

PROMOTING ENTREPRENEURSHIP IN THE DEFENSE INDUSTRY: THE CETEDEX REGIONAL PROJECT

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Abstract: The changing geopolitical landscape and the rapid advancement of military technologies are creating unprecedented opportunities for innovation in the defense sector. Traditionally dominated by large contractors, this sector is increasingly witnessing the emergence of agile, technology-driven startups capable of introducing disruptive solutions. This article examines the strategic importance of fostering entrepreneurship in the defense industry, with particular attention to the Jaén Technological Center for the Development and Experimentation of Defense (CETEDEX), a significant regional initiative in Spain. CETEDEX, focused on defense drones, autonomous systems, and artificial intelligence, acts as a hub for collaboration and capability development. The study analyzes the key factors driving entrepreneurial activity in this ecosystem, including financing mechanisms, innovation ecosystems, regulatory flexibility, and intellectual property protection. Furthermore, it explores the dual-use potential of technologies from various civil sectors and highlights the fundamental role of startups in driving disruptive innovation, creating strategic alliances, facilitating agile prototyping, boosting regional economic development, and attracting specialized talent. Ultimately, this paper argues that the strategic promotion of entrepreneurship, exemplified by projects such as CETEDEX, is crucial to driving technological advancements and maintaining a competitive advantage in the modern defense landscape.

Keywords: Defense Industry, Entrepreneurship, Innovation Ecosystem, Startups, Dual-Use Technology, Regional Development, CETEDEX.

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1.INTRODUCTION AND CURRENT CONTEXT

1.1 New International Order

- U.S. breaks with precedent (02/2025, votes against a UN resolution condemning Russia's invasion of Ukraine.
- End of the liberal international order: (Imposition of reciprocal tariffs).
- Europe becomes vulnerable: The EU is forced to reassess its strategic autonomy.
- New geopolitical landscape: Characterized by asymmetric bilateral relations, great power competition, and the erosion of multilateral institutions.

1.INTRODUCTION AND CURRENT CONTEXT

1.2. Transformation of military technologies (I)

- **Unmanned systems (UAVs, UGVs, USVs):**
 - Autonomous platforms revolutionize combat (e.g., Bayraktar TB2 in Nagorno-Karabakh).
- **Artificial Intelligence and Machine Learning:**
 - Used for intelligence analysis, predictive maintenance, cybersecurity, and decision-making (e.g., Project Maven, Palantir).
- **Hypersonic and Directed-Energy Weapons:**
 - Missiles at Mach 5+ alter deterrence doctrines; lasers and microwaves offer low-cost, unlimited-shot defenses.

1.INTRODUCTION AND CURRENT CONTEXT.

1.2. Transformation of military technologies (II)

- **Cybersecurity and Quantum Cryptography:**
 - Protection of critical infrastructure; development of post-quantum algorithms and Zero Trust Architecture.
- **Additive Manufacturing and New Materials:**
 - Metal 3D printing in advanced bases; use of graphene and advanced ceramics for armor and structures.
- **Biotechnology and Biosecurity:**
 - Biomedical sensors, rapid vaccine development, and biotech innovations as new layers of defense.

1.INTRODUCTION AND CURRENT CONTEXT.

1.3. Rise of Start-ups in the Defense Sector

- Traditional dominance of large contractors
- Emergence of tech-driven start-ups:
 - Agile, focused on AI, drones, cybersecurity.
 - Foster faster innovation and introduce new business models into defense.

2. THE TECHNOLOGICAL CENTRE FOR DEFENSE DEVELOPMENT AND EXPERIMENTATION OF JAÉN (CETEDEX)

The project has a total planned investment of 222 million euros and is estimated to generate approximately 2,600 direct and indirect jobs in the region

Focuses on three areas:

Drone Defense Systems.

Autonomous and Intelligent Vehicles.

Artificial Intelligence.



2. THE TECHNOLOGICAL CENTRE FOR DEFENSE DEVELOPMENT AND EXPERIMENTATION OF JAÉN (CETEDEx)

CETEDEx collaborates closely with the University of Jaén and other institutions to promote innovation and technological development.

Artificial Intelligence Hub: Creation of a specialized AI center to support CETEDEx's activities.

Open Innovation Lab: Open innovation laboratory to promote collaboration with local companies and entrepreneurs.

Microcredential Programs: Training initiatives aimed at students and professionals to acquire specific skills demanded by the center

3. PROMOTION OF ENTREPRENEURSHIP IN THE CETEDEX DEFENSE ECOSYSTEM

3.1 Funding and public support

Access to finance is a key driver for innovation.

Programs such as SBIR/STTR (USA) and the European Defense Fund (EU) fund dual-use technology startups.

Countries in conflict (e.g., Ukraine) have launched wartime defense grants to support rapid prototyping.

3. PROMOTION OF ENTREPRENEURSHIP IN THE CETEDEX DEFENSE ECOSYSTEM

3.2 Innovation Ecosystems

- Defense-focused accelerators such as DIANA (NATO) and AFWERX (U.S.).
- Technology clusters and events (e.g., Teknofest in Turkey) unite startups, military, universities, and industry.
- Enable knowledge transfer and rapid tech development.

3. PROMOTION OF ENTREPRENEURSHIP IN THE CETEDEX DEFENSE ECOSYSTEM

3.3 Flexible Regulatory Frameworks

Tools like OTA (Other Transaction Authority) streamline defense procurement.

