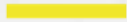




MEMBER OF
BASQUE RESEARCH
& TECHNOLOGY ALLIANCE



Tecnologías Aceleradoras para la Competitividad Aeroespacial

Hegan - Basque Aerospace Cluster

15 Octubre

09:00h - 13:45h

Sala de Exposiciones del Parque Tecnológico
de Miñano

Ion Martinez de Apellaniz

Bus. Dev. Manager – Advanced Manufacturing

imartinezag@ceit.es

Índice:

- Introducción Ceit
- Capacidades Cervera:
 1. Fabricación aditiva
 2. Tecnologías de Superficies
 3. Robótica en Fabricación Inteligente
 4. Movilidad Aérea Autónoma

ceit

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Ceit en cifras



+280

PERSONAS
EN
PLANTILLA

+350 PhDs

+400 Investigadores

TRANSFERIDOS A LA
INDUSTRIA



+100

Proyectos europeos

Actividad científica:

+1300 publicaciones científicas indexadas

+2000 publicaciones a Congresos
Internacionales

Spin-offs

+300 Puestos de trabajo creados

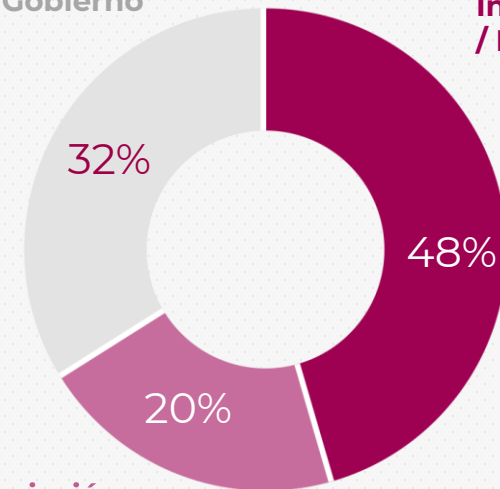
+200 Millones de euros de ingresos

PRESUPUESTO 2024

€ **25,5 Millones**

Fuentes de financiación y tipo de investigación

Financiación
Pública Competitiva
(Europa, Gobierno
Central, Gobierno
Vasco)*



