SITM
INTERNATIONAL MOUNTAIN TROOPS SUMMIT

12-13 FEB. 2025
ALPEXPO - GRENOBLE, FRANCE

in association with the
27e BRIGADE D'INFANTERIE DE MONTAGNE

SUMMARY OF DISCUSSIONS

INTERNATIONAL MOUNTAIN TROOPS SUMMIT

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INAUGURAL CONFERENCE

The inauguration of the first **International Summit of Mountain Troops (SITM)** in Grenoble marked a key milestone in strategic thinking on combat in mountain and extreme cold environments. Three key speakers highlighted the challenges and ambitions of this unprecedented event.

Nathalie BÉRANGER, President of Alpexpo, emphasized the significance of Grenoble as a host city, thanks to its **strategic geographical location**, the presence of the **27th Mountain Infantry Brigade (BIM)**, and its **dynamic technological ecosystem**. **GDI (2S) Charles BAUDOUIN**, President of COGES EVENTS, stressed the need for **enhanced international cooperation** and **adaptation to extreme conditions** to meet operational challenges in mountain warfare. Finally, **GBR Lionel CATAR**, Commander of the **27th BIM**, shed light on the **current commitments** of mountain troops and the **growing strategic importance** of these environments.

With **over 1,200 international professional participants** attending over two days, this summit has firmly established itself as an **essential gathering** for the specialized military and industrial community. **Building on this success, a second edition is already scheduled for 10-11 February 2027.**

- Nathalie BÉRANGER, President of ALPEXPO

Ladies and Gentlemen,

It is with great emotion that I open today **the** first edition of the International Summit of Mountain Troops**.** General Lionel CATAR**,** Commander of the 27th Mountain Infantry Brigade**,** General Charles

BEAUDOUIN**,** President o**f** COGES EVENTS**,** Madam Sub-Prefect, representing the Prefect of Isère, Madam Vice-President of the Department, Mr Deputy Mayor of Grenoble, distinguished officers, esteemed guests, dear friends**,**

It is a great honour for Alpexpo and the Grenoble region to host an event of such scale. This summit brings together delegations from around the world, with over 1,000 international decision-makers. It stands as a powerful symbol of strengthened international cooperation and the exchange of expertise between units specializing in mountain and extreme cold warfare.

The choice of Grenoble as the venue for this gathering was an obvious one. Located at the heart of the Alps, our city benefits from an exceptional mountainous environment, bordered by the Vercors, Chartreuse, and Belledonne massifs. This geographical proximity is a strategic advantage, allowing for real-condition demonstrations and equipment testing.

Grenoble is also a city with a strong military heritage, home to the 27th Mountain Infantry Brigade, an elite unit of the French Army, specialising in high-altitude and extreme climate combat. Its expertise is further reinforced by a world-class technological hub, internationally recognized in innovation, extreme environment research, and altitude medicine.

Since assuming the presidency of Alpexpo in 2020, I have sought to align our programming with the identity of our region. The organization of this summit perfectly reflects this ambition. It is the result of years of trusted collaboration with mountain troops, whose deep engagement in local life is truly remarkable.

Finally, I express my sincere hope that this summit becomes a long-term fixture. The next edition is already scheduled for 2027, and we aspire to establish itself as an essential gathering for all stakeholders in the field.

Thank you all for your presence and your commitment**.**

- GDI Charles BAUDOUIN, President of COGES Events

Ladies and Gentlemen,

It is a great honor for me to speak on this occasion, at the inauguration of the first International Summit of Mountain and Extreme Cold Troops.

I would like to extend my sincere thanks to General CATAR and the 27th Mountain Infantry Brigade for their unwavering commitment to organizing this event. Our teams, alongside Alpexpo and numerous partners, have joined forces to make this first edition a success.

Mountain warfare is a demanding discipline that allows for no approximation. It requires exemplary discipline, unwavering endurance, and highly specialized resources. Today, the evolving geopolitical landscape calls for a renewed focus on European forces' readiness for extreme cold warfare. In this context, mountain troops play a pivotal role.

