CEA AND TECHNOLOGICAL INNOVATION FOR DEFENSE

- Jean-Philippe BOURGOIN, Deputy Director of Technological Research

Jean-Philippe BOURGOIN, representing the French Alternative Energies and Atomic Energy Commission (CEA)**,** presented the role of his institution in **technological innovation for defence**. He recalled that the **CEA**, founded 80 years ago under the leadership of **General de Gaulle**, was built on a strong **scientific heritage**, based on **three fundamental pillars**: **excellence in research, the mobilization of significant resources for ambitious projects, and a clear objective of technology transfer to industry**.

With 21,000 employees, an annual budget of €6 billion, 700 industrial partnerships, and 250 start-ups created since 1972, the **CEA** is a key player in innovation in France. It is the world's leading research organization in innovation and houses the second-largest cybersecurity certification laboratory. Its activities are structured around several strategic directions, notably the **Military Applications Division**, which is responsible for **nuclear deterrence**, and the **Technological Research Division**, focused on **digital and energy innovations**. Over the past year, the **CEA** has also incorporated two program agencies, one dedicated to decarbonized energy and the other to components, systems, and digital infrastructures**.**

Technological Innovation for Defence

The **CEA** plays a vital role in **transforming scientific innovations into operational technologies**, particularly at **intermediate levels of technological readiness (TRL)**. It adopts an **approach based on the development of generic technologies** that can be applied to various **industrial sectors, including defence**.

Several major advancements were highlighted, including:

- **Infrared sensors**, developed with **LYNRED** ;
- **Image recognition systems**, in partnership with **THALES** ;
- **OLED micro-displays**, designed for advanced vision systems ;
- **Secure communication networks**, developed with **SAFRAN** ;
- **NRBC (Nuclear, Radiological, Biological, and Chemical) solutions**, presented at the **CEA**'s stand during the symposium.

Mr. BOURGOIN emphasized the importance of dual-use technology**,** noting that civilian technological advancements are increasingly adapted to military needs**.** Artificial intelligence is a concrete example, with rapid developments such as the rise of generative AI, which requires **s**trategic adaptation to address sovereignty and operational effectiveness challenges.

Strengthened Collaboration with the 27th Mountain Infantry Brigade

The **CEA** maintains a **structural partnership** with the **27th Mountain Infantry Brigade (BIM)**, initiated under the leadership of **General GIVRE** and continued by his successors. This cooperation aims to **test and adapt technological innovations** to the **operational realities of mountain combat**.

The joint work focuses on several priority areas:

- **Improving the energy and material autonomy of deployed units ;**
- **Experimenting with technologies suited to hostile environments**, particularly **at high altitudes and under extreme climatic conditions ;**
- **Assessing stress levels in operations**, using **biometric sensors and artificial intelligence models**;
- **Developing head-up display systems**, optimised for **airborne forces** ;
- **Designing low-emissivity thermal tents**.

Emerging Technologies and Operations in Extreme Conditions

The presentation also highlighted **solutions developed by the CEA** to **enhance the operational capability of forces in challenging environments**. Key innovations include:

- **Robust and resilient communication networks**, notably the **NEON system**, designed to operate in **extreme conditions**;
- **Specialized reconnaissance drones**, equipped with **sensors capable of detecting avalanche victims**;
- **Multimodal data fusion tools**, intended for **crisis situation monitoring**;
- **Advanced artificial intelligence models**, capable of **identifying unknown objects with minimal learning**;
- **GPS-independent navigation systems**, specially designed for **areas lacking structured reference points**;
- **Alternative energy sources**, such as **hydrogen fuel cells for drones and high-efficiency solar panels**, tested under **extreme conditions**.

- Technology Adapted to Operational Realities

Mr. BOURGOIN stressed an essential point: **technology must serve the armed forces as a tool, not an additional constraint**. He highlighted that **the best way to achieve this goal is through close collaboration with operational units**, ensuring that **innovations align with battlefield requirements**.

In a world where **technological advancements are progressing exponentially**, the **CEA** is committed to **supporting the armed forces by developing ever more adaptable, innovative, and resilient solutions**.

Finally, he **thanked all participants** for their attention and reaffirmed the **CEA**'s and its teams' **availability to further explore these topics and continue discussions on innovation for defence**.