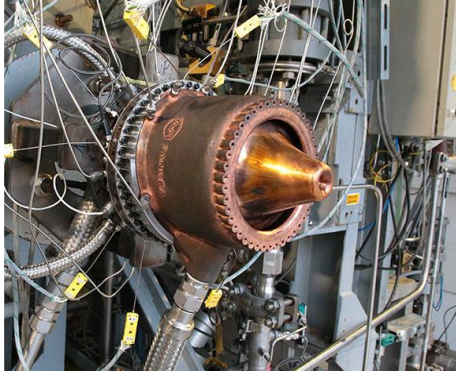
Financiación
Basal
Gobierno Vasco

Industria
/ Privada

1- Additive Manufacturing

Aerospace projects

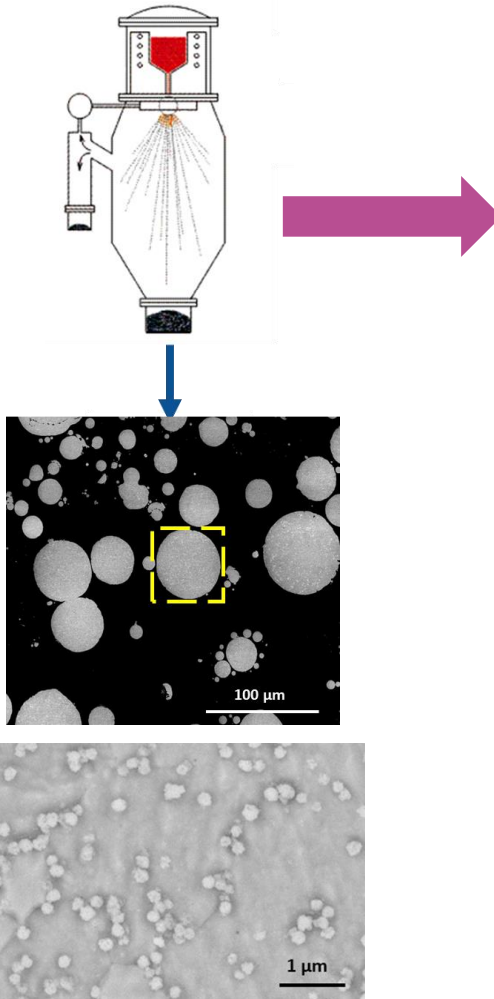
Gas atomization



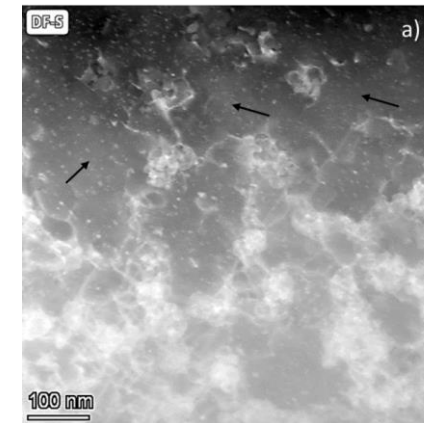
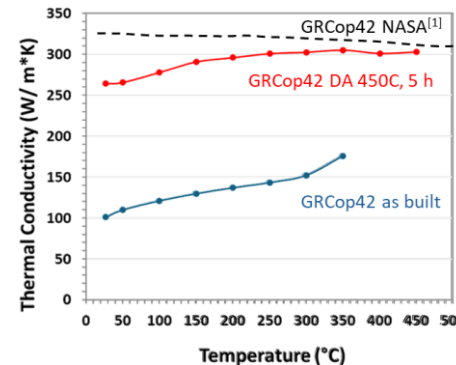
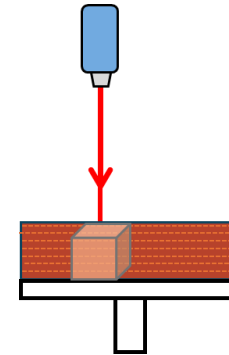
GRCop-42 MethaLox aerospike, PBF-LB (Pangea)

Cu-4Cr-2Nb (at.%) gas atomized powder.

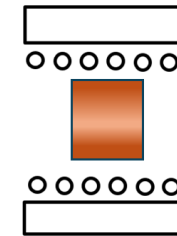
- Composition within specifications
- Fine and homogenous distribución of alloying elements



Additive manufacturing (PBF-LB)



Post-build HTs



• Porosity below 0,3% in the as-built condition.
• Further reduction by HIP

- Combination of excellent conductivity and Hardness through addequate selection of post-build heat treatments
- Ultrathin nanometric Cr₂Nb precipitates

1- Additive Manufacturing

Aerospace projects

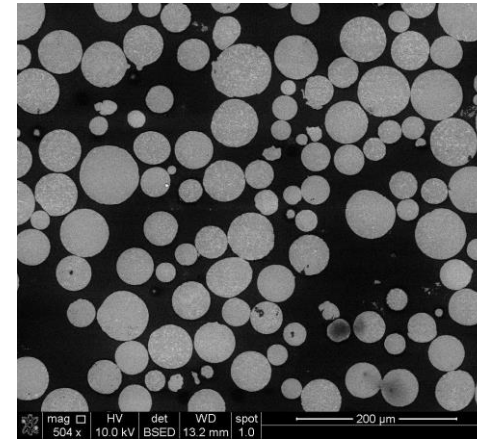
- RIME bracket (Spacecraft component)



Scalmalloy®



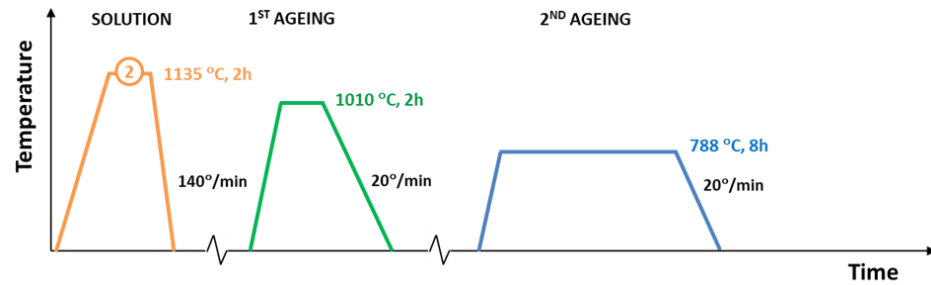
Scancromal®



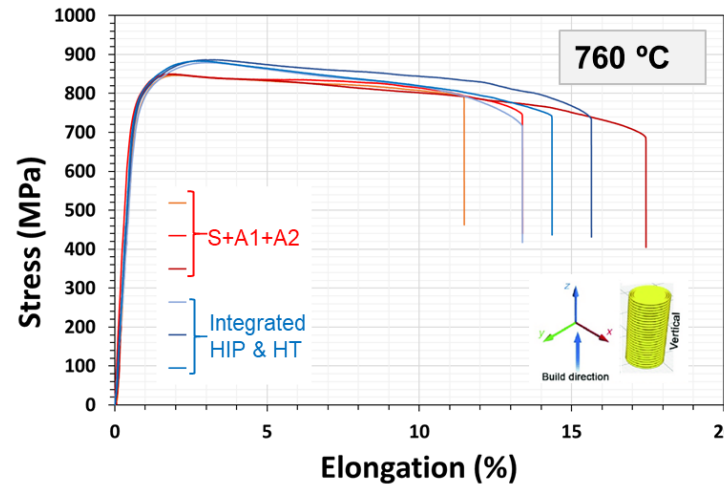
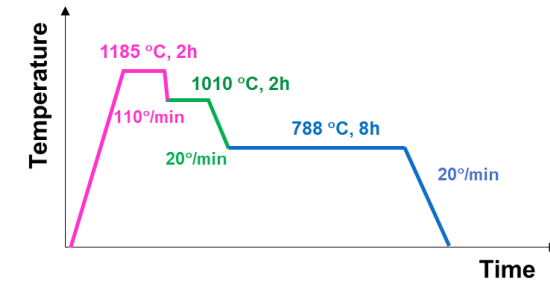
1- Additive Manufacturing

