] A global approach to improve the manufacturing of casings for the new aero engines

**Retos colaboración, Ministry of Science and Innovation (MINECO 2019)**

Improving manufacturing technologies used in the next wave of engines for aircrafts (NEO)

**Main results:** High-feed turning and turn-milling modelling, Cryogenic cooling on Ni-Co alloys. Polishing by robotic polishing and final check control by optical means.

**CFAA partners involved:** UPV/EHU

### [ADDENDUMh] Design, analysis and innovative development of machine tool components by additive

**Centre for the Development of Industrial Technology (CDTI) - 2020-2021**

Additive Manufacturing is an option for several components of machine tool, but design and process must be rethought

**Main results:** additive manufacture components for machine tools

**CFAA partners involved:** Danobat, Ibarmia, ONA, UPV/EHU

### [FREE TURN] Research on new processes for superalloys machining based on new turning concepts

**Ceratizit**

Testing new ideas related with free turn new concepts, on superalloys and titanium alloys.

**Main results:** Free turn is a radical new concept, several tests could help to improve its application in aeroengine alloys

**CFAA partners involved:** Ceratizit

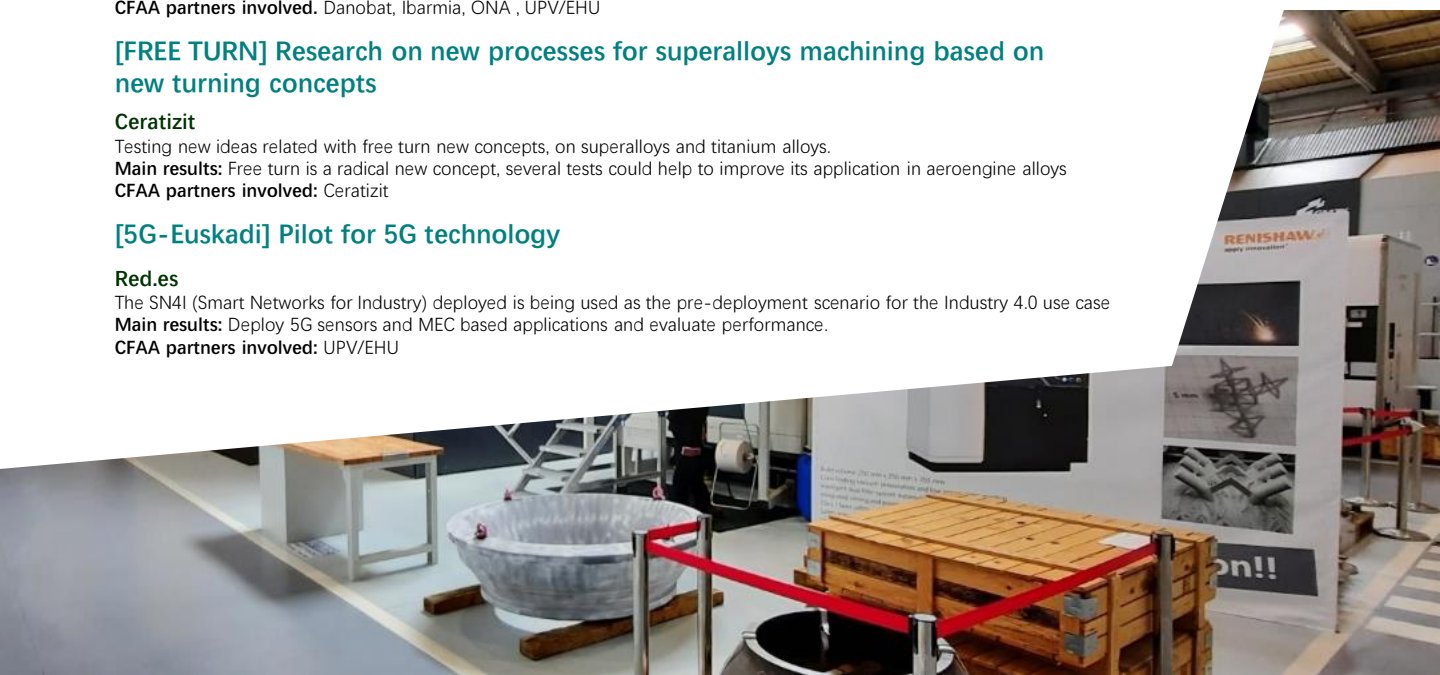
### [5G-Euskadi] Pilot for 5G technology

**Red.es**

The SN4I (Smart Networks for Industry) deployed is being used as the pre-deployment scenario for the Industry 4.0 use case

**Main results:** Deploy 5G sensors and MEC based applications and evaluate performance.

**CFAA partners involved:** UPV/EHU



# 07 FRAMEWORK

## BASQUE FRAME-PROJECTS

### [FAKTORIA] New technologies and processes of Basque Manufacturing supply chain companies for next future high-speed turbines

**HAZITEK strategic 2020-2022 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

Manufacturing technologies for future turbines related with Ultrafan new aircraft engine.

