Sodobni vojaški izzivi

Contemporary Military Challenges

Znanstveno-strokovna publikacija Slovenske vojske

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Deset let Natovega centra odličnosti za gorsko bojevanje

Gorsko bojevanje (MW) se je iz primitivnih spopadov na nedostopnih terenih razvilo v visoko specializirano področje vojaških operacij, ki ga oblikujejo geografija, tehnologija in strategija. V preteklosti so gore ponujale zatočišča in strateške položaje, od starodavnih plemenskih obrambnih sistemov do zahtevnih pohodov v prvi in drugi svetovni vojni. Posebne zahteve bojevanja na visokih nadmorskih višinah, kot so logistika, mobilnost, vzdržljivost in podnebje, so spodbudile oblikovanje elitnih gorskih enot in namenskih doktrin, zlasti v državah z razgibanimi mejami. Pomen takega bojevanja se je povečal v 20. stoletju, ko so Alpe, Kavkaz in Hindukuš postali prizorišča pomembnih vojaških operacij. V obdobju po hladni vojni in tudi danes ohranja gorsko bojevanje strateški pomen v Natu in širše – zaradi nastajajočih hibridnih groženj, ponovnega pojava ozemeljskih sporov na gorskih območjih ter potrebe po delovanju sil v zahtevnih, ekstremnih okoljih.

Podnebne spremembe, tehnološki razvoj in regionalna nestabilnost še povečujejo potrebo po prožnih, interoperabilnih in prilagodljivih zmogljivostih gorskega bojevanja. Danes ustanove, kot je Natov center odličnosti za gorsko bojevanje (MW COE), institucionalizirajo pridobljena znanja in spodbujajo doktrinarne inovacije, s čimer zagotavljajo, da gorsko bojevanje ne ostane le dediščina preteklosti, temveč pomembna kompetenca za prihodnje večnacionalne operacije na najzahtevnejših terenih. Marca 2025 je Natov center odličnosti za gorsko bojevanje v Poljčah v Sloveniji praznoval deseto obletnico. Ta mejnik je več kot simboličen – odraža desetletje operativnega zorenja, doktrinarnih inovacij in večnacionalnega sodelovanja na enem od najbolj specializiranih in strateško kritičnih področij Nata: gorskem bojevanju.

MW COE, ki je bil akreditiran leta 2015, je postal glavno Natovo središče za strokovno znanje, usposabljanje in razvoj zmogljivosti na področju gorskega bojevanja. Njegova ustanovitev temelji na močni vojaški dediščini Slovenije, zlasti na oblikovanju 32. gorske brigade leta 1992 in Gorske šole leta 1996. Vizija centra je dobila zagon leta 2004, ko je vrhovni poveljnik zavezniških sil za preoblikovanje (SACT) spodbudil Slovenijo, naj prevzame vodilno vlogo. Do leta 2011 je bil vzpostavljen večnacionalni okvir, center pa je bil uradno ustanovljen leta 2015 s sodelovanjem Slovenije, Italije, Nemčije in Hrvaške, kot partnerska država se je pridružila Avstrija. Pozneje se je center razširil še na Romunijo, Poljsko in Češko republiko. Ta institucionalna evolucija odraža trajno zavezanost Nata k interoperabilnosti in priznanje, da gorsko okolje zahteva posebej prilagojene zmogljivosti. Ker se zavezništvo spopada z nestabilnim globalnim varnostnim okoljem, za katerega so značilni sporna območja, hibridne grožnje in posledice podnebnih sprememb, strateški pomen centra nenehno narašča, podobno kot višine, za katere je bil ustvarjen.

Natovi centri odličnosti niso del poveljniške strukture zavezništva, temveč delujejo kot večnacionalne platforme za inovacije in specializacijo. S prispevkom k razvoju doktrine, izobraževanju, eksperimentiranju in usposabljanju imajo pomembno vlogo

pri preoblikovanju zavezništva. MW COE je primer take funkcije, saj ohranja nišno zmogljivost, ki je operativno zahtevna in geopolitično nepogrešljiva.

Za vpliv centra je pomemben razvoj koncepta gorskega bojevanja – temeljnega dokumenta, ki gorsko bojevanje vključuje v širšo operativno arhitekturo Nata. Koncept opredeljuje posebne zahteve delovanja v visokogorju, kot so mobilnost, vzdržljivost, poveljevanje, preživetje in vse bolj tudi večdomensko integracijo. MW COE je vodil tudi pripravo zavezniške publikacije za usposabljanje (ATrainP-6): Izobraževanje in usposabljanje za gorsko bojevanje ter prispeval k zavezniški doktrinarni publikaciji (ATP 3.2.1.3), ki usklajujeta terminologijo, taktiko in postopke gorskega bojevanja v celotnem zavezništvu. Ta prizadevanja zagotavljajo, da gorsko bojevanje ni več domena le nekaterih alpskih držav, temveč standardizirana in premestljiva zmogljivost Nata.

Osnovna izobraževalna filozofija centra se ne osredotoča le na oblikovanje individualnih usposabljanj, temveč na podporo in izboljšanje večnacionalnih vaj, ki naslavljajo taktično in strateško realnost gorskih operacij. Vaje temeljijo na izzivih realnega sveta, kot so premikanje po strmih prelazih, nepredvidljivo vreme in vse pogostejše operacije pod zemeljsko površino, vključno z naravnimi jamami, umetnimi tuneli ter podzemnimi skladišči logistike in orožja. Te značilnosti dodajajo vertikalno kompleksnost in taktično nejasnost na bojišču, kar zahteva natančno usklajevanje in specializirano usposabljanje.

Pomemben dopolnilni element je razvoj vojnih iger, prilagojenih gorskim razmeram. Take simulacije udeležencem pomagajo razumeti in se spoprijeti z visoko tveganimi scenariji, ki vključujejo omejeno vidljivost, omejen manevrski prostor in skrite nevarnosti v podzemnih sistemih – značilnosti konfliktnih območij, kjer gore pogosto služijo kot zatočišča in strateške trdnjave. Center zato izvaja zahtevne in večdimenzionalne programe usposabljanja, ki združujejo akademsko izobraževanje z intenzivnimi vajami na terenu. Udeleženci, med katerimi so častniki in višji podčastniki, se usposabljajo v poveljevanju s poslanstvom, decentraliziranem vodenju in situacijskem zavedanjem v združenem večdomenskem okolju, hkrati pa se spopadajo s fizičnimi, logističnimi in psihološkimi omejitvami gorskih bojišč. Tak celovit pristop krepi prilagodljivost, odpornost in taktično kohezijo med večnacionalnimi formacijami, ki delujejo v nekaterih najbolj zahtevnih in sovražnih okoljih na svetu.

Kot dopolnitev tradicionalnega poučevanja so bile uvedene nove platforme za e-učenje, ki omogočajo širši dostop do znanja v državah članicah Nata in partnerskih državah. Digitalna orodja omogočajo učenje pred napotitvijo in stalno izobraževanje razpršenih in rezervnih enot. MW COE je razširil tudi program vojaških študijskih potovanj (*staff ride*), metodo izkustvenega učenja, ki povezuje zgodovinsko analizo z oceno terena in taktičnim vpogledom. Poleg soške fronte zdaj prek novih vojaških študijskih potovanj v Romuniji in Črni gori raziskujejo ključno ozemlje, povezano s sodobnimi strateškimi vprašanji. Center je organiziral tečaj načrtovanja

gorskih operacij, ki se je osredotočil na vključevanje kibernetskega, vesoljskega in informacijskega področja v koncepte gorskega bojevanja – pomemben korak k celostnim, večdomenskim operacijam. Vse pomembnejše postaja tudi usposabljanje načrtovalcev in poveljnikov na operativni ravni, pri čemer se posebnosti gorskega bojevanja vključujejo v doktrino, logistiko in strateško načrtovanje – dolgo pred tem, ko enote dosežejo ključen vrh.

V skladu z Natovim temeljnim konceptom vojskovanja je MW COE vodilni v digitalni transformaciji gorskega vojskovanja. Center prilagaja sisteme C4I zahtevnim topografijam in razvija tehnologije, kot so digitalno modeliranje terena, avtonomna logistika in izvidovanje z uporabo brezpilotnih letal (UAS). Te inovacije so pomembne v okolju, kjer so mobilnost, komunikacija z vidnim poljem in konvencionalne metode oskrbe enot omejene. Je tudi vodilni pri integraciji vremenskih podatkov v realnem času, modeliranju tveganj na terenu in napovedovanju plazov v poveljniške sisteme, kar poveljnikom omogoča sprejemanje premišljenih odločitev v zelo spremenljivih okoljih. Podzemne značilnosti, kot so skrite jame ali mreže tunelov, dodatno otežujejo zbiranje informacij in manevriranje. Te težave center naslavlja s tehnološkimi rešitvami in doktrinarnimi prilagoditvami.

Gore so več kot le fizične ovire – so geostrateški ojačevalci. Gore zajemajo 25 odstotkov zemeljske površine in 85 odstotkov meja poteka po gorskem terenu, kar močno vpliva na konflikte, zlasti na nadzor nad viri, čezmejno mobilnost in prikrivanje asimetričnih groženj. V mnogih sodobnih operativnih okoljih nasprotniki izkoriščajo gorska območja za gradnjo podzemnih utrdb, skritih logističnih poti in odpornih poveljniških postojank. Zato zmogljivosti Nata v gorah niso prestiž, temveč strateška nujnost.

Kljub pomembnim dosežkom ima Natov center odličnosti za gorsko bojevanje nenehne izzive:

– Vrzeli v zmogljivostih: razlike v usposabljanju, doktrini in opremi še vedno ovirajo popolno interoperabilnost znotraj zavezništva.
– Digitalna odvisnost: gorsko območje otežuje varno komunikacijo, zato so potrebna orodja C4ISR z nizko pasovno širino in visoko odpornostjo.
– Okoljska nestabilnost: podnebne nevarnosti, kot so umikanje ledenikov in nepredvidljivost plazov, zahtevajo modeliranje v realnem času in načrtovanje ukrepov za izredne razmere.
– Pravnoetična zapletenost: vojaške operacije morajo biti v skladu z mednarodnim humanitarnim pravom, zlasti v oddaljenih ali civilno občutljivih alpskih območjih.
– Hkrati pa nastajajoče tehnologije, kot so modeliranje tveganj s pomočjo umetne inteligence, brezpilotna kopenska vozila in energetsko avtonomni sistemi ponujajo nove načine za premikanje po terenu, zmanjševanje tveganj in povečanje operativnega tempa.
– Center še naprej zagovarja kognitivno in čustveno odpornost, saj se zaveda, da vodstvo v gorah ni povezano le z vzdržljivostjo, temveč tudi z razsodnostjo,

mirnostjo in pobudo pod pritiskom. Še naprej ohranja tesne vezi z akademskim svetom, industrijo in službami za civilno zaščito, s čimer razširja zmogljivosti gorskega bojevanja na področja pomoči ob nesrečah, okoljske varnosti in civilno-vojaško sodelovanje.

V prvem desetletju je Natov center odličnosti za gorsko bojevanje preoblikoval gorsko bojevanje iz obrobne vojaške veščine v strateško zmogljivost zavezništva. Z združevanjem inovativnosti in tradicije ter daljnovidnosti in realnosti je center postal nepogrešljiv dejavnik v procesu prilagajanja Nata grožnjam 21. stoletja.

Toda, kot je dobro znano vsakemu gorniku: doseženi vrh pomeni le polovico poti.

Dediščina MW COE se ne bo opirala na pretekle dosežke, temveč na to, kako bo center še naprej usmerjal zavezništvo višje, dlje in bolj povezano v zahtevna operativna okolja, ki prihajajo.

Polkovnik Leon Holc
direktor Natovega centra odličnosti
za gorsko bojevanje (NATO MW COE)

Ten Years of the NATO Mountain Warfare Centre of Excellence

Mountain warfare (MW) has evolved from primitive skirmishes in inaccessible terrains into a highly specialized domain of military operations, shaped by geography, technology, and strategy. Historically, mountainous terrain has offered both sanctuary and strategic vantage points, from ancient tribal defences to the gruelling campaigns of World War I and II. The unique demands of high-altitude combat—logistics, mobility, endurance, and climate—prompted the development of elite mountain units and dedicated doctrines, especially in nations bordered by rugged frontiers.

Its importance surged in the 20th century, as the Alps, the Caucasus, and the Hindu Kush became theatres of critical military operations. In the post-Cold War and contemporary era, MW has maintained its strategic significance in NATO and beyond due to emerging hybrid threats, the resurgence of territorial disputes in mountainous zones, and the imperative for forces to operate in complex, extreme environments. Climate change, technological proliferation, and regional instability further heighten the need for resilient, interoperable, and adaptable MW capabilities.

Today, institutions like the NATO Mountain Warfare Centre of Excellence (MW COE) institutionalize lessons learned and drive doctrinal innovation, ensuring that mountain warfare remains not only a legacy of the past, but a vital competence for future multinational operations in the most demanding terrains.