Integration of HIP and post-build heat treatments of AM components for highly demanding applications

Standard: Solution annealing & ageing



Integrated into a unique HIP cycle



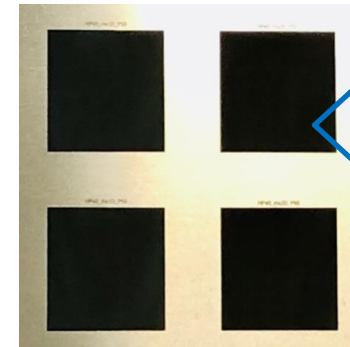
- ▶ Integrated HIP improves mechanical strength and reliability of PBF-LB Haynes® 282

2- Surface Technologies

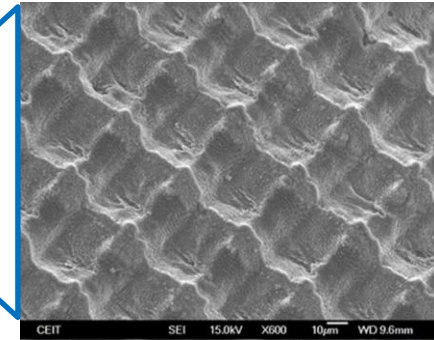
Laser Precision Manufacturing

Broadband omnidirectional antireflective surfaces

- Combination of micro-nanostructures in Al and Steel surfaces with:
 - Low IR-visible reflectivity (< 12%), High emissivity (> 89%), High absorptivity (> 92%) in Al
 - Industrial applications: Aerospace/aeronautic, IR Detectors, Solar panels



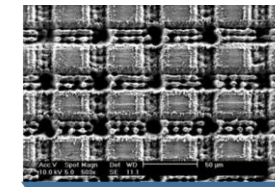
Texturized Al surfaces with low reflectivity



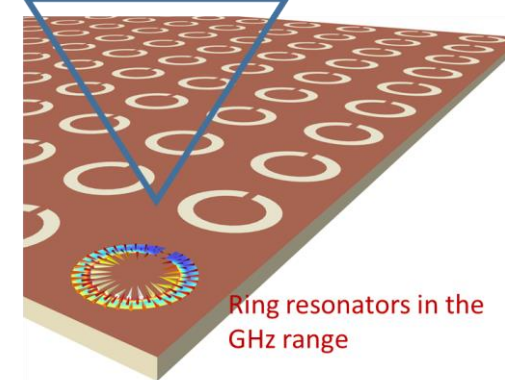
Pyramidal microstructure

Femtosecond laser stealth structures based on metamaterials

- 1.- Antireflective hierarchical micro/nanostructures in the IR range
 - Combining laser microstructures and LIPSS nanostructures
- 2.- Ring resonators in the GHz/THz range
 - Split/Closed ring resonators with tailored dimensions
 - Ultrabroadband absorbers using multiple ring resonators and/or lumped resistors
- 3.- Compatible stealth in radar and infrared bands
 - Combining ring resonators and hierarchical micro/nano structures
 - Design and simulation using standard FDTD method