**Main results:** machine and optimised processes for 2030 engine programs

**CFAA partners involved:** ITP Aero, Danobat, EIPC, Fresmak, Sariki, Mesima, M Marina

### [ABIO II] Development of machine and systems for competitive Manufacturing of aeronautical components

**HAZITEK strategic 2020-2022 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

Optimization of machines and production lines to improve OEE in aeronautical production.

**Main results:** software for smart control of production lines.

**CFAA partners involved:** Fagor Aut., GMTK, Ibarria, Sariki

### [TECH4CUT] New monitoring technologies and variable performance for individual optimization of machining processes

**HAZITEK strategic 2020-2021 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

Development of new process-behavior models based on theoretical modeling and real information from previously machined parts

**Main results:** New concept of monitored, flexible and adaptive machining process

**CFAA partners involved:** Savvy Data Systems, Wolco, HRE Hidraulic, Talleres de Gernika.

### [ROTOSEAL] A new approach to the production of segments and seals for rotary machines

**HAZITEK competitive 2019-2020 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

Welding and EDM of seals and other segments for turbines

**Main results:** Optimised processes for several seals and segment of different engine programs

**CFAA partners involved:** WEC

### [COMPLETER] Components for test bench elements of critical system

**HAZITEK competitive 2020-2021 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

A new process for production of complex components for high-speed turbines

**Main results:** A new industrial process with great impact in turbine and compressor component manufacturing

**CFAA partners involved:** Intermaher, Metal Estalki, Kendu, Mufer, Aotech, UPV/EHU

### [BEATRICE] High-performance broaching tools for new transport systems

**HAZITEK competitive 2020-2021 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

Optimization of broaching tools, substrates, geometry, coatings, in high-speed conditions

**Main results:** new broaching tools for several sectors, automotive and aeronautics

**CFAA partners involved:** Ekin

### [APROPOS] Precise finishing of critical of key components for the oil&gas market

**HAZITEK competitive 2020-2021 (Dept. of Economic Development, Sustainability and Environment, Basque Government)**

New tools for general purposes and oil&gas applications

**Main results:** Tested tools, with optimised geometry, substrate and coating.

**CFAA partners involved:** Izar tools, Komtek, Metal Estalki

### [BISKYTEAM] UPV/EHU student club for developing spatial launchers and space technology

**UPV/EHU 2020-2022**

Develop suborbital space launchers that reach an altitude of 100km carrying micro-experiments or cubesats

**Main results:** Three components of ignition and burning systems

**CFAA partners involved:** Bisky team is part of UPV/EHU

### Basque Digital Innovation Hub BDIH - Konexio 2020

**Sprir - Dept. of Economic Development, Sustainability and Environment, Basque Government**

Testing and validation using assets of the Basque digital innovation hub network

**Main results:** Demonstrators of new technologies, additive and digital, technical and economic validation

**CFAA partners involved:** HRE Hydraulics, Mufer, Laip

### 5G-Factories

**UPV/EHU funds**

5G-Factories is promoting a transdisciplinary Cross-Border Joint Laboratory (LTC) with Bordeaux University.

**Main results:** We target a holistic approach for Industry 4.0 that blends 5G, advanced manufacturing, data governance and RRI.

**CFAA partners involved:** UPV/EHU



# 08 HIGHLIGHTS OF THE YEAR

- JAN** Acquisition of new spot welding equipment (SOUDEX) for the development of novel joining technologies for engine sealing components.
- FEB** CFAA receives ASPROMEC award as finalist on “best equipment” category, by the Association of Professionals for Machining Competitiveness.
- MAR** Acquisition of new broaching bench (EKIN). A full-scale vertical machine for R+D on firtrees/dovetails manufacturing.
- APR** CFAA teaches the 1st intercontinental on-line course on Advanced Manufacturing.
- MAY** Develop of an advanced lubri-coolant system (BECOLD): a clear example of knowledge transfer from Basque R+D to industrial producto.
- JUN** Acknowledgment STEAM Euskadi to advance teaching practices.
- JUL** Implementing a new 5G network operating at CFAA as the pre-deployment scenario for the Industry 4.0 use case.
- AUG** Agreement signature with Biskyteam rocket group: prototipe injection system components were manufactured.
- SEP** Acceptance as CFAA partners of new industrial entities (partner C & D).
- OCT** Best Reviewer award of JMPT Q1 journal (Prof. López de Lacalle).
- NOV** Acceptance of 3 BDIH-KONEXIO projects to use Basque Digital Hub Equipments at CFAA.
- DIC** Second demonstrator of Astroloy turbine case was manufactured and delivered to ITP Aero for the Ultrafan® engine development programme.





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