In March 2025, the NATO Mountain Warfare Centre of Excellence (MW COE), located in Poljče, Slovenia, marks its tenth anniversary. This milestone is more than symbolic—it reflects a decade of operational maturation, doctrinal innovation, and multinational cooperation in one of NATO's most specialized and strategically critical domains: mountain warfare.

Accredited in 2015, the MW COE has become NATO's principal hub for mountain-specific expertise, training, and capability development. Its establishment is rooted in Slovenia's strong military legacy, particularly the formation of the 32nd Mountain Brigade in 1992 and the Mountain School in 1996. The vision for a NATO-accredited centre gained momentum in 2004, when the Supreme Allied Commander Transformation (SACT) encouraged Slovenia to take the lead. By 2011, a multinational framework was in place, and the Centre was formally launched in 2015 through the cooperation of Slovenia, Italy, Germany, and Croatia—with Austria joining as a partner nation. It has since expanded to include Romania, Poland, and the Czech Republic.

This institutional evolution reflects NATO's enduring commitment to interoperability and the recognition that mountainous terrain requires uniquely tailored capabilities. As the Alliance contends with a volatile global security environment—marked by contested terrain, hybrid threats, and the effects of climate change—the Centre's strategic relevance has grown steadily, much like the altitudes it was built to master.

NATO Centres of Excellence are not part of the Alliance's command structure, but they serve as multinational platforms for innovation and specialization. By contributing to doctrine development, education, experimentation, and training, they play a pivotal role in Alliance transformation. The MW COE exemplifies this function by safeguarding a niche capability that is both operationally demanding and geopolitically indispensable.

Central to the Centre's impact is the development of the Mountain Warfare Capstone Concept—a foundational document that integrates mountain warfare into NATO's broader operational architecture. It outlines the specific requirements of high-altitude operations, including mobility, sustainment, command, survivability, and increasingly, multi-domain integration.

The MW COE has also led the publication of ATrainP-6: Mountain Warfare Education and Training and contributed to the forthcoming ATP 3.2.1.3, both of which harmonize mountain warfare terminology, tactics, and procedures across the Alliance. These efforts ensure that mountain warfare is no longer the purview of a few alpine nations, but a standardized and deployable NATO capability.

The Centre‘s core educational philosophy does not simply revolve around designing training events, but rather on supporting and enhancing multinational exercises that are deeply embedded in the tactical and strategic realities of mountain operations. These exercises are shaped by real-world challenges—such as movement through steep passes, unpredictable weather, and increasingly, operations in subterranean environments, including natural caves, man-made tunnels, and underground logistics and weapons caches. These features add vertical complexity and tactical ambiguity to the battlefield, requiring precise coordination and specialized training.

A vital complementary element is the development of mountain-adapted wargaming platforms. These simulations help participants engage with high-risk scenarios involving limited visibility, constricted manoeuvre space, and hidden threats in underground systems—common across conflict zones where mountains double as sanctuaries and strategic fortresses.

To this end, the Centre delivers rigorous and multidimensional training programs that combine academic instruction with immersive field exercises. Participants—including officers and senior NCOs—are trained in mission command, decentralized leadership, and joint-domain awareness, while navigating the physical, logistical, and psychological constraints of complex mountainous battlespaces. This comprehensive approach fosters adaptability, resilience, and tactical cohesion across multinational formations operating in some of the most rugged and hostile environments on Earth.

To complement traditional instruction, new e-learning platforms have been launched to extend access to knowledge across NATO and Partner Nations. These digital tools allow pre-deployment learning and continuous education for dispersed or reserve

units. The MW COE has also expanded its staff ride program, an experiential learning method that combines historical analysis with terrain appreciation and tactical insight. Beyond the Isonzo Front, new rides in Romania and Montenegro explore key terrain tied to contemporary strategic concerns.

Further advancing its operational contribution, the Centre hosted an Operations Planning Course focused on integrating cyber, space, and information domains into mountain warfare planning—a vital step toward truly holistic, multi-domain operations. Importantly, the Centre now increasingly educates operational-level planners and commanders, embedding mountain-specific considerations into doctrine, logistics, and strategic planning—long before troops arrive at the ridgeline.

Aligned with NATO's Warfare Development Agenda, the MW COE is a leader in the digital transformation of mountain warfare. The Centre is adapting C4I systems to rugged topographies, advancing technologies like digital terrain modelling, autonomous logistics, and UAS-based reconnaissance. These innovations are critical in terrain that restricts mobility, line-of-sight communications, and conventional resupply methods.

The Centre also spearheads the integration of real-time weather intelligence, terrain risk modelling, and avalanche prediction into command systems, enabling commanders to make informed decisions in highly volatile environments. Underground features such as hidden caves or tunnel networks further complicate intelligence and manoeuvre—a problem the Centre actively addresses through technology-enabled solutions and doctrinal adjustments.

Mountains are more than physical barriers—they are geostrategic amplifiers. With 25% of Earth's landmass and 85% of borders traversing mountainous terrain, they shape conflict by influencing resource control, cross-border mobility, and asymmetric threat concealment. In many modern operational environments, adversaries leverage mountainous areas to build underground fortifications, concealed logistics routes, and resilient command posts.

NATO's mountain capability is thus not a luxury—it is a strategic imperative.

– Despite significant achievements, the MW COE recognizes persistent challenges:
– Capability Gaps: Disparities in training, doctrine, and equipment still inhibit full interoperability across the Alliance.
– Digital Dependency: Mountain terrain complicates secure communication, necessitating low-bandwidth, resilient C4ISR tools.
– Environmental Instability: Climate-related hazards, such as glacial retreat and avalanche unpredictability, demand real-time modelling and contingency planning.
– Legal-Ethical Complexity: Military operations must comply with international humanitarian law, especially in remote or civilian-sensitive alpine zones.

– At the same time, emerging technologies—like AI-assisted risk modelling, unmanned ground vehicles, and energy-autonomous systems—offer new ways to navigate terrain, reduce risk, and enhance operational tempo.
– The Centre continues to champion cognitive and emotional resilience, recognizing that leadership in the mountains is not only about endurance but about judgment, composure, and initiative under pressure. It continues to foster close ties with academia, industry, and civil protection services—extending mountain warfare capabilities into disaster relief, environmental security, and civil-military cooperation.

In its first decade, the NATO Mountain Warfare Centre of Excellence has transformed mountain warfare from a peripheral discipline into a strategic capability for the Alliance. By blending innovation with tradition, foresight with realism, the Centre has become an indispensable node in NATO's adaptation to 21st-century threats.

But as every mountaineer knows: reaching the summit is only half the journey.

The MW COE's legacy will not rest on past climbs—but on how it continues to lead the Alliance higher, further, and more cohesively into the challenging operational terrain that lies ahead.

Colonel Leon Holc
Director of the NATO Mountain Warfare
Centre of Excellence (NATO MW COE)

GORSKO BOJEVANJE

»Slovenska vojska bo ohranjala in v drugem razvojnem obdobju pospešeno razvijala tudi zmogljivosti gorske pehote, vključno s podporo Natovemu centru odličnosti za gorsko bojevanje.«

Resolucija o splošnem dolgoročnem programu razvoja in opremljanja Slovenske vojske do leta 2040 (ReDPROSV40-1), 2025.

MOUNTAIN WARFARE

»The Slovenian Armed Forces will maintain and accelerate the development of mountain infantry capabilities in the second development period, including support for NATO Mountain Warfare Centre of Excellence.«

Resolution on the overall long-term programme for the development and equipping of the Slovenian Armed Forces until 2040 (ReDPROSV40-1), 2025.

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Klemen Kocjančič

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UVODNIK

GORSKO BOJEVANJE GLEDE NA SODOBNE IN PRIHODNJE OBOROŽENE SPOPADE

Uvod

Gorsko bojevanje je ena najzahtevnejših oblik vojaških operacij. Nasprotujoče si sile se ne spopadajo le med seboj, temveč tudi z zahtevnimi naravnimi razmerami. Razgibana pokrajina visokih gora s strmimi pobočji, povezanimi z ozkimi dolinami, pečinami in ozkimi grebeni, v kombinaciji z visoko nadmorsko višino in nepredvidljivim vremenom močno vpliva na vse vojaške operacije, od logistične podpore do napadov na sovražnikove položaje.

V takem okolju niso edina nevarnost sovražnikove krogle ali granate, saj vojaki umirajo zaradi podhladitve, plazov, padcev in drugega, zato morajo biti izjemno pripravljeni, sposobni fizične vzdržljivosti in psihološko odporni, pri tem pa uporabljajo specializirano orožje ter opremo. Vojaki potrebujejo specializirano usposabljanje, da lahko preživijo na tako zahtevnem terenu in sodelujejo na bojnih misijah. Hkrati so gore navadno daleč od mestnih okolij, kar prispeva k omejeni logistični podpori, zato je treba več napora za prevoz vseh potrebnih zalog, od pitne vode, hrane in gradbenega materiala do orožja ter streliva. Prevoz v gore in po njih je navadno omejen na ozke ali strme poti, zaradi česar je mogoč le ročni transport zalog na višine s pomočjo vojakov ter vojaških živali.

Nato je na podlagi preteklih izkušenj in predvidevanja potrebe po razvoju novega znanja o gorskem bojevanju leta 2015 s podpisom memoranduma o soglasju ustanovil Natov center odličnosti za gorsko bojevanje (MW COE). Slovenija je delovala kot okvirna država, Hrvaška, Nemčija in Italija so se projektu pridružile kot sponzorske države, Avstrija pa je postala partnerska država. Center je 27. novembra 2015 dobil akreditacijo in postal 21. center odličnosti Nata. Trenutno v njem sodeluje osem držav, saj so se mu pozneje pridružile Češka, Poljska in Romunija. Glavna naloga centra je izboljšati zmogljivosti gorskega bojevanja držav članic Nata, partneric in mednarodnih organizacij, pri čemer se osredotoča na razvoj, vzdrževanje in izvajanje konceptov, doktrin in taktik, posebnih za gorsko bojevanje, spodbujanje

pridobivanja in izmenjave izkušenj, pridobljenih v gorskem bojevanju, podporo razvoju zmogljivosti za gorsko bojevanje, zagotavljanje celovitega izobraževanja in usposabljanja za gorsko bojevanje ter najsodobnejših rešitev za reševanje edinstvenih izzivov, ki jih predstavljajo gorska okolja, zagotavljanje varnosti, zaščite, interoperabilnosti in uspešnosti misij za sile, ki delujejo v scenarijih gorskega bojevanja (MW COE, 2023; Zupančič, Poklukar, Kolbl, 2015).

1 ZGODOVINA GORSKEGA BOJEVANJA

Zgodovinsko gledano mnoge vojaške kampanje ponazarjajo tako priložnosti kot tudi nevarnosti gorskega bojevanja.

Eden najzgodnejših primerov gorskega bojevanja je Hanibalov prehod zahodnih Alp s svojo kartaginsko vojsko leta 218 pr. n. št. Prehod Alp med drugo punsko vojno še danes velja za enega najslavnejših vojaških dosežkov v antiki (Mahaney, 2016).

Med Napoleonovimi vojnami je potekala italijanska in švicarska ekspedicija leta 1799 v gorskih regijah sodobne Italije ter Švice, kjer so se ruske sile bojevale proti Francozom (Statiev, 2019).

Zunaj Evrope je bilo prečkanje Andov generala Joséja de San Martína leta 1817 med špansko-ameriškimi vojnami za neodvisnost primerjano in povzdignjeno na isto raven kot Hanibalovo ter Napoleonovo prečkanje Alp (Lynch, 2001). Podobno se je Ruski imperij med letoma 1817 in 1864 bojeval proti lokalnemu prebivalstvu na goratih območjih Severnega Kavkaza (Gammer, 2013), Britanski imperij pa je poskušal razširiti svoje ozemlje v Afganistan (Lee, 2019).

Eno izmed najbolj preučevanih obdobij gorskega bojevanja je italijanska kampanja med prvo svetovno vojno. Fronta se je začela leta 1915, ko je Kraljevina Italija napadla Avstro-Ogrsko, boji pa so trajali do konca vojne leta 1918 in so potekali od meje s Švico do Tržaškega zaliva. Najpomembnejša dela fronte sta bili tirolska in soška fronta. Najpomembnejši dogodek na italijanski fronti, kar zadeva vojaško taktiko in strategijo, ostaja dvanajsta bitka na Soči (Kuhar, Torkar, 2018).

Med drugo svetovno vojno je tretji rajh napadel Norveško, pri čemer je bila bitka pri Narviku najbolj izrazit primer gorskega bojevanja (Ziemke, 1959). Pozneje se je vojna ponovno razširila na Kavkaz (Statiev, 2018) in italijanski Apeninski polotok (Lamb, 1993), nemške enote pa so se bojevale na gorskih območjih Jugoslavije (Trifković, 2022).

