Wallonia'sTechnological and strategic roadmap for the defense sector

June 2024

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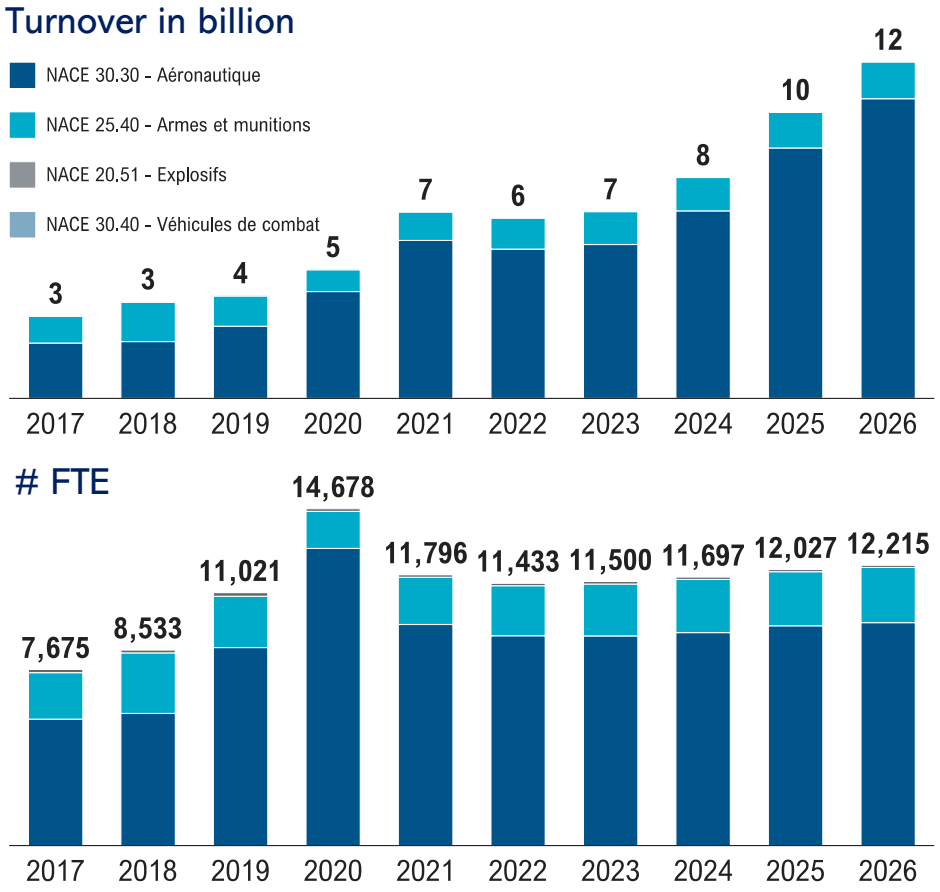
Aerospace cluster of Wallonia

Belgian and Walloon Defense Industry
Overview

The **Belgian defense industry** generates an estimated turnover of around €6 billion (around **€4.5 to €5 billion in Wallonia**) and employs around **12,000 full-time equivalents in Wallonia** (2022).



Source: Roland Berger, IBISworld, Agoria

- Current turnover of **€6-7 billion**, including 4.5 to 5 billion for Wallonia
  - just under **100 companies**
  - **12,000 jobs**, including 9,000 in Wallonia
- Stable arms activity until the outbreak of war in Ukraine and the increase in the defense budgets of NATO member states
- Drop in the number of jobs in aeronautics post-COVID-19 (2021), before stabilizing until 2026 despite the **resumption of sales growth.**
- **Export licenses** have been granted for €2.6 billion in 2020 and €2.7 billion in 2019. These exports will continue in 2021:
  - the European Union and North America (84%)
  - Asia and the Near and Middle East (7%)
  - Central and South America (3.25%)
  - Europe (excluding the EU) and Turkey (2.08%)
  - Africa (1.83%)