This summit aims to foster knowledge-sharing and constructive dialogue between allied nations, specialized forces, and industry leaders. We hope it will serve as the starting point for strengthened collaboration and concrete advancements, ensuring the operational effectiveness of our Armed Forces.

I wish you all a summit rich in discussions and new perspectives.

Long live the Mountain Troops!!

- GBR Lionel CATAR, Commander of the 27th BIM

Ladies and Gentlemen,

It is with great emotion that I open today the first International Summit of Mountain and Extreme Cold Troops. On behalf of all the units of the 27th Mountain Infantry Brigade, I warmly welcome you to Grenoble, the capital of the French Alps and the birthplace of our troops.

In an increasingly tense strategic context, mountainous and cold regions hold major operational significance. They are often areas of friction, transit routes, and home to strategic natural resources. Our brigade is preparing for these challenges by intensifying its commitment:

- Since 5 February, we have been leading the national rapid response echelon, ready to be deployed within 48 hours to any crisis theatre.
- In 2025, our units will be deployed in Estonia, Romania, Lebanon, Africa, and Arctic regions such as Alaska and Greenland.
- We will continue training and cooperation with allied forces, particularly in Europe and the Middle East.

This summit is one of a kind. It is the result of a bold initiative, driven by a shared conviction: mountain and extreme cold environments require a dedicated community of specialised soldiers, united by rare and invaluable expertise.

It is with great pride that I declare open the first International Summit of Mountain and Extreme Cold Troops.

MODERN WARFARE IN MOUNTAIN ENVIRONMENTS

This **first session** brought together **French and American military officials** to analyse the **specific challenges of modern warfare in mountainous environments**. Moderated by **Jean-Luc THEUS**, the discussions **contextualized key lessons learned from the conflict in Ukraine**, highlighting the **strategic and operational shifts** imposed by the **new realities of high-intensity combat**.

The central themes of the session included:

- **The impact of emerging technologies** (drones, advanced sensors) on the conduct of operations in mountain warfare;
- **The importance of preparation and training** to ensure the effectiveness of forces in extreme environments;
- **Challenges related to maintaining operational capabilities and the resilience of units** in response to the constraints of the terrain.

- Colonel Sébastien LESPINASSE, Commander of the 13th Mountain Infantry Battalion (BCA)

Mountain warfare presents unique challenges that require constant adaptation. The mountainous environment is far more than just terrain; it is a complex geography shaped over centuries, with passes, valleys, and extreme climatic conditions that directly impact military operations.

Modern warfare is now multidimensional. The rise of digitalization and new technologies is transforming military strategies, requiring increased flexibility. The use of drones, advanced reconnaissance, and cyber capabilities demand an adaptation of engagement doctrines. It is imperative to reconcile these technological advancements with the fundamentals of mountain warfare, notably mobility, concealment, and the use of terrain.

Troop training plays a key role in this evolution. The preparation of mountain soldiers relies on a progressive acclimatization to the harsh environment in which they operate. This involves not only developing specific technical skills but also integrating the physical and psychological constraints inherent to high-altitude combat.

In conclusion, mountain warfare requires a thorough mastery of the environment, seamless integration of new technologies, and rigorous troop training. Cooperation between allied forces and the coordination of resources are essential to ensuring the effectiveness of future engagements.

- Colonel Jackson DOAN, Commander of the Marine Corps Mountain Warfare Training Center (MCMWTC)

Colonel Jackson DOAN, representing the United States Marine Corps, expressed his gratitude for the opportunity to participate in this summit. He emphasised that, unlike forces specifically trained for mountain warfare, the Marine Corps does not have units dedicated to this environment. This reality necessitates accelerated troop training to enable them to adapt quickly and operate effectively in extreme conditions.

He highlighted the evolution of mountain warfare, which now incorporates a "fifth domain": cyberspace. The integration of digital capabilities and advanced communication systems in these complex environments represents a major challenge. He therefore stressed that cooperation between allied forces is essential to overcoming these obstacles and leveraging technological advancements while ensuring tactical and operational efficiency.

Regarding force training, he explained that it follows a structured, multi-phase process, incorporating:

- Preparation for extreme environmental conditions ;
- Development of mobility capabilities ;
- Immersion in large-scale exercises.