AR hierarchical structures in the IR range



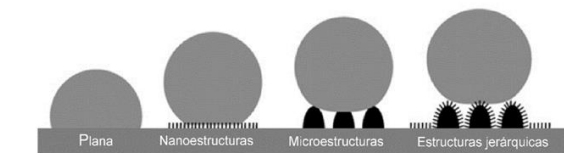
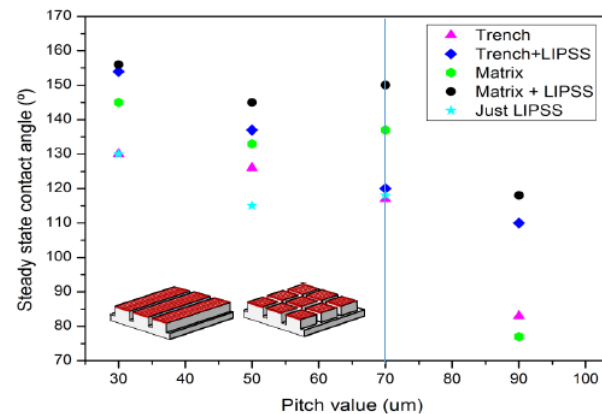
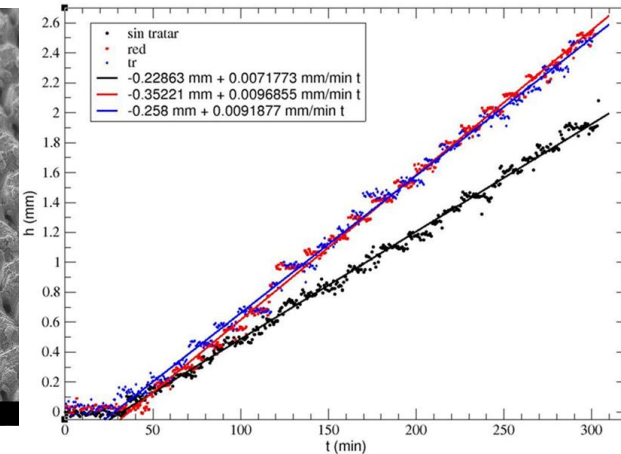
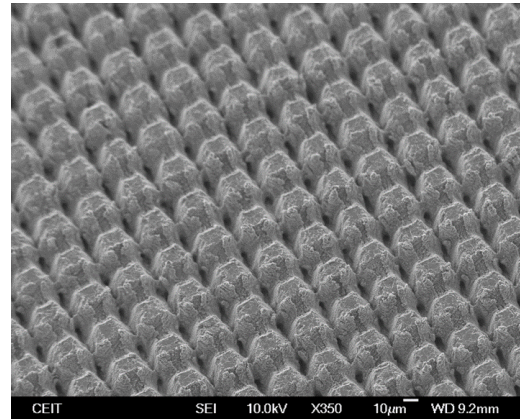
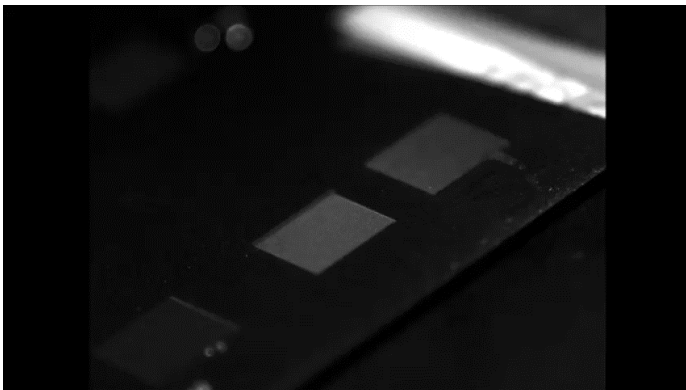
Ring resonators in the GHz range

2- Surface Technologies

Superhydrophobic metallic surfaces with hierarchical structure

Combined micro/nanostructures to produce extreme water-repellent metallic surfaces:

- Contact angle up to 160° (stainless steel)
- Increase of 40% in water condensation
- Industrial applications:
 - Heat exchangers
 - Anti-fouling surfaces
 - Self cleaning surfaces
 - Anti-icing surfaces