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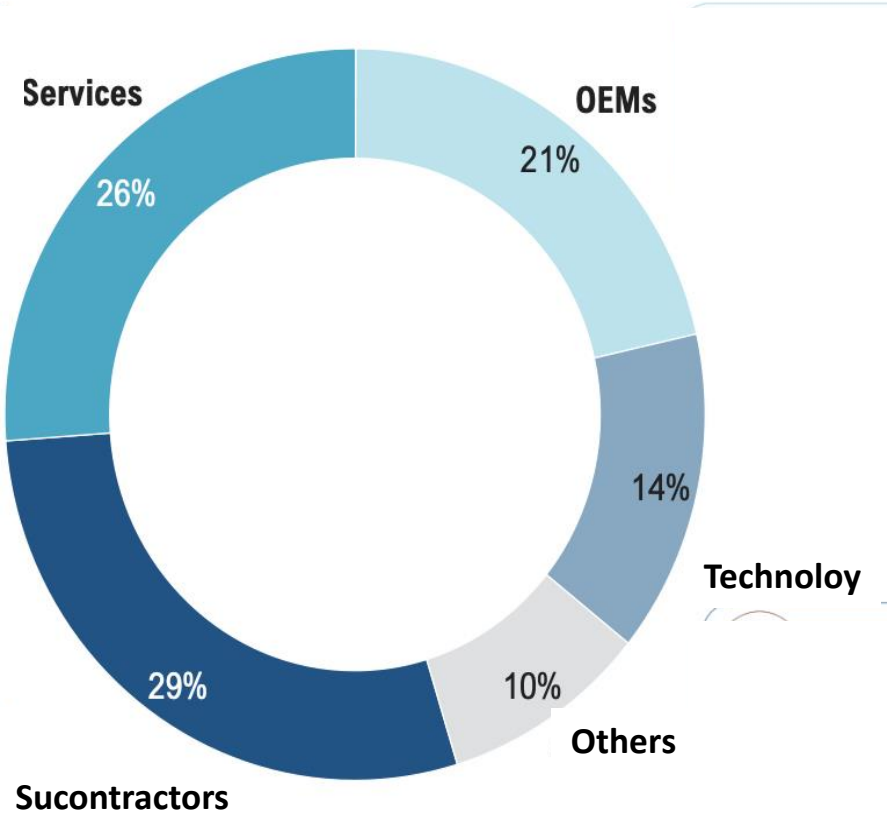
The Walloon industrial landscape is balanced between OEMs, subcontractors and service companies.

Economic landscape in # of companies



Some **40 Walloon companies** active in the defense sector

There are **more than 2 times** as many subcontractors and service companies as there are OEMs
- Component manufacturers (half of them)
- Consultancy or engineering services (a quarter)
- CDMO or MRO (the rest)

A few small technology companies active, for example, in sensors, radar and x-rays, UAVs/UAMs, artificial intelligence and robotic targeting systems.

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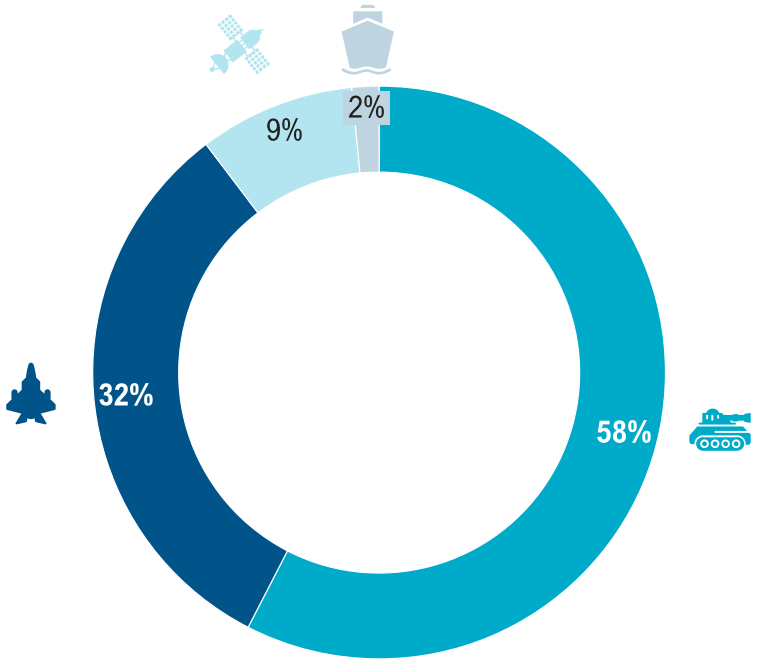
The Walloon defense industry is overwhelmingly geared towards land-based applications, followed by airborne applications.

