Defence-related Research Action - DEFRA

ACRONYM: ANDORRA

Title: AdvaNceD cOmposite for smaRt pRotective Armour

Duration of the project: 1/03/2024 – 28/02/2027

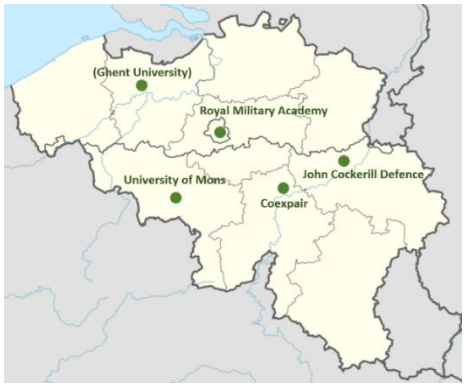
Budget: 1.965.072 €

of which RHID contribution: 1.597.371 €

Key words: composite, hybrid materials, damage detection, energy absorption, smart protection

PROJECT DESCRIPTION

To maintain the Belgian Defence military and technological edge to face current and future security challenges, scientific and technological research in the domain of security and defence is key. For this purpose, the Ministry of Defence seeks to further develop and strengthen the links between Defence, the national research institutions and the industry by gradually increasing its R&T contribution as from 2022, with a view to reaching 2% of the total defence effort in 2030. The setup of the Defence-related Research Action DEFRA fits perfectly in and contributes to the implementation of this strategic vision and general policy for Defence.



In this context, a research project called **ANDORRA** – AdvaNceD cOmposite for smaRt pRotective Armour – is addressing the requirements of "**Materials : protective characteristics**". A well-balanced partnership is involving technology leaders on their industry sector as Coexpair and John Cockerill Defence, major actor in Belgium Defence industry and entities from the academic and scientific research world: Royal Military Academy & University of Mons.

The research will answer the following priorities: improvement of the personal/vehicle protection, weight reduction, improved resistance to environmental conditions (e.g., better properties than

metallic structures vs. temperature, corrosion, acoustic…), identification of damages, reduced need for maintenance operations, increase manufacturing/assembling flexibility. The innovation potential of ANDORRA lays on a multi-layer protective armour approach offering a higher level of ballistic protection as well as a reduction of weight, which both allows better mobility and sustainability. The ambition is to develop a novel composite structure concept with an embedded damage detection system and associated eXplainable Artificial Intelligence software.

The research will focus on protective elements with the following main characteristics: higher energy absorption level vs. weight compared to the state of the art, embedded novel thin metallic sensors and associated signal and data treatment system, closed mould technology for net shape composite. The project will last 36 months and include 7 Work Packages: WP1 Feasibility study, WP2 Demonstrator & Test Bench Definition, WP3 Modelling & Characterisation, WP4 Demonstration & Exploitation, WP5 Coordination, Project Management & Reporting, WP6 Data Management & WP7 Valorisation, Dissemination, Exploitation of Results.

As major impact for the Belgian Defence, ANDORRA will highlight a highly qualified industrial network – supported by experts from the academic / scientific field – to develop an original and more efficient protective solution. **Key technologies will be located in Belgium**. The large worldwide base of customers from industrial partners in many sectors will ensure a large diffusion of ANDORRA outcomes leading to a strong economical return for Belgian Defence Industry. Modelling and testing will push further the science of academic actors, like the physics that govern the phenomenon of failure mode (e.g., delamination, debonding…) in composite materials and hybrid structures, supporting further technology development and bringing to them the attention of international Defence actors. These analyses consider the context of rapid dynamics and large deformation whose characteristic times are very short. These outcomes will give the Belgian Defence Industry a very significant competitive advantage. The targeted markets are those of Defence: protection of personnel, vehicles, and infrastructures. But the results will be extrapolated to other sectors as civilian one, in particular for the protection of sensitive and critical installations and/or to protect people likely to be under threats. The aeronautics sector will also benefit from the project outcomes as the protection of aircraft (e.g., leading edge).

Mastery of analysis and production methodologies will also enable Belgian Defence Industry to be less dependent on the outside world which is becoming more and more uncertain. This would result in a greater capacity for innovation at a constant budget. In addition, the benefits in terms of activity and employment for all relevant parties will be very significant. Indeed, the security (including civil applications) and Defence markets being in full growth in the context of the current change, only companies offering products with high added value will be able to survive.

For **John Cockerill Defence**, the design of innovative protection against punctual impacts and blast is fundamental in trade negotiations. Reducing the mass for a given level of protection is critical to avoid deteriorating the mobility performance of the whole systems. For **Coexpair**, the project will generate original concepts to propose to actual customers/partners, key players in Defence and Aeronautics sectors as General Atomics, Lockheed Martin, Airbus, Sabca, Asco Industries etc. The **Royal Military Academy** will further extend its knowledge in the field of armour systems to composite materials and production techniques currently not considered for ballistic and blast protection. This knowledge will help in further playing its role as main expert in this matter for the Belgian Defence. **University of Mons** will increase its expertise in both data collection/centralization and the development of edge and explainable AI models that can be applied on different data modalities provided from various sensors.

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LINK(S)

Not applicable.