V zadnjem času sovjetska vojna v Afganistanu (Braithwaite, 2011) in nenehni spopadi med Indijo ter Pakistanom v Himalaji, zlasti na Kašmirju, Kargilu in ledeniku Siachen, kažejo, kako lahko gore vplivajo na sodobne spopade enako kot v preteklosti (Mohan, 2022). Zahodne države so v zadnjega pol stoletja doživele gorsko bojevanje med vojno za Falklandske otoke (Middlebrook, 2012) in se bojevale proti

talibanom ter Al Kaidi v Afganistanu med operacijo Enduring Freedom in poznejšo misijo Isafa (Degen, Reardon, 2021). Leta 2023 se je z vojno v Gorskem Karabahu, ki se je začela leta 1991, končal še en oborožen spopad, ki je potekal predvsem v gorskem svetu (Landgraf, Seferian, 2024).

2 IZZIVI GORSKEGA BOJEVANJA

Osnova gorskega bojevanja je geografija. Dinamični teren oblikuje bojišče in zaledje. Gibanje je na splošno omejeno za motorizirane in mehanizirane enote, zato so za gorsko bojevanje primernejše lahke pehotne enote. Naravne značilnosti dajejo prednost branilcu, ki lahko z razmeroma majhnimi silami izkoristi prevladujoče višine za nadzor dostopnih poti in nižje ležečih območij, kot so doline (Tannheimer, Lechner, 2022).

Strateško gledano gore pokrivajo približno četrtino zemeljske površine, vendar tam živi le približno deset odstotkov prebivalstva. Zaradi redke poseljenosti in omejene infrastrukture so bile gore vedno zatočišče za bandite, odpadnike, revolucionarje, borce za svobodo in/ali teroriste. Drugi pomemben element gora je izvor vodnih virov, ki nastajajo z zbiranjem padavin in taljenjem snega (Tannheimer, Lechner, 2022).

Na večjih nadmorskih višinah pomanjkanje kisika ne vpliva le na vojake in živali, ki se morajo ustrezno prilagoditi, temveč tudi na stroje. Razgiban teren, sneg in pomanjkanje naravnega kritja vplivajo na mobilnost ter tako na manevrsko sposobnost vojaških enot. Vojaške operacije so na splošno omejene na manjše enote, čeprav je mogoča tudi uporaba večjih enot, kot je bilo na primer v dvanajsti bitki na Soči. Gorsko območje vpliva tudi na logistični sistem, saj je treba vse prinesti na bojno črto na višji nadmorski višini, kar omejuje količino in kakovost zalog ter tako negativno vpliva na bojno moč (Tannheimer, Lechner, 2022).

Oborožene sile se poskušajo spopasti s posebnostmi gorskega bojevanja z ustanavljanjem specializiranih enot lahke pehote, ki jih navadno sestavljajo pripadniki z gorskih območij, ki so že navajeni na gore. Take enote, kot so Alpini v Italiji in Gebirgsjäger v Nemčiji, so deležne specializiranega usposabljanja, kot so plezanje, smučanje in preživetje v mrzlem vremenu in/ali gorskem okolju. Poleg tega sta orožje in oprema prilagojena, da lahko delujejo v takih težkih razmerah ali da predstavljajo čim manjšo obremenitev za vojsko. Gorsko bojevanje zahteva uporabo specializiranih taktik in doktrinarnih pristopov (Kaiser, 2016; Polanec, 2022).

Razvoj novih materialov in tehnologije pomeni novo priložnost tudi za gorske enote ter gorske operacije. Helikopterji lahko laže prevažajo stvari in enote po gorah, z njimi pa poskrbijo tudi za evakuacije ranjenih. Brezpilotna letala bodo imela pomembne funkcije ne le za nadzor in izboljšano komunikacijo, temveč tudi za neposredne kinetične akcije. Sateliti prav tako izboljšujejo komunikacijo, zlasti globoko v dolinah in soteskah, kjer ima tradicionalna radijska oprema omejen doseg,

ter nadzor terena. Natančno vodena streliva v kombinaciji z brezpilotnimi letalniki in sateliti bodo izboljšala natančnost artilerije. Novi materiali bodo izboljšali njihovo trajnost, hkrati pa bodo lažji. Podobno lahko nova oblačila, optimizirana za nošenje v hladnem vremenu, izboljšajo udobje vojakov in zagotovijo boljšo zaščito pred naravnimi elementi, s čimer preprečijo hipertermijo poleti in hipotermijo ali ozebline pozimi.

Kljub takim izboljšavam nam zgodovina kaže, da gorsko bojevanje ostaja delovno intenzivna dejavnost, saj od vojakov zahteva plezanje, kopanje in vzdržljivost. Posledično je gorsko bojevanje edinstvena in trajna oblika spopada, na katero vplivajo geografija, podnebje ter človeška prilagodljivost. Poudarja omejitve tehnologije in trajno pomembnost fizične vzdržljivosti, morale ter taktične iznajdljivosti, ko se spoprijemamo z nasprotnikom in še močnejšo naravo. Zgodovina kaže, da oborožene sile, ki niso pripravljene na gore, pogosto doživijo nesorazmerne izgube, tiste, ki obvladajo teren, pa lahko dosežejo izjemne dosežke.

3 PRISPEVKI

Članek **Petra Paplerja** z naslovom *Gorsko bojevanje in Natovi načrti odvračanja ter obrambe* raziskuje razvoj nacionalnih načrtov za slovensko obrambo v okviru Natovih načrtov za odvračanje in obrambo glede gorske vojne in temelji na zgodovinskih operacijah, ki so potekale v evropskih gorah. Tako načrtovanje je bistvenega pomena za vojaško interoperabilnost in integracijo zavezniških vojsk, da se zagotovi ustrezen odziv na sovražne grožnje v gorah.

Miha Kuhar je prispeval članek *Pretekli in prihodnji elementi gorskega bojevanja*. V njem raziskuje pomembne spremembe v dojemanju gorskega bojevanja, ki temeljijo na novih tehnologijah in strateških, operativnih ter taktičnih konceptih. Operativni koncept gorskega bojišča se je razširil čez gore in zdaj obstajajo možnosti za vključitev kopenskih, zračnih, pomorskih, kibernetskih in vesoljskih domen.

V članku *Od preteklosti do sedanjosti: Razvoj avstrijskih in avstro-ogrskih enot za gorsko bojevanje in trenutni izzivi* je **Christian Ortner** analiziral razvoj sodobnih avstrijskih gorskih enot. Od začetkov v Avstro-Ogrski do sodobne vojske so gorske enote vedno imele, imajo in bodo imele pomembno vlogo ter položaj v avstrijski vojaški tradiciji.

Italo Giacomo Spini je prispeval članek z naslovom *Od ledu in skale do tehnologije: kako se bodo morale gorske enote spopasti z izzivi nabora, usposabljanja in inovacij*. V članku se avtor osredotoča na razvoj in izboljšanje specializirane opreme, ki jo uporabljajo gorske enote. Poleg tega Spini v svoji analizi pokaže potrebo po multidisciplinarnem pristopu za izboljšanje opreme za vojaške operacije v gorah.

Zadnji članek, delo **Michała Barskega** in **Piotra Dąbrowskega**, z naslovom *Medicinske kompetence vojakov v gorah: študija primera poljskih oboroženih sil* se

osredotoča na zelo pomembno kategorijo gorskega bojevanja, in sicer dobro počutje vojakov, ki delujejo v ekstremnih razmerah. Gorski vojaki morajo biti v odlični zdravstveni kondiciji, da lahko preživijo in izvajajo vojaške operacije v gorah.

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EDITORIAL

MOUNTAIN WARFARE IN THE LIGHT OF CONTEMPORARY AND FUTURE ARMED CONFLICTS

Introduction

Mountain warfare represents one of the most demanding forms of military operations. Opposing forces face not only each other, but also harsh natural conditions. The rugged landscape of high mountains with steep slopes, connected by narrow valleys, cliffs, and narrow ridgelines, combined with high altitude and unpredictable weather, heavily influences all military operations, from logistical support to assaults on enemy positions.

In such an environment, an enemy's bullet, grenade, or shell is not the only danger; soldiers also die from hypothermia, avalanches, falls, etc. Such conditions demand extremely fit soldiers, capable of both physical endurance and psychological resilience, using specialized weaponry and equipment. Soldiers require specialized training to help them survive in such harsh terrain, let alone conduct combat missions. At the same time, mountains are usually located far from urban environments, which limits logistical support and necessitates greater effort in transporting essential supplies, such as drinking water, food, building materials, weapons, and ammunition. Transport to and within the mountains is usually restricted to narrow trails or goat paths, forcing reliance on manual effort, in the form of soldiers and pack animals, to move supplies to higher positions.

NATO, drawing on past experiences and recognizing the need to develop new knowledge regarding mountain warfare, established the NATO Mountain Warfare Centre of Excellence (MW COE) in 2015 with the signing of a Memorandum of Understanding. While Slovenia acted as the Framework Nation, Croatia, Germany, and Italy joined the project as Sponsoring Nations, and Austria became a Partner Nation. On 27 November 2015, the Centre received its accreditation and became the twenty-second NATO Centre of Excellence. Currently, eight nations are participating in the centre, with Czechia, Poland, and Romania joining in subsequent years. The Centre's primary mission is to enhance "the mountain warfare capabilities

of NATO member countries, partners, and international organizations," focusing on "developing, maintaining, and delivering mountain warfare-specific concepts, doctrines, and tactics; fostering the process of capturing and sharing lessons learned in mountain warfare; supporting the development of mountain warfare capabilities; providing comprehensive education and training for mountain warfare; delivering cutting-edge solutions to address the unique challenges posed by mountainous environments […]; ensuring the safety, security, interoperability, and mission success for forces operating in mountain warfare scenarios." (MW COE, 2023; Zupančič, Poklukar, Kolbl, 2015).

1 HISTORY OF MOUNTAIN WARFARE

Historically, many campaigns illustrate both the opportunities and the perils of mountain warfare.

One of the earliest examples is Hannibal's crossing of the Western Alps with his Carthaginian army in 218 BC. The crossing of the Alps during the Second Punic War is still regarded as one of the most celebrated military achievements in ancient times (Mahaney, 2016).

During the Napoleonic Wars, the Italian and Swiss expedition of 1799 was taking place in the mountainous regions of modern Italy and Switzerland, where Russian forces were fighting the French (Statiev, 2019).

Outside Europe, the Crossing of the Andes by the General José de San Martín in 1817, during the Spanish American wars of independence, was compared to and elevated to the same significance as Hannibal's and Napoleon's Alpine crossings (Lynch, 2001). Similarly, the Russian Empire fought the local population in the mountainous North Caucasus between 1817 and 1864 (Gammer, 2013), while at the same time, the British Empire tried to expand into Afghanistan (Lee, 2019).

One of the more studied examples of mountain warfare is the Italian campaign of World War I. The front opened in 1915, when the Kingdom of Italy attacked Austria-Hungary, and fighting continued until 1918, stretching from the Swiss border to the Bay of Trieste. The most significant sectors were the Tyrolian and Isonzo fronts. The Twelfth Battle of the Isonzo remains the most significant event of the Italian front in terms of military tactics and strategy (Kuhar, Torkar, 2018).

During World War II, the Third Reich invaded Norway, with the Battle of Narvik as the most prominent example of mountain warfare (Ziemke, 1959). Later, the war once again reached the Caucasus (Statiev, 2018), to the Italian Apennine peninsula (Lamb, 1993), and the mountainous areas of Yugoslavia where German units fought local forces (Trifković, 2022).

More recently, the Soviet war in Afghanistan (Braithwaite, 2011) and the ongoing skirmishes between India and Pakistan in the Himalayas—especially inKashmir, Kargil, and Siachen Glacier—demonstrate how mountains can shape modern conflicts just as much as ancient ones (Mohan, 2022). In the past fifty years, Western nations have experienced mountain warfare during the Falklands War (Middlebrook, 2012) and in Afghanistan against the Taliban and Al-Qaida during the Operation Enduring Freedom and later the ISAF mission (Degen & Reardon, 2021). In 2023, the Nagorno-Karabakh war, which started in 1991, ended another armed conflict, fought primarily in mountainous terrain (Landgraf & Seferian, 2024).

2 CHALLENGES OF MOUNTAIN WARFARE

At the core of mountain warfare lies geography. The dynamic terrain shapes the battlefield and the hinterland. Movement is generally limited to motorized and mechanized troops, making light infantry units are more suitable for mountain warfare. Natural features favour defenders, who can use dominating heights to control access routes and lower-laying areas, such as a valleys, with relatively small forces (Tannheimer, Lechner, 2022).

Strategically, mountains cover around one quarter of the Earth's surface, yet only around 10 percents of the population lives there. Sparse population and limited infrastructure have long mademountains a refuge for bandits, renegades, revolutionaries, freedom fighters, and/or terrorists. Mountains are also critical as sources of water, through rainfall accumulation and snowmelt (Tannheimer, Lechner, 2022).

In higher altitudes, the lack of oxygen affects not only soldiers and animals, who need to be properly acclimatized, but also machinery. Rugged terrain, snow, and lack of natural cover all affect mobility and thus the manoeuvrability of military units. Military operations are generally limited to smaller units, though larger operations, such as the Twelfth Battle of the Isonzo, are also possible. Mountain terrain also strains logistical systems, as everything must be transported to higher elevations, which limits the quantity and quality of supplies, and thus negatively affects the fighting power (Tannheimer, Lechner, 2022).