Applications
as % of # of companies



1) Comptabilisation au prorata pour les sous-traitants servant plusieurs applications

LAND

- **Strong position throughout the chain**
  - OEM's (John Cockerill, FN Herstal)
  - Group of subcontractors
  - CDMO and MRO
  - Technology companies (sensors and radars, robotic targeting systems, x-rays, etc.)
  - Consulting and engineering services
- **Arms and Munitions companies are particularly well represented** (FN Herstal, Mécar, Poudrerie Belge de Clermont)

AIR

- **Strong position**
  - Group of subcontractors
  - Several OEMs (Safran, Sonaca)
  - CDMO and MRO
  - Technology companies (AI, UAV/UAM, and x-ray)
- **Subcontractors serving the Air component are also likely to serve the Land component, but the reverse is not true**

SPACE

- **Expertise in launchers, satellites and optical instruments**
- **Not very present, but development expected in the short term** (development of the value chain, 'New Space' program, Aerospacelab in Charleroi, etc.).

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Defense Technology and Strategic Roadmap 2023

Wallonia's Strategic Technology Priorities

Wallonia's Strategic Technology Priorities
Walloon companies are active on **6+1 technology platforms**

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WG1 - Unmanned Intelligent Autonomous Systems (UIAS)

- Platform/embedded systems integration
- Platform autonomy
- Platform collaboration capability
- Platform endurance
- Platform operation

WG2 - Information Processing/Data management, Communication & Embedded intelligent systems

- Information processing
- Communicating information
- Securing information
- The techniques and technologies needed to integrate the above topics into intelligent embedded products/systems
- Normative constraints specific to the defense and aeronautics sectors

WG3 - Ammunition Systems/Effectors and integration

- Improved effectors and conventional ammunition
- Integration of sensors and effectors on air/land/sea platforms
- Development of new generations of effectors

WG4 - Structures, materials (including energetic) and protection éléments

- Structures in advanced composite materials
- Ballistic protection
- Environmental resistance
- Additive manufacturing

WG5 - Life cycle support & services

- Technologies for simulating maintainability, operation and maintenance activities
- Embedded technologies for data acquisition and use in the context of maintenance
- Technologies and methodologies for predictive maintenance of components, modules and systems
- Technologies and processes for repairing components, modules and systems
- Technical management of obsolescence and upgrades

WG6 - Advanced Air Vehicles, Control Systems and Propulsion

- 6th generation fighter aircraft

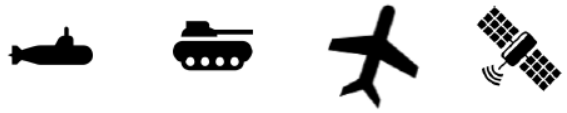
+ WG7
Space4Defense

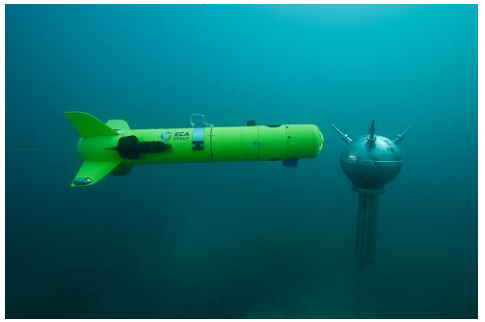
WG1 – Unmanned Intelligent Autonomous Systems (UIAS)