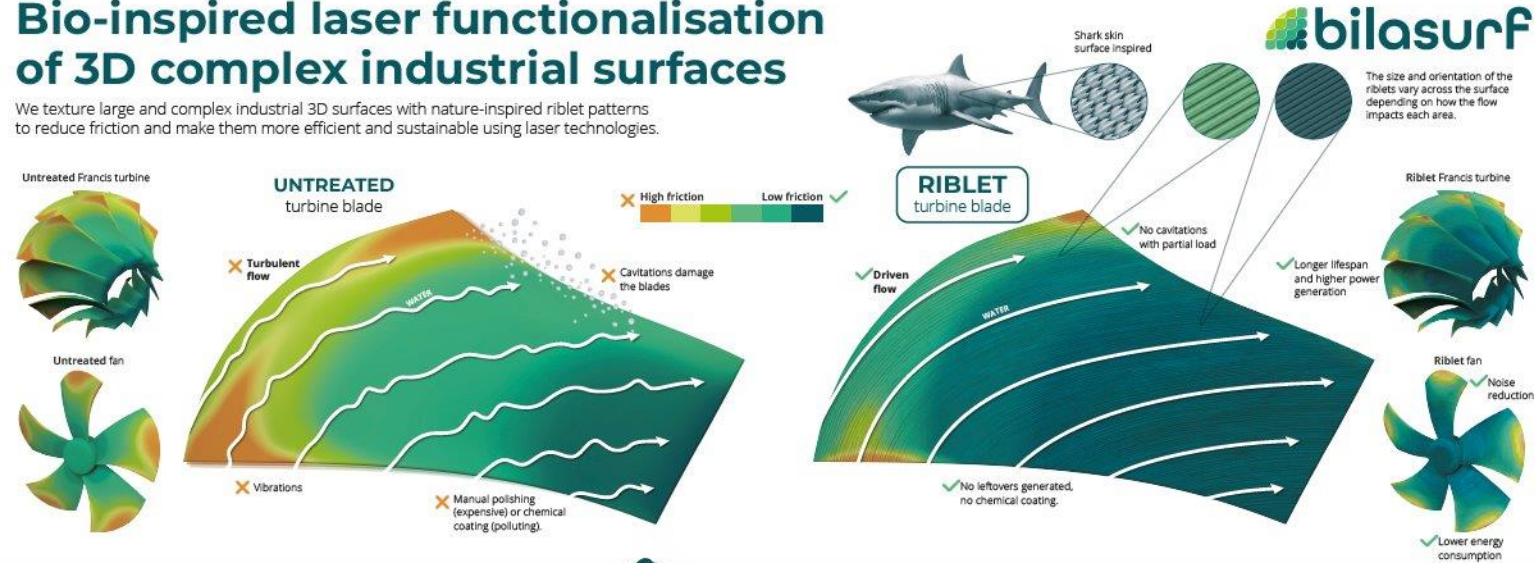
Dependence of the contact angle with the hierarchical structure

2- Surface Technologies

Laser Precision Manufacturing

Bio-inspired laser functionalisation of 3D complex industrial surfaces

We texture large and complex industrial 3D surfaces with nature-inspired riblet patterns to reduce friction and make them more efficient and sustainable using laser technologies.



Surface texturization

1 Riblets design
A Computational Fluid Dynamics (CFD) baseline simulation is performed taking into account the original shape and roughness of the part and riblets are designed and optimized by a specialized software.

2 Texturing modules
Advanced optical components enable both single-beam (DLW) and interference-based (DLIP) surface processing, combining robust positioning tolerance with high-speed, high-precision texturing.

3 Monitoring modules
Acoustic modules rapidly localise the XYZ position at the laser-workpiece interface, enabling adaptive autofocus for stable, defect-free processing.

4 Positioning module
A six-axis robot arm moves the piece so that the focal zone remains perpendicular to the surface.

Allows working with large pieces.

Funded by the European Union
 info@graphic-fundamentum.com

Applications

Two laser techniques to increase its flexibility:

Direct Laser Interference Patterning (DLIP)

Two laser beams overlap to generate an interference pattern that creates the riblet structure.

Advantages:

- Faster application
- Easier to focus

Direct Laser Writing (DLW)

One laser beam creates the riblets as if writing with a drill bit.

Advantages:

- Wider riblet period range
- Greater flexibility in patterns

Applications:

- Reduction of the environmental footprint and CO2 emissions
- Automated, flexible, replicable and competitive system

A guide will be generated to manufacture functionalized rotating parts not covered by the current standard, and to define the scaling rules.

A dedicated business plan will be developed to target additional industrial sectors in which this technology can be applied.

3- SIMFAL: Assembly Planning & Simulation of an Aircraft Final Assembly Line

Providing a simulation environment based on virtual reality and augmented Reality for the automatized assembly of linings and hatracks

Visualization by Augmented Reality

Automated Cabin & Cargo Lining and Hatrack Assembly

Human Robot Cooperation

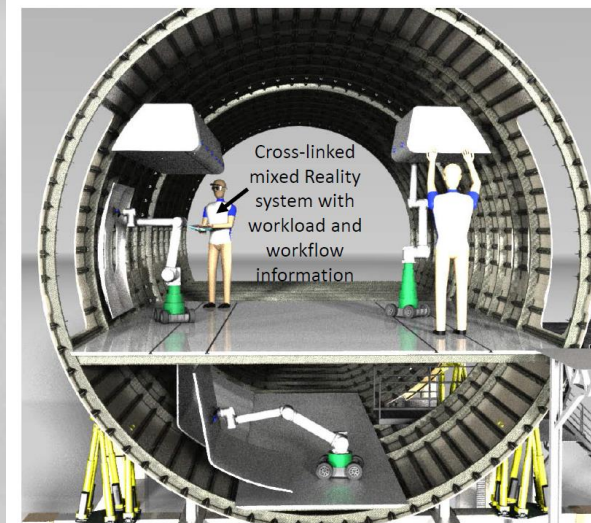
Automated guided Vehicles

Fraunhofer IFAM

AIRBUS

Assembly Planning by Virtual Reality:

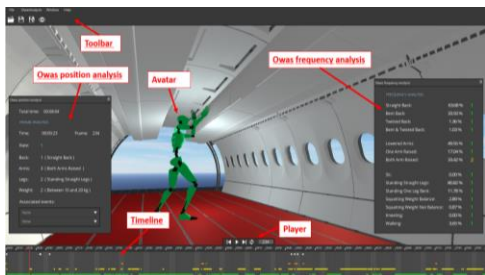
- Work cycles
- Resources
- Logistics
- Human Robot Collaboration



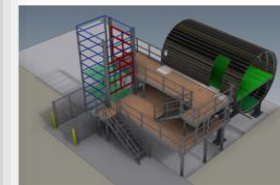
3- SIMFAL: Assembly Planning & Simulation of an Aircraft Final Assembly Line

Flexible and Interactive Virtual Simulator

- A very flexible VR environment to simulate different scenarios (even processes)
- Task manager and agents system to monitor, interpretate and evaluate tasks
- Simulation of “full-automated” and “human-robot collaborative” scenarios
- Motion capture system to acquire and evaluation of ergonomics
- Robust platform for “try-evaluate-decide” in terms of process decisions
- SIMFAL use case: assembly of interior components in cabin and cargo



IFAM demonstrator fuselage



CALITO parts

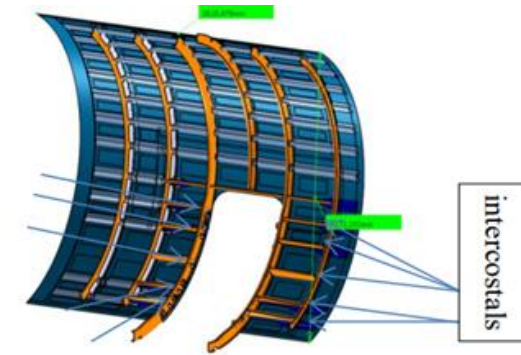
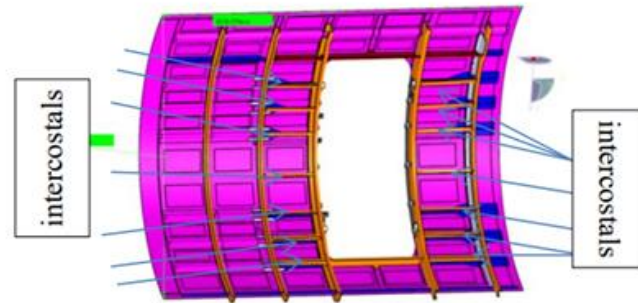


EURECA Mechatronic systems



3- Robotics in Intelligent Manufacturing

ASSASSINN: Intercostal Past Assembly Assistance System



Automatic sealant application:

1) Intercostal part recognition.

Area scanner: Using Phoxi 3D to scan the piece.



2) Automatic Sealant Deposition.

The robotic arm deposits the sealant on the part, efficiently covering the surface



3) Automatic quality inspection

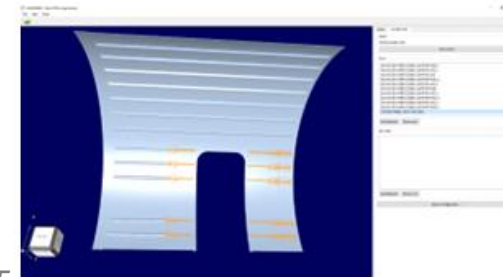
Linear scanner + Robot quality inspection.



This work needs to be redone.