To address these challenges, militaries create specialized, light-infantry units, usually manned by personnel from mountainous areas, who are already accustomed to mountains. Such units, as the *Alpini* in Italy and the *Gebirgsjäger* in Germany, receive specialized training in climbing, skiing, and survival in cold weather and/or austere conditions.Weapons and equipment are modified to withstand and operate in harsh environments or to minimize burdens on troops. Mountain warfare requires specialized tactics and doctrinal approaches (Kaiser, 2016; Polanec, 2022).

The development of new materials and technology presents a new opportunity for mountain troops and mountain operations as well. Helicopters facilitate supply transport,troop movement and casualty evacuation in the mountains. Unmanned

aerial vehicles play vital roles not only in surveillance and communications, but also in direct, kinetic actions. Satellites enhance communication, especially deep in valleys and gorges, where radio range is limited, and assist in terrain surveillance. Precision-guided munitions, combined with UAVs and satellites, improve artillery accuracy. Newly developed materials enhance durability while reducing weight. Likewise, new cold-weather clothing improves soldiers' comfort and protection from the natural elements, preventing hyperthermia in summer and hypothermia or frostbite in winter.

Despite such improvements, history shows us that mountain warfare remains manpower-intensive, requiring troops to climb, dig, and endure.

In conclusion, mountain warfare is a unique and enduring form of conflict shaped by geography, climate, and human resilience. It demonstrates the limits of technology and the importance of physical endurance, morale, and tactical ingenuity when facing both the enemy and an even more powerful nature. History shows that armies unprepared for mountains often suffer disproportionate losses, while those who master the terrain can achieve remarkable feats.

3 ARTICLES

Peter Papler, in his article *Mountain Warfare and the NATO Deterrence and Defence Plans*, explores the development of national home defence plans within NATO's Deterrence and Defence family of plans regarding the mountain warfare and based on the historical operations, that took place in European mountain ranges. Such planning is vital for military interoperability and integration of allied militaries to ensure proper responses to adversarial threats in the mountains.

Miha Kuhar contributes the article *The Past and Future Elements of Mountain Warfare*. He explores significant changes in the perception of mountain warfare driven by new technologies and by strategic, operational and tactical concepts. The operating concept of the mountainous battlefield expanded beyond just the mountains, opening the opportunities to incorporate land, air, maritime, cyber and space domains.

In the article *From Past to Present: Development of Austrian and Austro-Hungarian troops for mountain warfare and present challenges*, **Christian Ortner** analyses the development of modern Austrian mountain troops. From their Austro-Hungarian origins to modern military, mountain troops have always held, and will continue to hold an important role and position in Austrian military tradition.

Italo Giacomo Spini contributed an article, titled *From Ice and Rock to Technology: How Mountain Troops Will Need to Face the Challenge of Recruitment, Training, and Innovation*, which focuses on the development and improvement of specialized equipment used by mountain troops. His analysis highlights the need for a

multidisciplinary approach to improve equipment needed for military operations in mountains.

Finally, **Michał Barski** and **Piotr Dąbrowski**, in their article *Medical Competencies of Soldiers in the Mountains: A Case Study of the Polish Armed Forces*, address the very important issue of mountain warfare – soldiers' wellbeing in extreme environment. Mountain soldiers need to be in excellent medical condition to survive, let alone conduct military operations in the mountains.

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GORSKO BOJEVANJE IN NATOVI NAČRTI ODVRAČANJA TER OBRAMBE

MOUNTAIN WARFARE AND THE NATO DETERRENCE AND DEFENCE PLANS

Povzetek Cilj članka je razviti spoznanja na podlagi analize zgodovinskih operacij, ki so potekale v evropskih goratih območjih in so bistvene za načrtovanje nacionalne obrambe v okviru Natovih načrtov odvračanja in obrambe. Ugotovitve teh zgodovinskih primerov jasno kažejo na problem skupnih operacij oboroženih sil, ki ga morajo obrambni načrtovalci ustrezno vključiti v svoje državne obrambne načrte. Evropske gorske verige vključujejo območja na Madžarskem, Norveškem, Poljskem, Slovaškem, v Romuniji in Sloveniji. Pri tem ima Natov center odličnosti za gorsko bojevanje pomembno vlogo kot zagovornik gorskih enot Nata – tako pri pripravi in izvajanju Natovih načrtov kot pri razvoju doktrine gorskega vojskovanja v večdomenskem okolju ter pri uveljavljanju Natovih politik v Republiki Sloveniji.

Ključne besede ***Gorsko bojevanje, nacionalni načrti za domačo obrambo, družina načrtov Nata za odvračanje in obrambo.***

Abstract The aim of this article is to develop insights based on an analysis of historical operations that took place in European mountain ranges, which are essential for national home defence planning within NATO's Deterrence and Defence family of plans. The conclusions from these historical examples unequivocally demonstrate the Joint Force Operations problem, which defence planners must adequately address in their state defence plans. European mountain chains include those in Hungary, Norway, Poland, Romania, Slovakia and Slovenia. The role of the Mountain Warfare Centre of Excellence, as a NATO Mountain Units advocate in preparing for the execution of the NATO Family of Plans and contributing to the development of mountain warfare doctrine in a Multi-Domain environment, as well as advocating NATO policies in the Republic of Slovenia, appears to be of key importance.

Key words ***Mountain Warfare, National Home Defence Plans, NATO Deterrence and Defence Family of Plans.***

Introduction

> *"To deny a science of war and then to theorise on war as an art is pure military alchemy, a process of reasoning that for thousands of years has blinded the soldier to the realities of war and will continue to blind him until he creates a science of war upon which to have his art."* (Fuller, 1993).

Mountain warfare has a thousand-year history, so there is enough empirical evidence to avoid military alchemy for the science of war; however, it still presents numerous challenges to military operations and the art of war. History has shown that the mountain environment has decreased combat strength, caused more casualties to us than to the enemy in some operations, and significantly influenced military, operational and battlefield strategies. The forms of strategy (Kasubaski, 2019) which affect the military are: grand strategy, security strategy, military strategy, operational strategy, and battlefield strategy (tactics).

Žabkar (2003, p 163) presents a structured conceptualization of war as a system of campaigns, underscoring the hierarchical and functional relationship between strategy, operational art, and tactics. He defined a campaign as a system of operations—composed of a combination of distinct military operations—which may be conducted either sequentially or concurrently. An operation, as a constituent element of a campaign, is carried out within a designated area of operations (the battlefield), itself a subset of the broader theatre of war, and may be further deconstructed into a system of battles.

To illustrate the systemic nature of war through the lens of campaign design, Žabkar (2003, pp 159–162) provides a historical case study of the Central Powers (Germany, Austria-Hungary, the Ottoman Empire, and Bulgaria) during the First World War. He outlines the segmentation of the war effort into multiple strategic campaigns: the Western Front, the Eastern Front, the South-Western Front, the Southern Front, the South-Eastern Front, maritime campaigns, and operations on the African continent. The focal point of the article is the analysis of the campaigns conducted on the Eastern and South-Western Fronts.

Operational strategy, the primary focus of this article, is the art and science of planning, orchestrating, and directing military campaigns within a theatre of operations to achieve national or coalition security objectives. Operations as part of warfare do not have their own logic, but they have their grammar[1], and the grammatical rules are used in this article. Mountains significantly influence operations and battlefield strategy, as well as all warfighting functions, particularly movement and manoeuvre, sustainment of operations, and force protection.

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[1] *Carl von Clausewitz (1976, pp 605) stated that war has "its own grammar, but not its own logic". The analogy highlights that the "grammar" of war, like the grammar of a language, refers to the established methods and practices, while the "logic" refers to the underlying purpose and goals. Clausewitz' analogy is used in the article for operational strategy as part of war.*

World War I revolutionised warfare through the introduction of new techniques and highly advanced weapons systems, and set roots for operational art and science (Tucker and Jordan, 2016). It was also the first time that great armies fought each other in such extended mountainous terrain over years in ruthless static warfare. Besides the Alps, campaigns also took place in the Carpathian Mountains. World War II mimicked World War I in that great armies also fought in mountainous terrain.

NATO's new Strategic Concept acknowledges that Russia and terrorist groups are the Alliance's two main threats, and reaffirms the Alliance's commitment to the security of all the Allies and a peaceful Euro-Atlantic Area. NATO's Strategic Concept is supported by a new military concept – the Concept for Deterrence and Defence of the Euro-Atlantic Area (DDA). Approved in June 2020 (Covington, 2023), the DDA is a strategic redesign of the Alliance's approach to deterrence and defence, which had been relied upon since the end of the Cold War. The DDA's peacetime activities and operations in defence are guided by the principles that no country or non-state actor will achieve an advantage over the Alliance in capability, readiness, or geography; no Ally will be alone to address the threats and challenges of this era; and all the Allies will defend every inch of Alliance territory.

These fundamental principles are reflected in the DDA's military activities in times of peace, crisis, and conflict. When it comes to adapting National Home Defence and Alliance plans (Covington, 2023), it is vital—especially for countries situated on or bordering mountainous terrain—that mountain warfare is appropriately addressed.

Mountain warfare continues to be present in all significant military conflicts around the globe. However, NATO has limited experience in mountain warfare at an operational level, particularly in addressing large mountain chains. India and China, in addition to their numerical superiority, have vastly more experience with operations in mountain environments and large mountain chains. The operating environment is so complex and uncertain that the experience and mental models from NATO's Cold War era or NATO's War against Terrorism are of limited use.

The Allied Joint Doctrine for Land Operations (AJP 3.2, Edition B) from 2022 addresses mountain warfare specifics as joint operations; so, a joint force, all-domain challenge. According to the Doctrine, mountainous environments are areas with extremely uneven terrain characterised by high, steep-sided slopes and valleys, which may cover a large area. Towns and other built-up areas are concentrated in the valleys. Some mountain ranges are situated in desert regions, where temperatures fluctuate between extreme heat in the summer and extreme cold in the winter. In tropical regions, small to medium mountains are covered in lush jungles with deep ravines which flood during the rainy season. Different mountain chains have different types of climate, but in general, their height means that the weather conditions are highly changeable.

As NATO transitions its focus towards large-scale combat operations against a peer threat, the current Doctrine references five operational domains: land, maritime, air, space, and cyber. Mountain operations reside within the land domain, despite being a Joint Forces challenge. There is no NATO Mountain Division or Core HQ, nor force structure adaptation related advice such as, for example, every Land Core HQ should have a Mountain Brigade in their structure or similar. NATO doctrine, as outlined in ATP 3.2.1.3., Conduct of Land Operations in Mountainous Environments, of 2024, often minimises its importance and capabilities at the operational level; however, it significantly contributes to the understanding of selected challenges in mountain warfare. The most current NATO doctrine, from a tactical perspective, focuses on tactics, techniques, and procedures while ignoring the operational and strategic implications. Mountain warfare is a complex, joint forces operational problem requiring a different cognitive framework and operational strategy to exploit the mountain terrain. At the operational level, warfighting in the mountains contradicts all commonly used mental models, planning considerations, and time horizons.

This article aims to shed light on how mountain ranges and mountain warfare should be addressed within the DDA family of plans, if it all, with a focus on critical operational directions or approaches in the European theatre of war. It is known that the Alliance (Deni, 2024) has strategic, domain-specific, and regional deterrence and defence plans, whose designers should take note of the specifics of mountain warfare.

The article's purpose is not to discuss the NATO Strategic Concept or the NATO DDA concept, or to analyse the operational planning process or the effectiveness of deterrence and defence efforts. However, operational strategy and NATO's mountain warfare alignment in the DDA family of plans must be informed by historical campaign insights in parallel with the implementation of the NATO Multi-Domain Operations (MDO) concept; the findings can undoubtedly serve as a foundation for future informed discussions at conferences, wargames, and plans rehearsals—whether focused on DDA or National Home Defence Plans (NHDPs).

1 METHODOLOGY

Mountain warfare was examined in depth in the undergraduate thesis of Zaletel (2008), who approached the subject through both theoretical frameworks and spatial-geographical analysis. He investigated the characteristics of mountain warfare prior to the outbreak of the First World War, while also engaging with key classical theorists of war—Henri de Jomini, Sun Tzu, and Carl von Clausewitz—highlighting their respective interpretations of warfare in mountainous terrain. In the analytical section of his work, Zaletel conducted a detailed operational and tactical assessment of the battles along the Isonzo Front, providing insights into the conduct of high-altitude combat and its implications for military doctrine and planning.

Surprisingly, despite the relatively significant role of mountain ranges in the European theatre, authors up to the end of the last century did not study mountain warfare at the operational level of war[2], nor the concepts and doctrines of defence and attack supported by natural obstacles. It is as if operations such as those on the Isonzo Front or in the Carpathians were believed to be unrepeatable. Instead, counterinsurgency warfare was studied extensively with, from the author's perspective, a lack of operational-level insight. In recent times, the focus has shifted to high-intensity warfighting—likely in the light of the Washington Treaty and leaders' declarations that the Alliance would defend every inch of the member states' territory.