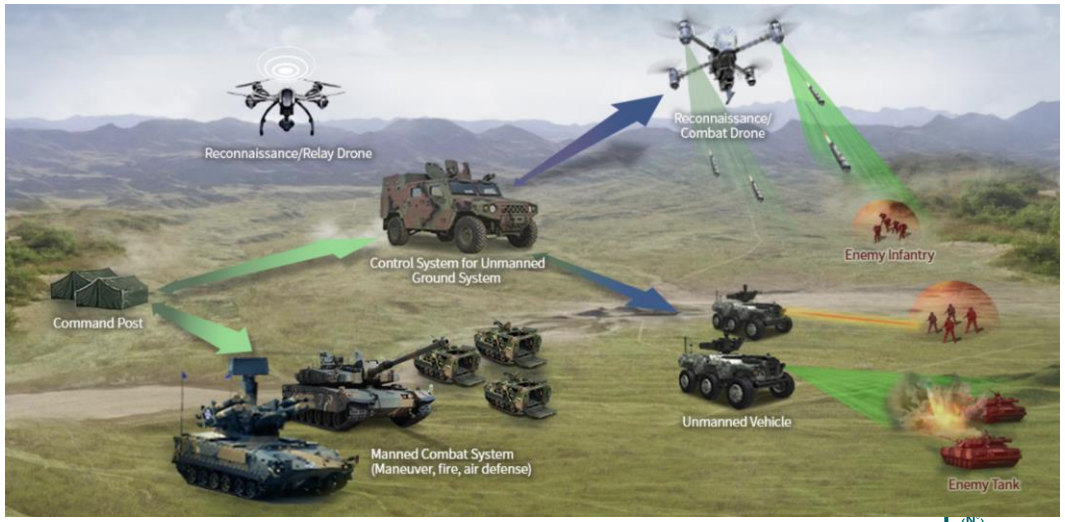
1. Scope

- **Autonomous System**
  - Air, naval and land vehicles
  - Human control adapted to type of activities
  - Platform collaboration capability
  - Long-endurance missions
  - Mission-specific embedded equipment integration

- **Means required for**
  - Deployment in operations theaters
  - Support systems







WG1 – Unmanned Intelligent Autonomous Systems (UIAS)

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2. Priorities

- **Protecting systems against threats**
  - Ballistic protection
  - Electromagnetic and cyber resilience
  - Stealth and signature reduction
- **Capabilities, functions and features**
  - Teaming - swarming
  - Threat detection and interception
  - Evacuation and assistance capabilities
  - Complex environments & Intelligence
- **Integrated modules**
  - Inter, intra and operator communications
  - HM Interface
  - Energy management
  - Navigation in complex environments
- **Support, training, certification and testing**
- **Additional opportunities**
  - Droning, command center integration
  - Regulations and ethics challenges

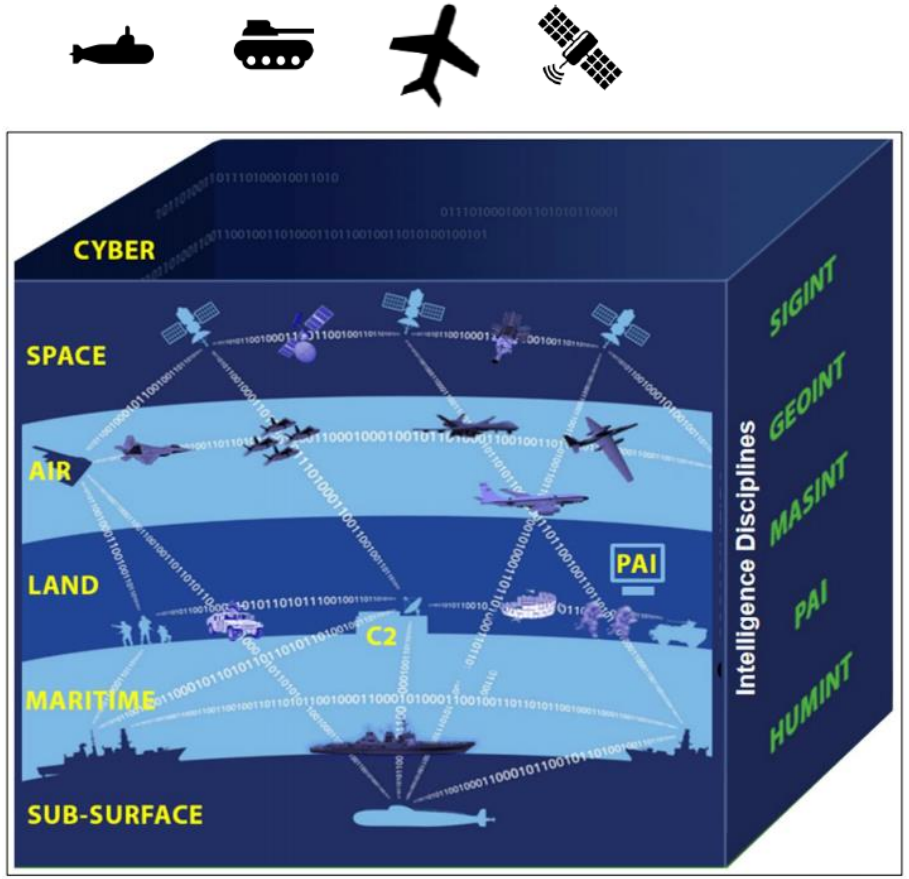
3. Partners (*)