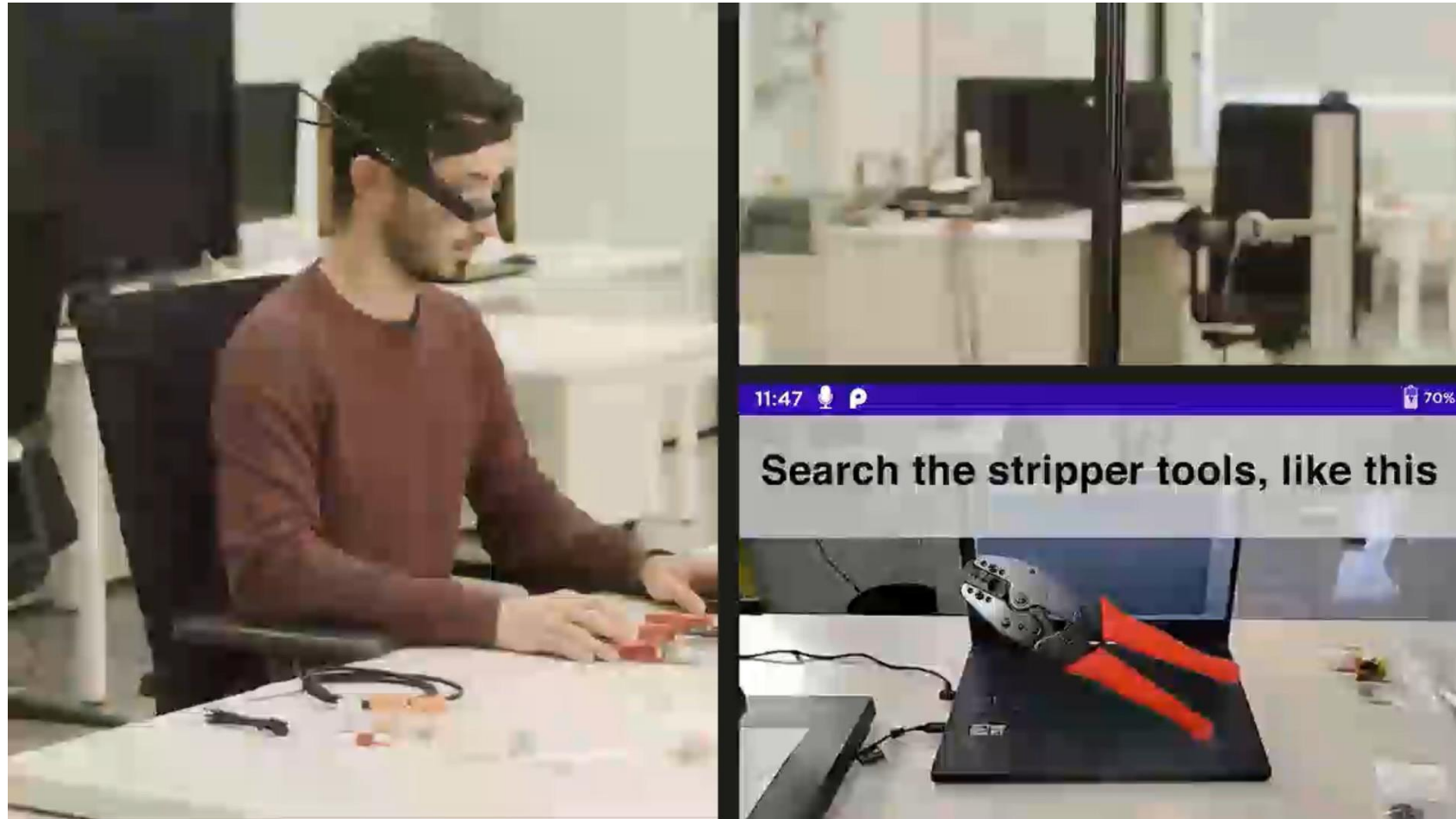
Mixed Reality Assembly Assistance Application:

The operator dresses the mixed reality glass and he runs the "mixed reality installation app". The application shows to the operator, the holograms of the parts to install and related work assembly instructions.



3- Robotics in Intelligent Manufacturing

ASSASSIN: Wire Assembly Assistance System



4- Tecnologías de posicionamiento en interiores

Sistemas de localización en tiempo real

► Sistema de posicionamiento para drones en tanques metálicos

- Nuevo sistema de posicionamiento basado en el sistema Ceit-LocEst
 - Medidas en entorno muy metálico
 - Resultados preliminares
 - Configuración A (usual)
 - Configuración B (Ceit- primera propuesta)

ALERION

Configuración	μ_p (m)	σ_p (m)	$RMSE_p$ (m)
Configuración A	1.76	1.54	2.33
Configuración B – Algoritmo 1	0.52	0.44	0.67
Configuración B – Algoritmo 2	0.30	0.12	0.32