An article review found that Torkar and Kuhar (2020 and 2023) have already extensively researched the 12th Isonzo Offensive, in major part from a tactical perspective with some additions related to operational strategy. The Isonzo Front, therefore not covered by the case studies, stretched along the Soča (Isonzo) river in modern-day Slovenia[3] and north-eastern Italy, and witnessed twelve major offensives between June 1915 and October 1917. Italy, a late entrant into the war on the side of the Entente, sought to break through the Austro-Hungarian defensive lines, entrenched in mountainous terrain, to reach the Karst plateau and ultimately advance toward Trieste and through Postojna[4] to Ljubljana.

The Battle of Caporetto, as shown in Figure 1 (see p 108), was a landmark in modern military history, marked by its demonstration of shock infiltration tactics, strategic surprise, and psychological warfare. German stormtrooper doctrine (Schindler, 2001)—characterised by small unit initiatives, deep penetration, and close air/artillery coordination—rendered conventional linear defences obsolete. Italy's static and poorly coordinated defence structure crumbled under pressure, compounded by inadequate communication and leadership paralysis. The collapse nearly forced Italy out of the war.

The Vision of Mountain Units in Slovenia, focused on the tactical level, was described in Polanec's (2024) paper. He argued that the history of mountain units in the Republic of Slovenia concentrates more on the mountain battalion and brigade in Bohinjska Bela, focused on the Julian Alps, and less on the mountain battalion

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[2] *There are a limited number of military history books which describe battles and operations in enough detail to allow operational analysis. The case study analyses below are based on these military history books as secondary sources; they are indicated in each case study separately. The operational assessment chapters in each case study are the authors' conclusion from only the historical operation assessment. The theoretical background for the operation analysis was from Milan Vego's articles: the first related to operational art (2017), and the second on the role of history in the development of operational ort (2010).*

[3] *Slovenia, with its geographical position in the European heartland and strategic role as the guard of the Postojna Gate, must answer the question of "how to defend and keep open the Postojna Gate until Allied reinforcement in forces, fires, or effect arrives" in the NHDP. The Postojna Gate is a southern door to Central Europe and key terrain for reinforcing NATO's eastern flank from the south.*

[4] *Postojna (in Map 1 it is identified by its historical name Adelsberg) was the location of the World War I Austro-Hungarian Second Army Headquarters, under the leadership of Field Marshal Boroević. The Postojna Gate was defended on the surrounding passes of the Alps. The historical mission of guard of the Postojna Gate in Slovenia was inherited from the Austro-Hungarian Empire, later from the Kingdom of Italy, and then from Socialist Yugoslavia.*

in Kranj, which was focused on Jože Pučnik Airport and the adjacent Karavanke mountain range. He also outlined a vision for the development of mountain units primarily intended for the independent defence of Slovenia, while also noting the role of Allied defence.

The vision of the MW COE, as a multinational military organization, was presented in Contemporary Military Challenges (Zupančič et al., 2017). The Centre aims to become NATO's central expert institution for acquiring knowledge and insights on mountain warfare. It is intended to ensure excellence and expertise in training individuals and units, supporting doctrine development, learning from experience, conducting research, standardising units for mountain warfare, and restructuring units for effective mountain warfare operations. The Centre's first decade of successes focused on training and doctrine. Conceptual thinking related to mountain warfare, given deterrence and the defence of NATO territory, will fall within the next decade.

The article examines how historical military campaigns in European mountain ranges can be used as a tool to understand mountain warfare at the operational level. It can help staff officers analyse NATO's designated capabilities, develop realistic options for planners and commanders, and set the foundation for NATO's Concept of Multi-Domain Operations (MDO) in mountain environments. The research focuses on the role of mountain ranges in land operations and how they influence the outcomes of battles and campaigns.

A historical case study method was used. The analysis employs the campaign's phases and elements of the operational level of warfare which influenced the land domain campaigns and operations. An operation analysis covered the examination of certain operational factors which affected the campaign's success or failure. These include (Vego, 2006):

– Operational Reach with a culminating point;
– Operational Leverage with critical factors and centre of gravity[5];
– Operational Manoeuvre;
– Operational Risk.

Operational Reach refers to the ability to achieve success through the balance of endurance, momentum and protection by extending and projecting combat while avoiding culmination. Operational Leverage refers to the relative speed and rhythm of military operations over time, particularly in relation to the enemy. Operational manoeuvre addresses the movement and employment of forces at the operational level. Risk is defined as the probability of loss linked to a hazard.

[5] *The Centre of Gravity (COG) is where the mass is concentrated (Clausewitz, 1976, p 485). It is the most effective target for a blow and the defeat of the enemy. What is the centre of gravity in combat? The hub of all power and movement, on which everything depends. That is the point against which all energy should be directed. In this article Allies' capital cities are indicated as strategic COG and main population centres only as an indication of "forces, fires and effects" at geographical approaches as operational COG.*

Vego (2017) argues that military history is vital for professional development, offering indirect experience and operational insight, especially for leaders unlikely to gain real-world combat exposure at higher command levels. The key prerequisites for applying operational art are a complete knowledge and understanding of its theory as part of military science, and this theory cannot be adequately developed without mastery of military history. The opportunities to acquire direct experience in combat are few for any commander. Military history is a primary source of such experiences. History serves as a foundation of knowledge because it illustrates how humanity repeats its mistakes, and highlights the nature of those mistakes. It can show us what to avoid, but it cannot tell us how to prevent it. The greatest danger to the proper application of historical knowledge is the propagation of censored and propagandistic history. The critical study of past wars, campaigns, and significant operations, in particular, is a primary source for developing operational art rather than military alchemy. The methods of accomplishing operational or strategic objectives which were effective in the past may be obsolete today; however, the fundamentals of strategy or operational art remain essential, just as they were in the past.

2 HISTORICAL CASE STUDIES

The following research examines historical examples of mountain operations and campaigns, including the WWI campaigns in the Carpathian Mountains and WWII joint operations along Norway's Scandinavian Mountains.

2.1 Mountain campaign in the historical region of Galicia – Eastern Carpathians – World War I (Figure 2, see p 108: December 1914 – April 1915)

The Carpathian Mountains campaign of 1914–1915 stands as a brutal example of attritional warfare in the mountains during World War I, and is a historical showcase for the consequences of not all forces being equipped and trained for mountain warfare. The campaign highlighted the risks of conducting offensive operations in mountainous terrain without adequate preparation, logistics, or coordination. Despite immense sacrifices, the Austro-Hungarian objective to relieve Przemyśl failed, and their forces suffered irreplaceable losses. Following the Austro-Hungarian defeats at Lemberg (Lviv) and the encirclement threat to the key fortress city of Przemyśl (Herwig, 2009), the Carpathian mountain campaign emerged as a desperate attempt by Austria-Hungary to halt the Russian advance and relieve its besieged garrison. The Carpathian Mountains, a formidable terrain barrier with narrow valleys, dense forests, and snowbound passes (Buttar, 2014), became the site of sustained and gruelling winter warfare. This theatre involved high-altitude combat under extreme weather, often without adequate supply or shelter.

2.1.1 Operational overview

- Campaign Name: Carpathian Winter Campaign/Carpathian Operations Eastern Front – Carpathian Mountains, Galicia (modern-day southern Poland, western Ukraine, and Slovakia)
- Forces Engaged:
  - Central Powers: Austro-Hungarian Army (2nd and 3rd Armies), supported by German Southern Army;
  - Russian Empire: Russian 8th, 11th, and 9th Armies (South-Western Front under General Nikolai Ivanov).
- Austro-Hungarian Objectives:
  - Prevent further Russian penetration into Hungary via mountain passes;
  - Break the siege of Przemyśl Fortress;
  - Stabilise the collapsing Eastern Front after the 1914 defeats.
- Russian Objectives:
  - Maintain pressure across the Carpathians;
  - Exploit Austro-Hungarian weakness to advance into Hungary;
  - Capture Przemyśl and disrupt enemy logistics.

2.1.2 Terrain and environmental conditions

- Altitude: Up to 2,000 metres; primary operational zones along the Dukla, Uzsok, and Lupkow Passes;
- Climate: Sub-zero temperatures, snowstorms, severe cold;
- Terrain: Rugged ridges, forested slopes, deep snow, mud;
- Logistics: Inadequate road networks – reliance on pack animals and human porters; aerial resupply largely unavailable.

2.1.3 Campaign chronology

Phase 1 – Initial Austrian Offensive (December 1914 – January 1915):

- Austro-Hungarian 3rd Army attempted to force the Russian-held passes;
- Attacks faltered due to terrain, lack of winter equipment, and determined Russian defence;
- German Southern Army began arriving to stabilise the front.

Phase 2 – Escalation and Counterattacks (February 1915):

- Austro-Hungarian high command, under General Conrad von Hötzendorf, ordered renewed attacks to relieve Przemyśl;
- Human wave assaults were executed in deep snow with minimal cover and artillery support;
- Russian counterattacks inflicted massive casualties; both sides fought for the control of ridgelines and key passes (Dukla, Uzhok, Mező-Laborc).
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Phase 3 – Siege Collapse and Attrition (March 1915):

- Russian siege of Przemyśl succeeded (22 March); 120,000 Austro-Hungarians captured;
- Mountain fighting intensified along the entire Carpathian arc;
- Front lines devolved into static attrition, characterised by trench warfare, sniper tactics, and close combat in forests.

Phase 4 – Exhaustion and Stalemate (April 1915):

- Spring thaw turned mountain terrain into a quagmire;
- Both armies were exhausted, suffering from logistical collapse, disease, and frostbite;
- No decisive territorial gains were made; both sides were severely weakened.

2.1.4 Order of battle

Austro-Hungarian Forces:

- Approximately 400,000 troops committed across the three Carpathian offensives;
- Heavy reliance on Czech, Slovak, and Hungarian conscripts;
- Limited mountain training; minimal cold-weather gear.

Russian Forces:

- Estimated 300,000 troops in the Carpathian sector;
- A defensive strategy centred on dominating ridgelines and defiles;
- Some units were better adapted to cold and the terrain conditions.

2.1.5 Casualties and losses

- Austro-Hungarian Army:
  - Estimated 800,000 total casualties (combat, disease, frostbite, starvation) across the winter and spring of 1915;
  - Tens of thousands perished due to exposure alone.
- Russian Army:
  - Estimated 450,000 casualties, including combat and non-combat attrition;
  - Significant loss of material and manpower, but held ground.

2.1.6 Outcome and consequences

- Operation Outcome: Indecisive; no breakthroughs achieved by either side.
- Strategic Outcome:
  - Russian forces held Carpathian positions and eventually captured Przemyśl;
  - The Austro-Hungarian Army suffered catastrophic manpower and morale losses;
  - This led to increased German military control on the Eastern Front, a precursor to the Gorlice-Tarnów offensive.

- Operational Characteristics:
  - The campaign was marked by *extreme environmental hardship* and *logistical inadequacy*;
  - Limited use of artillery due to terrain; most engagements are close-range and infantry-dominant;
  - Human wave tactics resulted in a high body count with minimal gains;
  - Notable failure of planning and command by the Austro-Hungarian High Command.

2.1.7 Operation assessment

The expansive terrain, inclement weather, and minimal road infrastructure severely limited the ability of either side to sustain operations deep into enemy territory. The Russian forces, after achieving early victories at Lemberg, quickly found themselves overstretched. Their lines of communication and supply, extending from the interior of the Russian Empire into the Carpathian arc, proved inadequate for sustained pressure. The Russian formations, poorly supplied and fatigued by long marches through forested and snowbound terrain, lost operational coherence during the winter campaigns of 1914–15. The Austro-Hungarian and German forces, benefitting from shorter interior lines and more developed logistics along the Hungarian plain, were able to reinforce rapidly through the Uzhok, Dukla, and Lupkow passes. The German rail mobilisation, in particular, enabled timely operational concentration despite the harsh winter conditions.

The Central Powers, which had division and core formations with one mountain battalion by design, but which were generally not equipped and trained for mountain warfare, recovered their leverage through positional defence and counterattack. By late 1914, Austria-Hungary's second encirclement of the key fortress city of Przemyśl (Herwig, 2009) marked the emergence of the Carpathian Mountain campaign as a desperate attempt to halt the Russian advance and relieve its besieged garrison. Austro-Hungarian units created resistance nodes that halted Russian advances. The Galician Campaign illustrates the perils of linear doctrine and centralised command in mobile, mountainous warfare. Modern forces operating in European mountain regions must prioritise manoeuvre warfare principles in a multi-domain environment: initiative, speed, concentration, and strategic flexibility.