ECA GROUP
ALX SYSTEMS
bats
MEBF MECA
SABCA
DYNALI
FN HERSTAL
John Cockerill
THALES
CENTUM
DENEO

** Sample of key players*

1. Scope

- **Information**
  - Collect, process, transmit information intra and inter-system
  - Security & cyber (not corrupted, stopped or diverted)
  - Increase nber and type of data & reducing the human load
  - Integration in embedded systems for Air, Land and Sea
- **C4ISR**
  - Control, command, Communication, Collaboration, Intelligence, Surveillance and Reconnaissance
- **C8ISR**
  - + Combat systems, Collaboration, Coordination and Code (C8ISR) by manned or unmanned platforms



WG2 – Information Processing/Data management, Communication & Embedded Intelligent Systems

2. Priorities

- **Information processing**
  - Augmented/virtual reality
  - Image & data processing
  - User interfacing
  - AI for decision support, trusted AI
- **Information communication**
  - Communication in hostile environments
  - Robust communications (short & long range)
  - Optimization of throughput/range ratios
- **Information security**
  - cyber threats (secured-by-design)
  - Data encryption techniques
  - Hardware security
- **Integration into products & systems**
  - Electronic components, OS, simulation & modeling
  - Specific sensors & actuators
- **Normative constraints (ASD)**
  - Norms, standards & certification process
  - Qualification test environments & resources

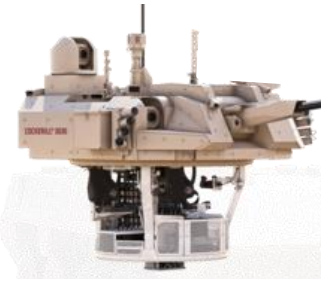
3. Partners (*)

** Sample of key players*

WG3 – Ammunition Systems / Effectors and Integration

1. Scope

- **Effectors**
  - Small arms, riffle & machine guns
  - Airborne pintle & pods
  - Rocket launchers
  - Remote Weapon systems
  - Turrets
- **Ammunitions**
  - Small, medium, large calibers
- **Systems Integration**
  - Land, Air & Naval platforms



WG3 – Ammunition Systems / Effectors and Integration

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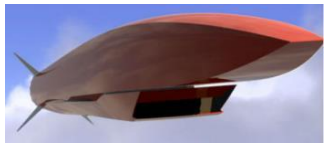
2. Priorities

- **Improved effectors and conventional ammunition**
  - Mass reduction of ammunition and systems
  - Improved effectiveness and reduced collateral damage
  - Integration of sensors and intelligence in ammunition
  - Reduced (illegal) proliferation of weapons and energetic materials
- **Integration of sensors and effectors on air/land/sea platforms**
  - Reduced interference effector & vehicle
  - Improved HMI
  - Integration of weapon systems on UAVs
  - Sensor data fusion, calculations and decision support for the weapon system
- **Development of new generations of effectors**
  - Cargo munitions > non-kinetic charges
  - Hypersonic vectors (> Mach 5)
  - Directed-energy effectors & new propulsion systems



3. Partners (*)

Integration	Effectors	Ammunitions
John Cockerill	FN HERSTAL	THALES
FN HERSTAL	John Cockerill	MECAR
THALES	THALES	FN HERSTAL