Allow startups to bypass traditional bureaucracy and enter defense contracts more easily.

3.4 Protected Intellectual Property

- Government licensing models enable startups to retain IP rights instead of full transfer.
- Encourages innovation sustainability and future commercialization.

4. CIVIL SECTORS ADAPTABLE TO DEFENSE APPLICATIONS (I)

4.1 Aerospace and Aviation

Companies like **SpaceX, Airbus, and Boeing** adapt civilian tech to military use (e.g., satellites, drones, fuselages). Reusable rockets and satellite constellations (e.g., **Starlink**) support secure communications and surveillance.

4.2 Automotive and Transportation

GM Defense converts electric vehicles (e.g., **Hummer EV**) for military purposes.

Rivian develops electric tactical prototypes; autonomous trucks support logistics in conflict zones.

4.3 Electronics and Semiconductors

Intel, NVIDIA, and TSMC provide advanced chips for radar, secure communications, and imaging systems.

Civilian-origin **night vision sensors** and **electronic warfare hardware** are key defense components.

4. CIVIL SECTORS ADAPTABLE TO DEFENSE APPLICATIONS (II)

4.4 Robotics and Automation

Boston Dynamics applies robotics to surveillance and bomb disposal.

ABB helps automate maintenance and logistics for armed forces.

4.5 Energy and Green Technologies

Tesla, Rolls-Royce, Bloom Energy adapt battery, hydrogen, and micro-reactor tech to power remote bases.

Reduces supply chain vulnerabilities and enhances operational sustainability.

4. CIVIL SECTORS ADAPTABLE TO DEFENSE APPLICATIONS (I)

4.6 Biotechnology and Pharmaceuticals

Moderna, Verily create rapid-response systems for pandemics and biothreats.

Biomedical sensors and genetic tools are being explored for **combat performance enhancement**.

4.7 Agriculture and Food

Agricultural drones can be repurposed for **border patrol**.

Vertical farming systems (e.g., AeroFarms) support nutrition in isolated bases.

Lab-grown meat offers sustainable protein for long missions.

4.8 Construction and Infrastructure

3D printing enables fast deployment of bases and runways.

Companies like **ICON** and **Caterpillar** work with military agencies for rapid infrastructure setup.

5. THE ROLE OF START-UPS IN THE DEVELOPMENT OF THE DEFENSE ECOSYSTEM

5.1 Drivers of disruptive innovation. They lead developments in areas such as:

Artificial Intelligence and Big Data
Autonomous vehicles, drones and swarms
Cybersecurity and Hybrid Threat Defense
Advanced materials and smart structures
Secure, quantum communications

5. THE ROLE OF START-UPS IN THE DEVELOPMENT OF THE DEFENSE ECOSYSTEM

5.2. Strategic alliances

- They collaborate with large contractors as specialized technology providers and participate in EU-funded R&D consortia.
- They facilitate the transfer of dual-use technology (civil/defense).

5.3. Agile prototyping and experimentation

- They rapidly test solutions through live labs and sandbox models, addressing specific operational needs or underserved niches.
- They support short-cycle innovation in high-risk environments.

5. THE ROLE OF START-UPS IN THE DEVELOPMENT OF THE DEFENSE ECOSYSTEM

5.4. Boosting regional defense ecosystems

- They contribute to consolidating innovation centers (e.g., CETEDEX in Jaén).
- They attract young talent and foster technological entrepreneurship.
- They promote collaboration between universities, industry, and government.

5. THE ROLE OF START-UPS IN THE DEVELOPMENT OF THE DEFENSE ECOSYSTEM

5.5 Access to specialized funding

- NATO Innovation Fund
- European Defense Fund
- National grants (e.g., CDTI, ENISA)
- Defense-focused accelerators:
- DIANA (NATO)
- Hacking4Defense (US)
- National startup programs

5. THE ROLE OF START-UPS IN THE DEVELOPMENT OF THE DEFENSE ECOSYSTEM

5.6. Talent attraction and cultural change

- They offer alternatives to traditional military careers.
- They inspire a new generation of defense engineers and innovators.
- They promote ethical, sustainable solutions focused on citizen well-being.

6. CONCLUSION

1. At the present time, entrepreneurship is vital to defense innovation. Fostering it is a crucial driver of innovation for technological advancement and the competitiveness of the defense sector.
2. CETEDEX is a significant model for regional defense innovation, serving as a regional initiative to effectively promote entrepreneurship and technological development in the defense industry, creating jobs and attracting investment.
3. A supportive ecosystem is essential for defense startups, providing access to funding, facilitating collaboration, offering regulatory flexibility, and protecting intellectual property. At the present time, entrepreneurship is vital to defense innovation. Fostering it is a crucial driver of innovation for technological advancement and the competitiveness of the defense sector.

6. CONCLUSION

4. Dual-use technologies are key to connecting the civil and defense sectors: leveraging technologies and innovations from the civil sectors offers significant potential to enhance defense capabilities and foster cross-sector collaboration.
5. Startups play a transformative role in the defense landscape. They are not just minor players, but key agents of disruptive innovation, bringing agility, new perspectives, and specialized expertise to the defense sector.
6. The strategic promotion of defense entrepreneurship generates multiple benefits, including technological advancements, economic growth in the region, and the attraction of a new generation of innovation-focused talent.

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