Particular attention is given to high-altitude combat tactics, where highly demanding conditions require both physical endurance and advanced technical expertise.

In conclusion, he reiterated that although the Marine Corps does not have units exclusively dedicated to mountain warfare, it has established rigorous training methods that allow troops to adapt quickly to the specific requirements of this environment. He also emphasised the importance of integrating new technologies and ensuring interoperability with international partners, which, in his view, are essential levers for enhancing the operational capabilities of forces operating in mountainous terrain.

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**.

STRATEGIC PERSPECTIVES: OPERATIONAL CHALLENGES OF THE 27th MOUNTAIN INFANTRY BRIGADE

Lieutenant General TOUJOUSE presented a detailed analysis of the current strategic challenges facing the 27th Mountain Infantry Brigade (BIM) and, more broadly, the French Army**.**

- **LTG Bertrand TOUJOUSE, CFOT**

Lieutenant General TOUJOUSE first expressed his gratitude to the **command of the 27th BIM** for organizing this event, which he described as a **must-attend gathering** from its very first edition.

He emphasized that the current context is marked by **growing strategic uncertainty**, making it **more necessary than ever for nations to increase investment in defence and force preparedness**. According to him, the **role of the armed forces is precisely to respond to periods of instability and ensure stability in the face of challenges to the international order**.

Within this framework, he highlighted the **central role of the 27th BIM within the French Army**. With **7,500 personnel**, the brigade **exceeds NATO standard unit sizes** and plays a **key role in adapting to new challenges in mountain warfare**. In his view, its **expertise is essential in addressing three major challenges**:

- **Extreme cold warfare**, requiring **both physical and technological resilience**;
- **Rear-area guerrilla warfare**, necessitating **harassment tactics and increased mobility**;
- **Urban combat**, which has become a **central element in modern conflicts**.

Lieutenant General TOUJOUSE then discussed the **evolution of recent conflicts**, particularly in **Ukraine**, which illustrates the **need for forces to adapt to new forms of warfare**. He highlighted the **importance** of urban combat, citing the determined resistance of Ukrainian forces in extreme conditions. He also pointed out that rear-area harassment operations have become an indispensable mode of action, requiring a highly agile and asymmetric approach.

In this context, he stressed the need to evolve the training of mountain units to incorporate these new tactical realities. It is no longer just about mastering extreme environments but also about optimising the use of new technologies and enhancing interoperability with international partners.

General TOUJOUSE also emphasized the importance of international cooperation in these adaptation efforts. In his view, forces cannot operate in isolation but must integrate into a collective framework to effectively respond to contemporary threats.

In conclusion, he highlighted three essential pillars for the future of mountain troops**:**

1. **Proper adaptation to extreme cold warfare**;
2. **Integration of guerrilla warfare tactics**;
3. **The ability to operate in urban environments**.

He concluded that this **summit represents a crucial step in strategic reflection and the exchange of expertise between nations**, underlining that these interactions **enhance the ability of forces to tackle the challenges of tomorrow**.

THE USE OF DRONES IN MOUNTAIN WARFARE

This session explored the **use of drones in mountain warfare**, addressing **strategic doctrines, operational constraints, and industrial innovations**. **Moderated by Antoine Level**, it brought together **experts from NATO's Mountain Warfare Centre of Excellence (MWCOE), the 7th BCA, and Drone Shield**.

The session highlighted the **strategic rise of drones in mountain warfare**, the **need to adapt doctrines and training**, and the **growing challenges related to counter-drone technologies**.

- Current State and Doctrine of Drones in Mountain Warfare, COL Leon Holc & LCL Dennis JAHN (MWCOE)

LCL Dennis JAHN recalled that the MWCOE organised a drone seminar in 2023, bringing together 100 participants from 16 nations and 12 private companies. The objective was to establish a clear vision of drone use in mountain combat. He stressed the importance of standardizing terminology in NATO doctrines and mentioned that the MWCOE is currently revising regulations to improve interoperability.