EURENCO

MECAR

FN HERSTAL

ALX SYSTEMS

bats

IR&D

CENTUM

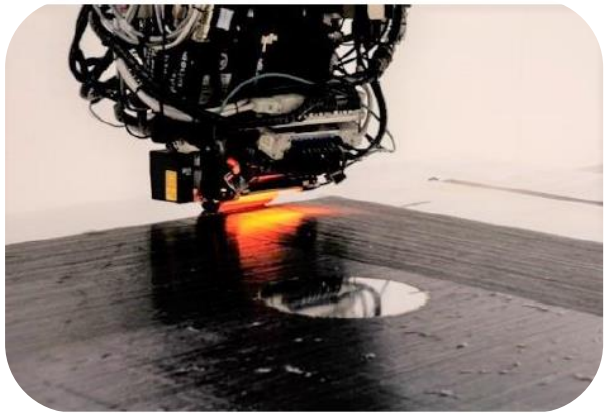
DENEO

** Sample of key players*

WG4 – Structures, materials (including energetic) and protection elements

1. Scope

- **Next Generation Materials and Structures for the Defense sector**
  - Advanced Structural Materials
  - Advanced Manufacturing Processes
  - And associated Numerical Tools for Design & Manufacturing



- **To improve the performance of :**
  - Next Generation Aerial, Land, Marine & Space vehicles
  - Effectors and ammunitions
  - Soldier Equipment

WG4 – Structures, materials (including energetic) and protection elements

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2. Priorities

- **Advanced composite structures**
  - Pertinent Material & Process selection
  - End-to-end development with optimized design
  - Process simulation
- **Balistic protection**
  - Pertinent Material & Process selection
  - Simulation of effects
- **Environmental resistance**
  - Improvement of High Temperature resistance
  - Improvement of Erosion & Corrosion Resistance
- **Additive Manufacturing**
  - Focus on Metallic Materials
  - Follow Process/Equipment evolution
  - Materials & Process qualification

3. Partners (*)

coexpair, FERONYL, FN HERSTAL, ionics, jdc, John Cockerill, MECAR, SABCA, SAFRAN AERO BOOSTERS, Sobelcomp, sonaca, THALES, Cenaero, CRM, MateriaNova MATERIALS R&D CENTRE, VON KARMAN INSTITUTE

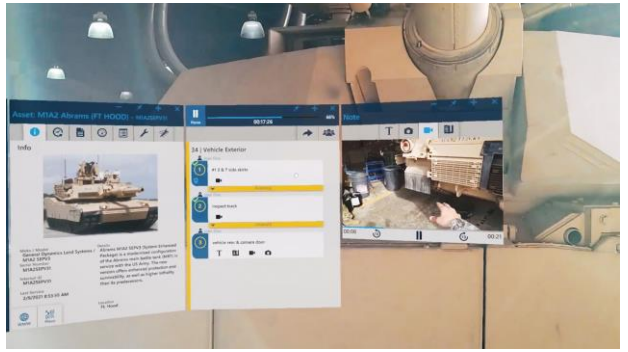
UCL Université catholique de Louvain, ULB, ULg Université de Liège, UMONS Université de Mons, RMA Royal Military Academy, ADDIPARTS, Any-Shape, elotte

** Sample of key players*

WG5 – Life Cycle Support & Services

1. Scope

- **Technologies, products and services**
  - to support the user during entire asset life cycle from acquisition to decommissioning
- **Cross-cutting topics**
  - air, land and sea vehicles, weapons and munitions, soldier equipment, satellites
- **Dual applications**
  - Possible synergies for both military and civilian assets applications
- **Defense Life Cycle specificity**
  - Systems in service for several decades ➔ sustainability of technologies, products and their supply chain



WG5 – Life Cycle Support & Services

2. Priorities

- **Simulation technologies for**
  - maintainability, operation and maintenance activities
- **Embedded technologies for**
  - data acquisition and use in the context of maintenance
- **Predictive maintenance**
  - technologies and methodologies for components, modules and systems failure prediction
- **Repair management**
  - technologies and processes for components, modules and systems repair
- **Life Cycle Engineering**
  - advanced technical management of obsolescence and upgrades
  - AI & digitalization solutions
  - prescriptive analytics