2.2 Mountain warfare in Romania – World War I (Figure 3, see p 109: August 1916 – early 1917)

The Romanian Carpathian campaign of World War I offers enduring lessons in mountain warfare and operational art. The Central Powers' success was achieved through the rapid exploitation of gaps, flexible command, and focused effort. In August 1916 (Torrey, 1998), Romania entered the war on the side of the Entente. Its main strategic goal was to reclaim Transylvania, then part of the Austro-Hungarian Empire. Romania launched an offensive across the Carpathians into Transylvanian territory. The campaign quickly shifted to defensive mountain warfare as the Central

Powers counterattacked from the west and south. Control of the Carpathian Mountain passes was vital. These passes served as geographic chokepoints and operational corridors for invasion or defence. They offered rugged terrain which favoured entrenched defenders, but demanded high logistical capacity and specialised tactics from all combatants.

The failure in the Carpathians had strategic implications for Romania and the Entente. Bucharest fell in December 1916, and the Romanian front collapsed, only to partially stabilise in Moldavia with Russian aid. The Carpathian failures showed an advantage for the Central Powers with mountain units in formation, and a weakness for the Entente in the absence of mountain units. Furthermore, it exposed the limitations of mountain offensives unsupported by robust logistics, deep manoeuvre options, and operational depth. Romania's defeat allowed the Central Powers to reallocate forces to other fronts. It also showcased the importance of operational coherence in multifront, coalition-based warfare—something Vego (2010) identifies as critical in aligning national strategy with campaign design.

2.2.1 Operational overview

Conflict: First World War – Romanian Campaign

Geographical Focus: Southern and Eastern Carpathians, Transylvanian Alps, Prahova Valley, Jiu Valley

Belligerents:

- Entente Powers: Kingdom of Romania (supported later by Russia)
- Central Powers: German Empire, Austro-Hungarian Empire, Ottoman Empire, Kingdom of Bulgaria

2.2.2 Terrain and environmental conditions

- Terrain: Narrow mountain passes, steep ridges, dense forests, and variable altitudes;
- Climate: Operations took place in autumn and winter, characterised by severe cold, heavy snow, and fog;
- Supply chains were hampered by a lack of roads and railway lines, and reliance on mule trains and human porters;
- Communications were dependent on runners and telegraph lines strung across exposed terrain.

2.2.3 Campaign chronology

1. Petroșani and Jiu Valley (October–November 1916):

- Romanian forces initially advanced into Transylvania;
- German General Falkenhayn led a coordinated counteroffensive;
- Harsh weather, narrow valleys, and Romanian resistance slowed progress;

– Mountain troops engaged in hand-to-hand combat amid ridges and forests;
– Romanian defence eventually broke under artillery and flanking assaults.

2. Bran-Câmpulung and Prahova Valleys:

– Central power troops used the mountain valleys for a southward advance toward Bucharest;
– German Alpine and Austro-Hungarian Gebirgsjäger units were employed in complex alpine operations;
– The Romanian defensive lines used fortified crests, minefields, and snipers in forested high ground;
– Severe winter conditions in late 1916 caused attrition due to exposure and frostbite.

3. Oituz and Trotuș Passes (December 1916 – January 1917):

– Romanian forces, with Russian assistance, stabilised the northern Carpathian flank;
– The Central Powers attempted breakthroughs to encircle the Moldavian front;
– Romanian mountain units carried out practical delaying actions and counterattacks in snow-covered high terrain;
– The terrain made the use of heavy artillery impossible; emphasis was placed on mortars, grenades, and infantry movement via switchbacks and goat paths.

2.2.4 Order of battle

Romanian Forces:

– Light infantry and *vânători de munte* (mountain hunter) units;
– Familiarity with the terrain enabled guerrilla-style ambushes and defensive fortification of crests and ravines;
– Limited artillery due to terrain constraints;
– Difficulties in supply, coordination, and mobility limited the ability to conduct extended operations.

Central Powers:

– Specialised Alpenkorps, Gebirgsjäger, and Austro-Hungarian Mountain troops;
– Support by pack artillery, mountain engineers, and aerial reconnaissance;
– Emphasis on flanking Romanian positions by ascending parallel ridgelines;
– Use of coordinated pressure from multiple passes to the thin Romanian lines.

2.2.5 Casualties and losses

– Romania and the Entente: Tens of thousands of casualties, many from exposure and exhaustion in addition to combat;
– Central Powers**:** Similar losses; the Austro-Hungarian forces, in particular, suffered heavy attrition in the mountain passes.

2.2.6 Outcome and consequences

- Operation Outcome: the Central Powers breached the Carpathian defences, advancing into southern Romania;
- Strategic Consequences: The fall of Bucharest in December 1916. However, the Romanian defence in the Moldavian Mountains stabilised the front;
- The Romanian Army regrouped in north-eastern Romania and later reformed with French military support in 1917;
- The mountain campaign inflicted heavy casualties on both sides, showcasing the brutality of mountain warfare in World War I.

2.2.7 Operation assessment

Mountain warfare in Romania during World War I highlighted the complexity of sustained operations in high-altitude terrain. Both sides suffered from the dual challenges of enemy action and environmental exposure. The Romanian forces defended the rugged positions exceptionally, despite strategic setbacks, while the Central Powers employed superior coordination and specialised troops but were frequently stalled by the terrain.

The campaign exemplified the attritional nature of mountain operations, where ground gains were measured in metres, and survival often depended as much on supply and adaptation as on firepower and tactics. The Romanian forces entered the war with ambitious aims, but lacked a coherent operational doctrine aligned with their capabilities and terrain. The campaign in the Carpathians began with promise—the Romanian advances into Brassó (Brașov) and Székelyföld (Tinutul Secuiesc) threatened deep penetration. However, the campaign rapidly stalled due to weather and logistical constraints, as well as growing resistance.

By November 1916, German and Austro-Hungarian troops had launched a coordinated counteroffensive from multiple axes—south from Predeal, west from Petrosani, and east through the Olt and Trotuș valleys. These attacks overwhelmed the Romanian formations, which lacked depth, mobility, and operational reserves. The failure to secure operational continuity meant the initial tactical victories yielded no strategic gain. The Central Powers' operational art, rooted in mobility, deception, and the integration of terrain, overwhelmed Romania's rigid, linear approach. Romania, while defending its home terrain, lacked sufficient mountain-trained troops and logistical infrastructure. Defensive positions were often overrun due to poor coordination and lack of fire support. The terrain favoured the defenders, but the attackers' superior tactics and initiative reversed this advantage. Romania's failure was not due to a lack of courage, but rather to poor strategic cohesion, centralisation, and an inability to adapt. For modern European forces, the campaign highlights the importance of geography, particularly in terms of joint forces alignment and land domain mountain units—a terrain alignment.

2.3 German Invasion of Norway – Operation Weserübung Norwegian Campaign – World War II (Figure 4, see p 109: 9 April – 10 June 1940)

The German invasion of Norway (Derry, 1952) aimed to secure access to Swedish iron ore via the port of Narvik and establish operational naval and air bases along the Norwegian coast. Control of Norway would deny the Royal Navy a northern flank, and secure the German lines of maritime communication in the North Atlantic and Arctic Oceans. Operation Weserübung required a bold extension of operational reach over vast maritime and mountainous terrain. Germany projected its force across 1,200 kilometres of the North Sea and the Norwegian coastline using a synchronised air-sea-land campaign. Despite lacking naval superiority, Germany used fast ship convoys supported by Luftwaffe dominance to deliver troops directly into key ports. The Gebirgsjäger mountain units were rapidly inserted inland to secure the passes and critical road junctions.

The German campaign in Norway (Deighton, 2000) was a bold and innovative example of joint operations featuring air, land, and sea coordination with an emphasis on surprise and tempo. Despite heavy naval losses and sustained resistance in central and northern Norway, the operation achieved its operational objectives. The Luftwaffe's rapid deployment and Germany's willingness to utilise airborne and special operations forces signalled a new form of modern warfare. However, the cost to the Kriegsmarine was severe, limiting German seaborne operations for the remainder of the war. The Norwegian defence forces, underprepared and ill-equipped, mobilised approximately 15,000 active troops with outdated weaponry and limited air or naval support. British and French expeditionary forces arrived to support Norway, contributing an additional 38,000 troops, including elite Allied troops. However, the Allied operations were hampered by disjointed command structures and poor terrain awareness. This force asymmetry, along with German doctrinal and logistical integration, would define the operational outcomes of the mountain battles and joint campaigns across Norway.

2.3.1 Operational overview

- **Name:** *Operation Weserübung* (Weser Exercise)
- **Belligerents:**
  - **Attacker:** Nazi Germany (Wehrmacht: Heer, Kriegsmarine, Luftwaffe)
  - **Defenders:** Kingdom of Norway, with Allied support (United Kingdom and France)
- **Objectives**
  - Seize the major Norwegian ports (Oslo, Bergen, Trondheim, Narvik, Kristiansand, Stavanger, Egersund) by a combined air and sea assault;
  - Prevent Allied occupation of Norway;
  - Establish a pro-German government and suppress Norwegian resistance.

2.3.2 Terrain and environmental conditions

– Terrain: Scandinavian Mountains – steep, snowy, and sparsely connected;
– Climate: Operations took place in spring, characterised by cold, snow, and fog;
– Supply chains were hampered by a lack of mobility and logistical support as the effect of the Luftwaffe achieved air superiority, striking Allied naval assets and troop concentrations.

2.3.3 Campaign chronology

1. Initial Assault – 9 April 1940:

– Surprise amphibious and airborne landings at all major Norwegian ports;
– Simultaneous diplomatic ultimatum delivered to the Norwegian government;
– Oslo was initially defended by shore batteries (e.g. the *Oscarsborg Fortress* sank the heavy cruiser *Blücher*), delaying the German advance.

2. Rapid Occupation – 10–20 April:

– Bergen, Trondheim, and Stavanger were secured within days;
– German airborne and mountain troops bypassed the coastal defences using surprise and speed;
– Narvik was seized via a naval landing, sparking an intense naval confrontation.

3. Allied Counteraction – April–May 1940:

– British and French forces landed near Narvik and Namsos;
– They conducted joint operations to retake Narvik; succeeded briefly in May;
– The German naval losses at Narvik were significant (10 destroyers sunk).

4. German Consolidation – May–June 1940:

– The German forces, reinforced by airlift and sea, pushed back the Allied positions;
– The Luftwaffe secured air superiority, as the Royal Air Force (RAF) suffered from inadequate support;
– Following the German invasion of France (10 May), the Allies had withdrawn by 10 June.

2.3.4 Order of battle

German Forces:

– Heer: Approximately 130,000 troops (including mountain, infantry, and airborne units);
– Kriegsmarine: 1 battleship (Scharnhorst), one battle cruiser (Gneisenau), heavy/light cruisers, destroyers, U-boats, and troop transports;
– Luftwaffe: JU 52 transports, Heinkel He 111 bombers, Messerschmitt fighters, Stuka dive bombers.
– Allied Forces:

- British and French expeditionary forces landed in mid-April (approximately 38,000 troops);
- The Royal Navy engaged in several key naval battles (e.g. Narvik);
- Norwegian Army mobilised approximately 55,000, but had limited air/naval capacity.

2.3.5 Casualties and losses

- Germany:
  - 5,296 killed/wounded;
  - 10 destroyers lost; 3 cruisers damaged;
  - 120 combat aircraft and 80 air transport aircraft lost,
- Allies (UK, France, Norway):
  - 5,602 casualties (combined);
  - 24 naval vessels sunk/damaged (including battlecruiser *HMS Glorious*);

2.3.6 Outcome and consequences

- Operation Outcome: German access to Swedish ore, air and naval coastal control; Norway occupied.
- Strategic Consequences:
  - German control of North Sea approaches and Arctic supply routes;
  - Denial of naval bases to the Allies;
  - The significant Kriegsmarine losses weakened Germany's naval strength for the remainder of the war;
  - Exile of the Norwegian government; establishment of Quisling collaborationist regime.

2.3.7 Operation assessment

As Vego (2010) outlines, operational reach involves not only physical distance but also the ability to sustain operations. The Germans pre-empted Allied reinforcements by integrating airlift capabilities and pre-staged supply chains. In contrast, the Allied forces, primarily those sent to Narvik and Trondheim, struggled to extend their operational reach due to fractured command and supply disruptions by Luftwaffe raids. The mountainous Norwegian interior further challenged the Allied units, which were untrained for mountain warfare and operating far from maritime supply lines.

Germany applied operational leverage by achieving tempo, surprise, and synchronisation. The mountain units captured key passes before the Norwegian mobilisation, while naval landings overwhelmed the uncoordinated resistance. The Luftwaffe's close air support, interdiction of supply convoys, and destruction of Allied ships created disproportionate effects. The mountainous terrain of Norway demanded creative operational manoeuvres. The German planners employed vertical envelopment—utilising paratroopers, seaborne landings, and mountain infantry ascents. The 3rd German Mountain Division, under the command of General Eduard Dietl, less its 138th Mountain Regiment, which was attacking Trondheim to the

south, found itself cut off from the rest of the country. Days after the seizure of Narvik, Dietl and his mountain troops and debarking sailors waited for the Allied attack. The Germans fought delaying actions to maintain a precarious foothold in Narvik, as well as control over the railway line leading eastward to Sweden. The 2nd Mountain Division was pushing hard from Trondheim to relieve Dietl. In June 1940, the Allies evacuated the Narvik area, ultimately giving up Narvik. The Gebirgsjäger captured Narvik and advanced through snow-covered valleys to deny the Allies inland movement (Hooker, Caglianese, 2003).