COL Leon HOLC highlighted the importance of drones for:

- Reconnaissance and surveillance of complex terrain;
- Targeting and objective acquisition;
- Logistics and rapid resupply for isolated troops;
- Environmental analysis to anticipate avalanche risks or restricted access zones.

- Operational Feedback on Drone Use in Mountain Environments, LCL Marc-Antoine (7e BCA)

LCL Marc-Antoine shared the 27th BIM's experience with small drones, highlighting:

- A growing need for drones in every combat group to improve tactical intelligence;
- Increased resistance to radio and GPS jamming is essential;
- The need for thermal cameras to detect enemy presence in snow or night conditions;
- Integration of artificial intelligence to enhance data analysis;
- Testing of simpler FPV drones, which can be repaired directly in the field.

He pointed out that mountainous terrain presents major challenges, including limited radio communication due to terrain features and cold temperatures affecting battery performance. Potential solutions include aerial relays to extend drone range and thermal storage systems to improve battery autonomy.

- Emerging Technologies and Counter-Drone Measures, Hans HOYER (DroneShield)

Hans HOYER highlighted the growing challenges posed by the proliferation of commercial and military drones. He explained that drone detection and neutralization rely on:

- Radiofrequency jamming systems and GPS signal disruption.
- Radars and acoustic sensors to identify and track autonomous drones.
- The increasing use of kinetic destruction ("hard kill") solutions, a trend reinforced by lessons learned from the conflict in Ukraine.

He also emphasized the rapid evolution of cheap, easily produced FPV drones, which are widely used in modern conflicts. These drones require adapted countermeasures, particularly faster and more intelligent interception systems.

The session concluded with a discussion on the future of drones in mountainous terrain, focusing on several key areas:

- **Standardisation of interfaces and control systems** to improve interoperability between allied forces and optimise drone operations;
- **Exploration of cargo drones**, particularly for transporting heavy loads and, in the future, conducting medical evacuation missions in difficult terrain;
- **Integration of ground robots to assist troops** in rugged areas and enhance logistics and operational capabilities.

MODERN WARFARE IN EXTREME COLD ENVIRONMENTS

This session brought together **Julia TASSE (IRIS), Colonel Gaétan DUBOIS (Commander of the French High Mountain Military School), and Captain JAMES (Royal Marines Commandos)** to analyse the challenges of combat in extreme cold environments.

The speakers emphasized the **primacy of individual training in coping with cold constraints**, with the **French model focusing primarily on specialized units**. **Climate change is altering Arctic operational theatres**, requiring **adapted tactics and equipment**. **Interoperability within NATO**, strengthened by **the integration of Sweden and Finland**, remains a key challenge.

- Julia TASSE: Introduction and the Challenges of Climate Change

Julia TASSE opened the session by thanking the organisers for their invitation, introducing herself as a **research director at IRIS (Institute for International and Strategic Relations)**. She specified that she **leads research on environmental, energy, and maritime issues** and heads a **research project for the French Ministry of the Armed Forces on the impact of climate change on defence**.

She emphasised that **climate change is already profoundly transforming operational theatres in polar regions**, with **increased temperature variability, more frequent extreme weather events, and ice melt**. These changes, combined with **strategic dynamics in the Arctic**, present **new challenges for the armed forces**.

- Colonel Gaëtan DUBOIS: Tactical Challenges and Military Adaptations

Colonel Gaétan DUBOIS, commander of the **French High Mountain Military School (EMHM)**, presented the **central role of his institution within the 27th Mountain Infantry Brigade**, based in **Chamonix and Modane**. He emphasized that **EMHM is the centre of excellence for the French Armed Forces in mountain and extreme cold operations**.