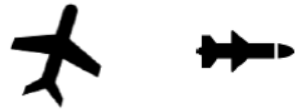
3. Partners (*)

FN HERSTAL, John Cockerill, SAFRAN AERO BOOSTERS, SABCA, sabena ENGINEERING, THALES

** Sample of key players*

WG6 – Advances Air Vehicles, Control Systems And Propulsion

1. Scope



- **6th generation fighters**

- **Drones, especially those working with 6th generation fighters**

- **Hypersonic launchers and interceptors**

Trend & opportunities : Increasing of on-board electrification

EDF: European Defence Fund (R&T)
EDA: European Defence Agency (R&T)
SCAF: Système de Combat Aérien du Futur (France, Germany, Spain)
GCAP: Global Combat Air Program (UK, Italy, Japan)
NGAD : Next Generation Air Dominance

WG6 – Advances Air Vehicles, Control Systems And Propulsion

2. Priorities

- **Propulsion**
  - Variable cycles, Operability, Compactness, Electrification
- **Thermal cooling systems**
  - Compactness, Electrification, Stealth
- **Smart actuators for critical applications**
  - Electrification
- **Electronic control systems and on-board software**
- **Stealth structures**
- **Enhancing resistance to external aggression**
- **Understanding aerodynamics and heat exchange at hypersonic speeds**
- **Thermal protection for hypersonic vehicles**

3. Partners (*)

SABCA, FN HERSTAL, SAFRAN AERO BOOSTERS, sonaca GROUP, THALES

** Sample of key players*

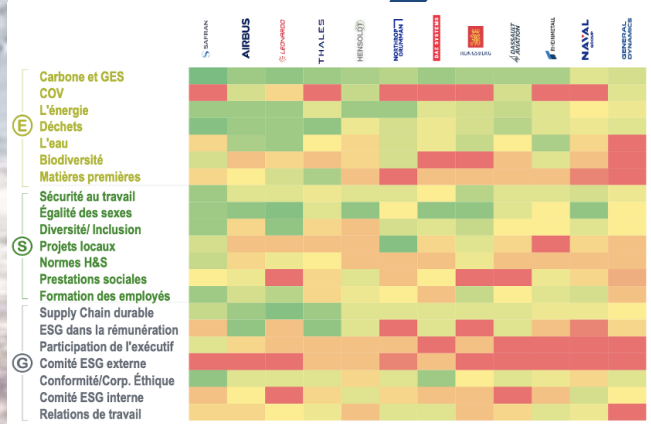
WG7 – Space4Defense

- June 30, 2023: Finalization of the Technological and strategic roadmap “Defense” – the Space4Defense theme has not been addressed
- July 2023 – Adoption of the European space strategy for security and defense.
- 2024 – Decision to complete the roadmap by adding the Space4Defense theme

➢ Establishment of working groups based on NATO themes to map the capabilities of the Walloon ecosystem as well as its ability (competence) to innovate

Wallonia's Transverse Working Topics

7 Strategic transverse working topics



ESG

Talents

Internationalisation

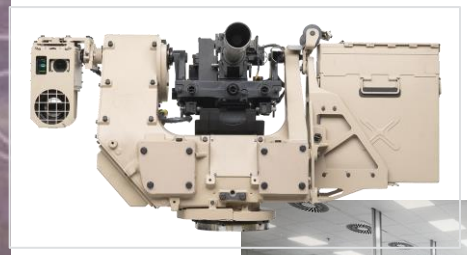
R&D

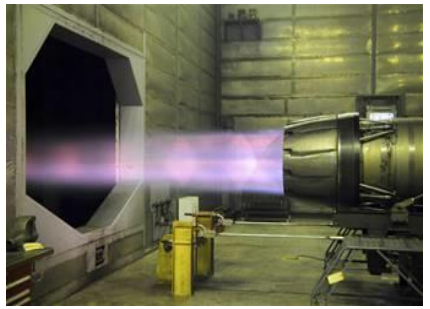
7 Strategic Themes

Sovereignty & Robustness

Diversification

Dual Applications





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