Vego (2010) emphasises manoeuvre as the method to gain positional advantage relative to the enemy. The Germans demonstrated this with encirclements at Narvik, flanking actions in Trondheim, and mountain infiltration to bypass Norwegian roadblocks. The Allied manoeuvre, in contrast, was linear and disjointed. British and French troops operated in fragmented sectors, unable to coordinate deep manoeuvres or exploit high ground. Without mountain units, they could not match the mobility of German mountain troops. Multi-domain operations executed by Joint Forces should also reinforce multinational interoperability through the use of common command and control (C2) frameworks, real-time cross-service data sharing, and mountain--specific training exercises.

3 DISCUSSION

These historical campaigns, from the Carpathians to the Scandinavian Mountains, emphasise the operational art and related operational strategy required for NATO mountain warfare. The enduring principles—operational reach without culmination, leverage through tempo and terrain, manoeuvre in depth, and risk anticipation—remain critical.

3.1 Operational reach and the culminating point

The Carpathian and Norwegian campaigns exemplify the challenges and consequences of failing to maintain sufficient reach or conduct and sustain operations across distances while avoiding culmination.

- The Carpathian Campaigns (1914–15 and 1916–17): Both the Austro-Hungarian and the Romanian forces confronted critical limitations in terrain, weather, and logistics. In 1915, the Austro-Hungarian attempt to relieve Przemyśl culminated in catastrophic losses due to overextension in snowbound passes and inadequate preparation for mountain warfighting. The Romanian forces similarly reached a culminating point early in their Transylvanian push, as logistical support failed.
- Operation Weserübung (1940): In contrast, Germany's campaign in Norway demonstrated how operational reach can be extended with pre-planned integration of air, land, and sea domains. Airlift of supplies and airborne insertions kept the German forces coherent and mobile, despite geographical dispersion and naval constraints. This precluded early culmination and secured the strategic objectives before the Allied reinforcements arrived.

By implication, NATO forces must ensure that forward-deployed and high-mobility elements are supported by integrated logistics and endurance-focused design. In mountain theatres, enduring momentum demands prepositioned supplies, rapid reinforcement through air-ground synchronisation, and weather-adapted campaign or operation mission tailored forces.

3.2 Operational leverage, critical factors, and centre of gravity

Campaign success hinges on leveraging time and space more effectively than the adversary. The Centre of Gravity (CoG) is the backbone of leverage-based strategy.

- German Leverage in Norway: The German use of paratroopers, mountain infantry, and fast-moving naval insertions created leverage through tempo and surprise. Their operational CoG was the integration of Luftwaffe air dominance with mobile mountain forces. The critical vulnerabilities of the Norwegians, their slow mobilisation with weak or absent concentration of forces, and of the Allied forces—fragmented command and untrained troops for mountainous terrain—were effectively targeted.
- The Romanians' CoG Collapse: Romania's CoG was its territorial integrity supported by allied reinforcement and defensive depth. Operational failures in the Carpathians exposed critical vulnerabilities: insufficient mountain training, lack of operational reserves, and logistical incoherence. These allowed the Central Powers to achieve leverage by multi-axial penetration and dislocation.

In the context of MDO, Clausewitz's CoG concept remains a vital analytical tool, although it must be adapted to address the complexity of today's warfare. The CoG in MDO extends beyond conventional military targets to include the interdependent political, informational, cyber, space, and economic domains. In this expanded battlespace, the CoG may not be a single armed forces entity, but a network of critical capabilities, such as a joint C2 structure, military leadership quality, or public trust. Identifying and targeting these centres requires a dynamic, systems-based analysis which accounts for non-linear interactions between domains and actors.

3.3 Operational manoeuvre

Operational manoeuvre enables forces to achieve positional advantage, either by movement or dislocation, with minimal attrition. In mountain operations, manoeuvre is complicated by physical terrain constraints and weather.

- Mountain warfare in the Carpathians in WWI**:** Manoeuvre was minimal due to snow, altitude, and inadequate mobility. The Russian forces overextended their reach and lost manoeuvre flexibility. The Austro-Hungarian resistance nodes stabilised the fronts, but failed to exploit their terrain advantage due to doctrinal rigidity.
- German manoeuvre in Norway: Germany's use of vertical envelopment and multi-domain manoeuvre showcased modern operational art. Paratroopers

secured key terrain in depth, while mountain troops leveraged narrow valleys and road junctions. Encirclements at Narvik and flanking actions through the fjords demonstrated superior mobility.
– The Isonzo Front and the Julian Alps: The Italian linear operations failed repeatedly against the Austro-Hungarian positions. The Caporetto breakthrough highlighted the effectiveness of shock manoeuvre and infiltration tactics, exploiting rigid command structures and terrain vulnerabilities.

This shows that operational manoeuvre, as part of DDA and NHDP, must avoid linearity. Doctrinal flexibility, decentralised command, and emphasis on mountain light infantry mobility, air mobility, and special operations are imperative for seizing and retaining the initiative.

3.4 Operational risk

Risk is the probability of loss linked to a hazard. In mountain warfare, risks stem from the terrain, weather, logistical constraints, and command incoherence. Effective risk management must anticipate environmental and operational hazards and build resilience.

– Culmination as Risk in the Carpathians and Romania: In both WWI campaigns, culmination was not just a failure of logistics, but a manifestation of underappreciated risk in the terrain and climate. Lack of reserves, poor terrain awareness, and overreliance on linear offensives increased exposure to attrition and collapse.
– Norwegian Risk Management (or Lack Thereof): Norway's pre-war constraints (e.g. minimal standing forces, limited air/naval capacity) exacerbated the risk. Despite the Allied support, Norway's failure to generate operational coherence led to rapid strategic collapse.

So, risk integration in NATO DDA Planning should address the Przemyśl Gap and the Focşani Gate operational chokepoints with strategic-level risk implications. An inability to maintain control over these chokepoints could allow enemy interdiction and operational paralysis. The operational dilemma comes from one of NATO's mainstream perspectives: the threat to the three Baltic Republics[6] must be the first to be addressed. In order not to repeat culmination as risk or the Norwegian lack of risk management, operational dilemmas must be managed through force posture (e.g. forward presence of mountain-capable units), doctrinal coherence (avoidance of fragmented command), and infrastructure resilience (roads, C2 systems, prepositioned supplies).

[6] *In a series of wargames conducted between the summer of 2014 and the spring of 2015, the longest it has taken Russian forces to reach the outskirts of the Estonian and/or Latvian capitals, Tallinn and Riga, respectively, is 60 hours (Shlapak and Johnson, 2016).*

3.5 Defence Plans Synchronization and the Influence of Historical Campaign Outcomes

Mountainous terrain acts not only as an obstacle, but also as a strategic instrument. In all three historical campaigns battlefield geography was a key operational variable, not merely a background condition. The degree of integration and coordination between national-level defence planning and coalition-level operational art directly influences campaign effectiveness. The historical case studies of both Allied and Central Power formations during World Wars I and II demonstrate how planning cohesion, or the lack thereof, can define operational success or failure.

The Central Powers, particularly Germany and Austria-Hungary, demonstrated effective operational cooperation despite challenges in political-military unity. In the Carpathians, the Austro-Hungarian forces leveraged German mobility and rail deployment capacities. During the 12th Capporeto offensive in 1917, the Central Powers inter-service coordination enabled simultaneous land and air offensives with mountain troops. These efforts reflected a coherent operational-level campaign design, supported by doctrinal compatibility and logistical planning.

In contrast, the Allied campaigns, particularly in Norway and the Romanian Carpathians, suffered from fragmented planning. The lack of a common operational framework, a limited shared doctrine, and the absence of real-time C2 interoperability contributed to operational dissonance. The British and French expeditionary forces in Norway were hampered by disconnected command structures, diverging operational assumptions, and a failure to adjust to the realities of mountain warfare. The Romanian operations in 1916-17 lacked the operational depth and multinational campaign structure[7] necessary to absorb and respond to the Central Powers' multi-pronged manoeuvres.

The modern application, in NATO Campaign Planning, shows that the necessity of synchronising National Home Defence Plans (NHDPs) with NATO's Deterrence and Defence of the Euro-Atlantic Area (DDA) family of plans is a core operational requirement. National plans must be interoperable in terms of doctrine, capability development, logistical resilience, and force deployment timelines. Failure leads to the replication of historical Allied errors—where national forces cannot absorb shock or contribute coherently to joint operations.

That this is not a one-way dilemma and simple challenge is shown by the Norwegian debate between the "traditionalist" and "modernist" strategic schools of thought, which is emblematic of wider Alliance challenges. While traditionalists advocate balanced, full-spectrum national forces capable of territorial defence, modernists favour tailored, high-readiness forces optimised for coalition interoperability (Saxi, 2020 and 2022).

[7] *The Allies established a multinational HQ structure in 1918 as a consequence of the defeat in the 12th Isonzo Offensive at Capporetto. Joint Force Command Naples could be considered its 21st Century successor.*

Operational effectiveness in coalition warfare is critically shaped by the level of coordination between the NHDPs and NATO's Regional and Strategic Plans within the DDA framework. As an outcome of the analysis, there is a recommendation that the Allies should develop and NATO integrate:

– Mountain-specific force structures in the form of Mountain Units, formation trained and equipped for combat in the mountain environment, and a C2 structure across key operational directions to Central Europe (e.g. the Postojna Gate, the Przemyśl Gap, the Focşcani Gate[8]).
– Synchronise NHDP with NATO's DDA family of plans.

Conclusion

The military theorist Carl von Clausewitz (1976, p 91) observed that defeating the enemy can, in practice, be replaced by two other grounds for making peace: the first is the improbability of victory, and the second is its unacceptable costs. He also indicated that "defence is intrinsically the stronger form of waging war". If an attack were the stronger form, there would be no case for using defence. NHDPs, orchestrated within NATO Regional Plans (RP), form a stronger Clausewitzian form of defence.

Russia, as NATO's designated future enemy, demonstrated in 2008 its capability for rapid regional power projection in Georgia (Cornel, 2009). The analysis results revealed significant dilemmas at the operational level of the Alliance. The dilemmas pertain not only to areas within northern and eastern European countries, such as Norway, Poland, and Romania, but also to Allies in the heart of the European theatre of operations. Slovenia, Slovakia, and Hungary are countries that should address mountains in their NHDPs and harmonise their solutions with the Allies. The national and allied defence concept alignment in order to overcome challenge, noted by Young (2019), must not be forgotten: that military and defence organisations typically operate based on outdated concepts which persist and need to be updated in parallel with DDA and NHDPs.

What is on hand today, and what is needed to fulfil the DDA plans? There are significant requirements (Deni, 2024) in the new operations plans for medium and heavy units. The use of modern capabilities and the resulting technological superiority will not be sufficient without appropriate operational art, currently MDO, to ensure the defence of the Euro-Atlantic area. This highlights the fact that defence in the depth of the European theatre based on mountain chains will be key until the results of accelerated investment in medium and heavy capabilities pay dividends. Adapting defence plans to the existing capabilities and characteristics of the European theatre means executing a straightforward operational strategy.

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[8] *The Foscani Gate is critical "key operational level terrain" (New Strategy Centre, 2019) for the military strategic stability of Europe. The Foscani Gate is a battlefield comprised of significant river barriers running north to south in its northern half and west to east in its southern half and all "squeezed" between the nearly impenetrable Carpathian Mountains and the longest navigable river in Central Europe – the Danube.*

Finally, the MW COE's role as an advocate for Allies' Mountain Units, including their scale and size, and as a Mountain Warfare doctrine custodian, as the historical case study teaches us, could influence the outcome of future operations and campaigns. These findings provide the foundation for the MW COE to streamline the programme of work in support of deterrence and defence in the Euro-Atlantic area, contribute its experience to the NATO Defence Planning Process, advise Allies and NATO strategic and regional planning, and make sure that mountain warfare doctrine is up to date with battlefield innovations..

The historical campaigns underscore the necessity of harmonising national readiness with alliance-level campaign planning. Fragmentation or misalignment in command, doctrine, or logistics often leads to early culmination or strategic defeat. Thus, DDA implementation must prioritise the seamless integration of NHDPs, enabling agile, interoperable, and terrain-informed coalition operations.

The NATO Regional Plans and the NHDP's coherence are prerequisites for the success of coalition-based warfare. The Allies' and NATO's military and political interoperability is not an easy task, nor is the integration of coalition and ally military doctrine and strategy. NATO has several Core HQs, including the Multinational Corps Northeast in Szczecin, Poland (MNC-NE); the Multinational Corps Southeast in Sibiu, Romania (MNC-SE); the Allied Rapid Reaction Core in Innsworth, UK; and the NATO Rapid Deployable Corps Italy in Solbiate Olona, near Milan, for the common defence. All of these are important for our mountain warfare conceptual analysis. The MNC-NE and MNC-SE are unique as being Core HQs in peacetime located on NATO's eastern flank, with tactical planning missions, and privileged with the coordination of Forward Land Forces. Both have been designated NATO's regionally focused headquarters, and have been assigned a brigade from each of the Baltic States, along with Poland, Romania, and Bulgaria, as well as all the NATO Forward Land Forces. This means they should have significant forces under command, a clear area of responsibility which covers the Carpathian Mountains, and the ability to develop robust procedures (Watling and MacFarland 2021, p 28).