He highlighted that combat in extreme cold presents severe constraints**,** affecting operational capacity even before engaging with the enemy**.** Cold, snow, and harsh climatic conditions degrade the performance of equipment, maneuvers, and personnel**,** making specialized training, rigorous preparation, and adapted equipment essential**.**

As part of modern warfare in extreme cold environments**,** Colonel DUBOIS also pointed out the tactical dilemma **in** which the increasing use of surveillance, targeting, and deep-strike capabilities forces tactical units to disperse**,** while grouping them, even temporarily, helps sustain operations in extreme cold**.** The integration of multi-sensor intelligence, C4ISR, and artificial intelligence**,** as seen in modern conflicts, is altering the readability of the battlefield and applies directly to cold-weather warfare. However, he noted that some technologies, such as drones, experience a significant decline in performance when temperatures drop for extended periods**,** as observed in Ukraine, where their use **is** limited in winter**.**

Regarding military engagement in polar environments**,** he stressed tha**t** Sweden and Finland's accession to NATO has significantly expanded France's potential engagement zone in extreme cold conditions**,** within a strategic solidarity framework**.** This strategic expansion requires enhanced cooperation with joint-force partners and adaptation of force projection capabilities**.**

Finally, he insisted on the importance of **training and preparation.** France has chosen to integrate cold-weather warfare expertise into individual winter mountain training for every soldier **and across** all levels of specialised units**.** This individual acclimatisation to extreme conditions **is reinforced by** garrison-based training and continuous exchanges with Arctic allies **such as** Canada, Norway, Finland, and Sweden**. These** cooperative efforts**, along with participation in** multinational exercises like Nordic Response**, ensure** crucial interoperability for operational engagements**.**

Furthermore, with the current deployments of the French Army and joint-support forces on NATO's eastern flank**, particularly in** winter conditions**,** cold-weather operations are not limited to specialised units**. To ensure that** all French forces can operate in severe winter conditions**, as they may encounter in** continental Europe**, the** EMHM also disseminates general cold-weather warfare expertise to all military branches **through various** training programmes open to all units**.**

- Captain James: The Royal Marines' Experience in Polar Warfare

Captain James, Mountain Leader in the Royal Marines Commandos, shared insights from Arctic operations, noting that his unit spends three to four months per year in Norway training for extreme conditions.

He highlighted a key lesson from these deployments: investing in the individual outweighs reliance on technology. In his view, training and soldier resilience are critical to operational success. While new technologies, such as ISR sensors, advanced optics, and communication systems, play an important role, they cannot replace the adaptability and self-sufficiency of soldiers in hostile environments.

Climate change is directly impacting operational conditions. He pointed out that temperature variability and changing freeze-thaw cycles affect troop mobility and camouflage effectiveness, requiring continuous adaptation of tactics and equipment.

He also outlined the unique challenges of high-latitude combat, particularly polar day and night cycles, which affect operations and logistics. He emphasized the importance of morale and nutrition management for troops in extreme cold conditions. Research is currently being conducted to optimize rations and light exposure protocols, improving soldier endurance.

Finally, Captain stressed the importance of allied cooperation. Force integration and communication system compatibility are, in his view, top priorities for ensuring rapid response and effectiveness in extreme environments.

MOBILITY

This roundtable discussion explored the challenges and innovations related to motorized mobility in mountainous terrain, moderated by Yohan Briant, Director General of the Institute for Applied Geopolitical Studies. The discussions were structured around three main themes:

- **Specific challenges of motorized mobility** in mountain environments, including constraints related to altitude, cold, and rugged terrain.
- **Technological advancements and strategic approaches** to improve vehicle performance and adaptability.
- **Logistical and operational challenges**, focusing on mission optimization and troop safety.

- LCL Grégoire (EMAT): Military Mobility in Mountainous Terrain

Motorized mobility in mountain environments relies on specialized equipment adapted to demanding terrain. Several vehicle types are distinguished:

- **Light vehicles**: HT 270, quads, and snowmobiles, facilitating access to steep areas.
- **Armored vehicles**: VHM and future Jaguar, essential for controlling valleys.
- **Helicopters**: NH90 and Chinook, enabling airborne maneuvering and troop deployment.
- **Mobile artillery units**: CAESAR cannon and mortar systems mounted on tracked vehicles.

The main priority is to ensure mobility adapted to extreme conditions, balancing protection, autonomy, and off-road capability. Camouflage and interoperability remain key challenges.