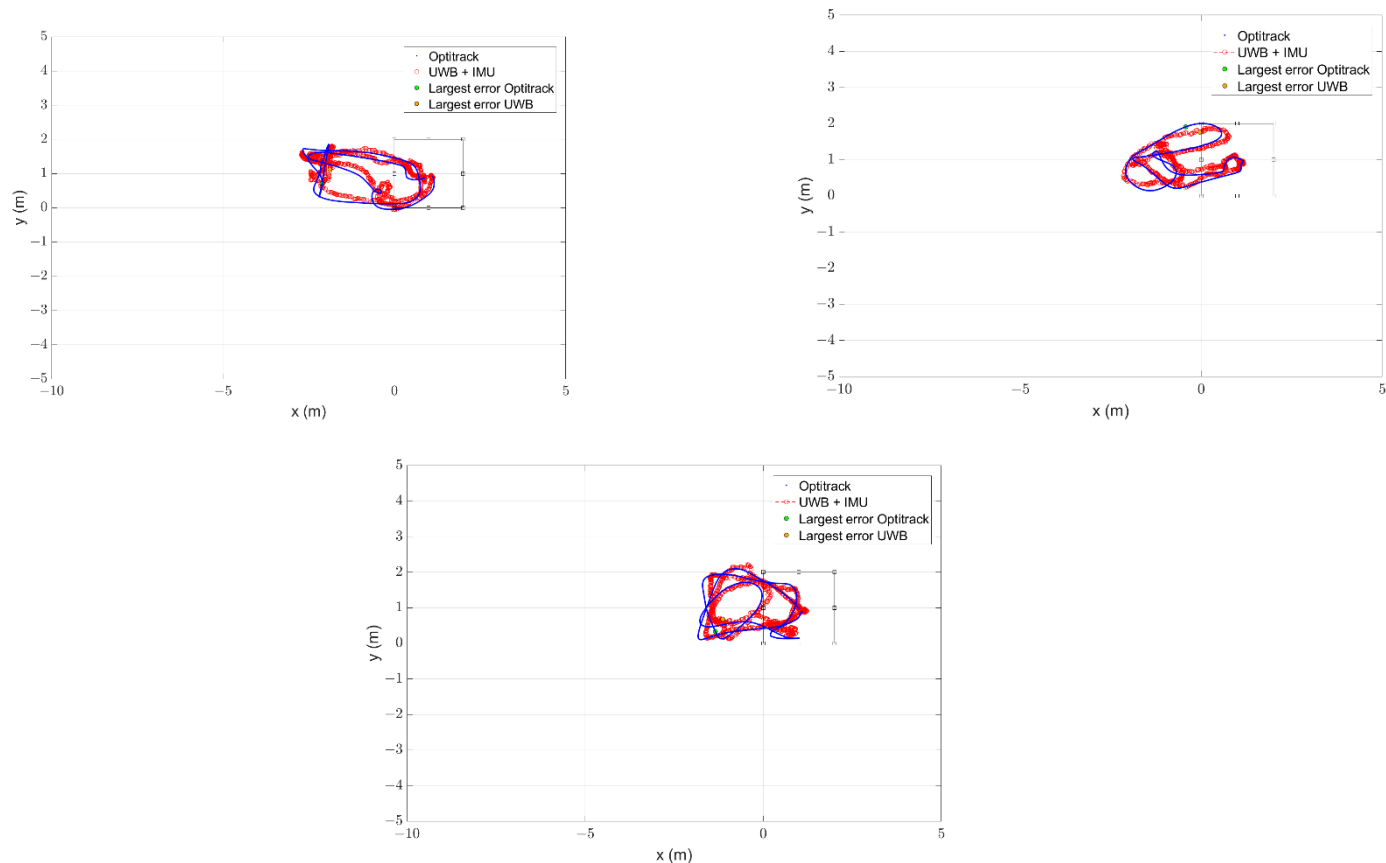
4- Tecnologías de posicionamiento en interiores

Sistemas de localización en tiempo real

► Ayuda al aterrizaje de drones

- Nuevo sistema de posicionamiento basado en el sistema Ceit-LocEst

— Resultados vuelos con dron:



ALERION



4- Tecnologías de posicionamiento en interiores/exteriores

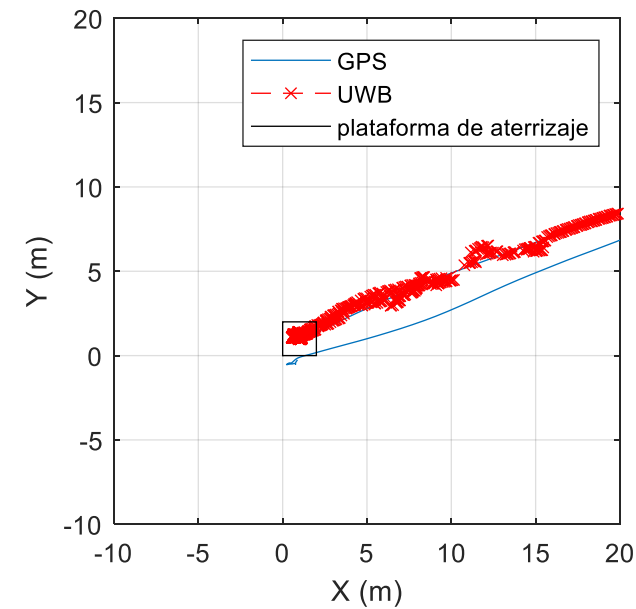
Sistemas de localización en tiempo real

► Sistema de posicionamiento para drones

- Nuevo sistema de posicionamiento basado en el sistema Ceit-LocEst
 - Resultados vuelos con dron en entorno relevante:



ALERION





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Thank you,
muchas gracias,
eskerrik asko

www.ceit.es