- The Role of Industry in Technological Innovation, Nicolas MALDERA (Arquus): Industrial Contributions to Military Mobility

As an industrial leader, our role is to meet the operational needs of the armed forces while integrating technological and budgetary constraints. Our development priorities for mountain mobility include:

- **Engine adaptation**: Enhancing high-altitude performance and minimizing power loss.
- **Cold-start solutions**: Implementing preheating systems, electric resistances, and specialized fluids.
- **Weight and fuel consumption reduction**: Finding the optimal balance between armor protection, autonomy, and logistics.

- **Hybrid and autonomous vehicles**: Advancing the robotic mule program for mountain infantry.

These innovations are tested in real-world trials, in collaboration with international partners.

- The German Approach and Multinational Challenges, LCL Andreas KUENZEL (ACCDC, German Army)

In Germany, we focus on vehicles like the BVS10 (BAE Systems) and modular solutions for mountain troops. We also integrate autonomous platforms with strict requirements on:

- **Human-machine collaboration** to enhance operational effectiveness.
- **Camouflage capabilities** and low-visibility operations, minimizing light emissions.
- **NATO standardization** to ensure interoperability with allied forces.

International cooperation is essential to share costs and standardize capabilities, but it also requires balancing national requirements, which may sometimes diverge.

LOGISTICS IN EXTREME COLD ENVIRONMENTS

This roundtable addressed the **major challenges of logistics in cold environments**, with a particular focus on **military operations**. During the discussion, three key speakers shared their insights: **Captain Didier**, an **alpinist from the High Mountain Military Group**, **Colonel David ROYER**, **commander of the 7th RMAT and an expert in mountain and extreme cold maintenance**, and **Eric DESFARD**, representing the **industry sector**.

- Thibault Fouillet (IESD): Opening Remarks

Mr. FOUILLET opened the session by presenting the **Institute for Strategic and Defence Studies (IESD)**, a **centre of excellence recognised by the French Ministry of the Armed Forces**.

Today, the session focused on three main areas:

- **Operational challenges of logistics in extreme environments** ;
- **Technological innovation and equipment adaptation** ;
- **The role of industry and future development prospects**

- CNE Didier (GMHM): The Challenges of Cold-Weather Operations

Extreme cold imposes **severe physiological and material constraints**. At **minus 30°C**, exposure for just a few minutes **without adequate protection** can cause **irreversible frostbite** and even **jeopardise the mission**.

Autonomy in extreme cold environments relies on several key principles:

- **Anticipation and preparation**: specialised training, strict routines, and gradual adaptation to cold.
- **Equipment management**: layering thermal clothing, selecting high-performance materials, and maintaining gear.
- **The importance of a warm zone**: ensuring a **reconditioning space** to allow soldiers to sustain operations.

Our **Arctic mission experience** shows that **isolation and extreme conditions** require **precisely calibrated logistics** and **total autonomy for several weeks.**

- COL David ROYER (7e RMAT): Logistical Adaptation and Support Challenges

Logistics in cold environments is a matter of both survival and operational performance. The support chain must be planned in advance to ensure:

- **Delivery of resources**: suitable fuel, specialised high-energy rations, and engine preheating. **Force mobility**: adapted vehicles, maintenance in extreme conditions, and reduced energy consumption.
- **The exponential impact of climatic constraints**: every drop in temperature **significantly increases logistical needs** and **extends implementation times**.
- Recent **operational feedback, particularly from Eastern Europe**, highlights that **effective logistics is essential** to maintaining **troop engagement capabilities** and **preventing attrition due to extreme conditions**.

- Eric DESFARD (Sciences): The Role of Industry and Technological Innovation

Industry plays a key role in adapting military equipment to extreme cold. Several innovations are currently under development:

- **Lithium-titanium-oxide batteries designed for cold environments**: reducing power loss in sub-zero temperatures.
- **Autonomous resupply systems**: gliders and logistics drones enabling precise delivery without exposing troops.
- **Enhanced thermal performance**: innovative textiles, portable heating systems, and optimised energy storage.

Cold-weather constraints require adjustments to logistics doctrine**: should priority be given to** soldier autonomy **or the** resilience of support points**? The answer depends on** the nature of engagements and tactical conditions.

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