To make the NATO DDA Family of Plans and NHDPs executable in the European mountain chain, mountain units and other units trained and equipped for fighting in mountain environments are required. Related to mountain units, an appropriate number of mountain brigades for the deployment phases[9] is required, and from the author's analysis, 30% of the armed forces should be trained and equipped for fighting in mountainous areas. Author-indicated Centres of Gravity (strategic) and [operational] and suggested Role in Regional Plans are also noted in Table 1.

[9] *For NATO in crisis management mode before 2022, the deployment phases in the article are understood as Very High Readiness Forces (VJTF) and NATO Response Forces (NRF). For NATO in Deterrence and Defence mode after 2022, it means the number of mountain brigades in Tiers 1, 2 and 3, as well as the number of brigades in the National Home Defence Forces. All must be interoperable in order to fight as Allies.*

Table 1: NATO Allies operational level consideration (Source: Author summary)

Allies with RPs and NHDPs coordination	Mountain Range (key operational area)	Centre of Gravity (strategic) and [operational]	NATO RPs / Joint Force Command (JFC)	NATO Force Structure Land HQs	Role in Regional Plans
Poland, Hungary, Slovakia	Carpathian Mountains (Premzsyl gap and passes; Dukla, Lipkow)	(Warsaw, Budapest Bratislava) [Premzsyl, Krakow]	Centre / JFC Brunssum	Multinational Core Northeast	Defend
Romania, Bulgaria	Carpathian Mountains (Focsani Gap, Predil, Oituz and Olt passes)	(Bucharest Sofia) [Focsani, Constanta]	East / JFC Naples	Multinational Core Southeast	Defend
Slovenia	Julian Alps (Postojna Gap and Col, Livek and Predel passes)	(Ljubljana), [Koper]	South / JFC Naples	Rapid Deployable Core Italian Army	Secure/ Enable
Norway	Scandinavian Mountains (Sennalandet and Kvænangsfjellet passes)	(Oslo), [Narvik, Alta, Kirkenes]	North / JFC Norfolk	Allied Rapid Reaction Core	Secure/ Enable

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PRETEKLI IN PRIHODNJI ELEMENTI GORSKEGA BOJEVANJA

THE PAST AND FUTURE ELEMENTS OF MOUNTAIN WARFARE

Povzetek Zaradi spremenjenega operativnega okolja, uvajanja novih tehnologij in vojaških konceptov na strateški, operativni in taktični ravni se je v zadnjih nekaj letih tradicionalno dojemanje gorskega bojevanja bistveno spremenilo. Prihodnje obsežne vojaške operacije proti enakovrednemu tekmecu bodo pomenile povsem drugačne operativne izzive. Operativni koncept gorskega bojišča se je razširil na širši bojiščni prostor, ki vključuje kopensko, zračno, pomorsko, kibernetsko in vesoljsko domeno. Cilj članka je opredeliti najpomembnejše elemente, ki so vplivali na gorsko bojevanje v preteklosti, sedanjosti in prihodnosti, ter predstaviti najpomembnejše Natove koncepte in doktrine na tem področju, da bi opredelili prihodnji okvir gorskega bojišča v večdomenskem okolju.

Ključne besede ***Gorsko bojevanje, večdomensko delovanje, koncept, bojiščni prostor.***

Abstract Over the past several years the traditional perception of mountain warfare has changed significantly, due to the new operating environment and the implementation of new technologies and concepts at the strategic, operational and tactical levels. Future large-scale military operations against a peer competitor will present altogether different operational challenges. The operating concept of the mountainous battlefield has expanded to a more comprehensive battle space, incorporating land, air, maritime, cyber and space domains. The aim of this article is to identify the key elements which have had impacts on mountain warfare in the past, present and future, and to review the key NATO concepts and doctrines in this field in order to define the future framework of mountain warfare in a multi-domain environment.

Key words ***Mountain warfare, multi domain oerations, concept, battlespace.***

Introduction

The future will be here sooner than is expected; this is one view. Another is that the future has already started – today. The most recent wars have shown that new technologies will have an increasingly great impact on the course of conflicts. Humans are more important than hardware, but only if those humans think and prepare.

In the future, preparation for Mountain Warfare (MW) will remain important so that land forces are mentally, physically and technically able to survive, move and fight in mountainous environments. In the mountains, smaller well-trained units will be more effective, as long as they are capable of employing the full range of combat capabilities (i.e. combined arms, multi-domain, and cross-domain), even at the lowest tactical level (MWCOE, 2023, p 1). Future warfighting will be no longer a land-centric force, but will use Multi-Domain Operations (MDO) which employ joint and combined arms capabilities.

Technology has continued to evolve, which has resulted in NATO expanding the three joint domains to five operational domains: maritime, land, air, space and cyberspace. The multi-domain approach combines the domain actions in a way that both amplifies and orchestrates the sum of its parts. The multi-domain approach is more than just an extension of the joint approach by simply adding the space and cyberspace domains (AJP-3.2, 2022, p 3); NATO's definition is the *"orchestration of military activities, across all domains and environments, synchronized with non-military activities, to enable the Alliance to deliver converging effects at the speed of relevance*" (AJP-01, 2022, p 2–3).

Future armed forces, as part of joint, interorganizational, and multinational teams, will have to contend with dramatic advances in science and technology (artificial intelligence, hypersonic weapons, robotics, directed energy, precision long-range fires, electronic warfare, and advanced cyberspace, among others) which are advancing and proliferating through the increased speed of human interaction and societal changes. Advancements in weapons technology, sensors, communications, and information-processing capabilities dramatically increase lethality. Future enemies will be able to detect, track, and target armed forces and activities throughout the depth of the expanded battlefield and across all domains, and will seek to gain direct and indirect fires overmatch with increasingly capable conventional and unconventional forces (U.S Army Concept, 2018, p 9).

The MDO concept describes how the Joint Force and its partners converge capabilities to create windows of superiority which enable cross-domain manoeuvre. "*Maneuver – physically, virtually, cognitively, or any combination – executed simultaneously across the expanded battlespace, seeks to directly attack critical vulnerabilities in the adversary's systems and foil his campaign plans in different ways to create multiple dilemmas for the enemy. Creating multiple physical, virtual, and cognitive dilemmas for the enemy overwhelms the adversary's systematic approach to fracturing friendly forces' cohesion, and allows the Joint Force and partners to*

achieve friendly objectives at acceptable levels of risk" (U.S Army Concept, 2018, p 9).

Multi-domain integration will be essential for NATO in the 21st century; it is a force multiplayer, and the mountainous environment will be no exception (Kaushal et al., 2023). According to Kaushal et al., there are three main reasons and advantages for integrating MDO:

– The ability to leverage information across joint forces can lead to efficiencies;
– Integration can offset the adversary's efforts to exploit vulnerabilities in the existing single-domain kill chain;
– It grants the ability to impose complex dilemmas on an opponent (Kaushal et al., 2023, p 3–4).

From the warfighting perspective, the mountainous environment must be seen not only as a battlefield but also more broadly as a battle space. The integration of the MDO approach will be paramount. The aim is to orchestrate the land domain as combined arms capabilities with other services (joint) and all the other domains (maritime, air, cyber, space) through the lines of operations, in order to achieve the desired effects in the virtual, cognitive and physical dimensions (Figure 1; see p 110).

1 TERRAIN, WEATHER AND CLIMATE

> *Know the enemy, know yourself; your victory will never be endangered. Know the ground, know the weather; your victory will then be total. (Sunt Tzu)*

"Terrain, weather and climate in the mountain area is, from a military point of view, a challenge, which can be an advantage, disadvantage or opportunity. Military units could portray enhanced capabilities only if they understand both environmental elements and are properly trained and equipped for MW" (MWCOE, 2023, p 1). In the mountainous environment it must be taken into account that the terrain, climate and weather have a significant impact on warfare. Much like strategy, the effects of the environment are pervasive.

Mountains have inherent, varying challenges due to the relief, and latent peculiarities such as caves, glaciers, and so on. Mountainous terrain poses mobility challenges, limiting communication and casualty evacuation options. High altitude and wet, cold and hot environments cause mental and physical stress and can be life-threatening.

The weather conditions in the mountains are often characterized by extremes: intense solar radiation, rapid weather changes, strong nocturnal cooling, high wind speeds and extreme snowfall are some examples. There is a significantly adverse effect on personnel with increased non-combat attrition, as well as a reduction in the performance of weapons and equipment (MWCOE, 2021, pp 15, 17).

In the mountainous environment increasing environmental stress will be more intense. Human influence on the climate system will have far-reaching consequences over the next 30 years, as floods, droughts, storms, heatwaves and heavy rainfall become more intense and possibly more frequent. Transport and trade routes, including key chokepoints, are likely to be disrupted, affecting global markets and supply chains (Global Strategic Trends, 2018, p 13).

Military equipment will need to be able to operate in these increasingly extreme conditions. Longer periods of heavy rain will disrupt shipping. Air transport is also likely to be affected; for example, the polar front jet stream (a current of fast-moving air in the upper atmosphere) will probably strengthen and, during the winter, incidents of high turbulence could be 40-170% more frequent. Without mitigation, this could lead to longer flight times, higher fuel consumption and an increased need for aircraft maintenance (Global Strategic Trends, 2018, p 32).

> ***Lessons, Falklands War 1982.*** *"The last citadel of morale is a man's sleeping bag; the comfort of resource it offers is unbounded. When the citadel is breached, morale can get pretty low, and that morning at first light it reached its low point, never to go so low again throughout the campaign. The Commandos were to spend more uncomfortable and more bitter nights with wet sleeping bags, or without them entirely, but they hardened and got used to it."* (Thompson, 2016, p 108–109)

2 FROM THE PAST TO THE FUTURE

> *"Throughout history, from a military point of view, mountains have been a natural barrier that, together with the weather, limits and shapes joint operations. Evidently, mountains represent challenging combat environments, which require specially trained and equipped units. Regardless of technological developments, one of the key questions is how to effectively overcome these obstacles and how to use the mountains as an advantage for NATO forces."* (MWCOE, 2023, p 3)

In the 19th century, two military theorists, Antonie Henri Jomini and Carl von Clausewitz wrote about mountain warfare. Many of their ideas are still applicable today and will probably still be valid in the future. Jomini believed that a small force could effectively defend against a larger attacking force at a specific point in a mountainous region such as a pass, defile or mountain peak. Jomini concluded his thoughts on mountain warfare with three key principles for commanders:

- Do not risk oneself in the valleys without securing the heights;
- Operations should be oriented on the lines of communications of the enemy;
- A mobile defence is the best means of defending (Pittard, 1993, p 5).

In his book *On War*, Carl von Clausewitz dedicated four chapters to mountain warfare. According to Clausewitz, mountain terrain favours the defender. However,

cutting off a defender's line of retreat is key to the Clausewitz view of offensive success in mountain warfare, due to the extremely limited routes of withdrawal.

The terrain problems that Clausewitz and Jomini noted have not changed significantly, except for the fact that the roads and trails have improved. Movements for ground forces will always be difficult and restrictive (Pittard, 1993, pp 6–7).

In the 20th century, a major change in mountain warfare was represented by helicopters, armoured vehicles, space and cyber capabilities. In the 21st century, mountain warfare has been significantly changed by modern technology such as new sensors, artificial intelligence, digitalization, space operations, robotic and autonomous systems, and more lethal and precise long range weapons systems. From the later period a good example of mountain warfare is the Second Nagorno Karabakh War of 2020. Retired Colonel John F. Antal wrote in his book "7 Seconds to Die" that the Second Nagorno Karabakh War of 2020 was the first war in history won primarily by robotic systems (Antal, 2022, p 3).

3 THE FUTURE MOUNTAINOUS BATTLESPACE ENVIRONMENT

> *"One of the biggest mistakes militaries make is to assume that future wars will resemble the wars of the past."* (Barno, Bensahel, 2020, p 231)

According to NATO standard ATP 3.2.1.3 *"the Fulfilment of NATO´s core tasks, collective defence, crisis engagement and cooperative security requests the Alliance`s operational effectiveness in many different domains, fields and geographic environments. One specific environment is mountainous terrain, where in addition to the opponent the independent actors of terrain and weather play an extremely decisive role. As military cannot change or influence the mountainous terrain and the weather, it is one essential key for operational success to adapt tactical principles, equipment and also training and education to the requirements of this special environment"* (ATP 3.2.1.3, 2024, p VII).

During a NATO Military Committee meeting on July 11th 2022, Lieutenant General David Julazadeh, Deputy Chief of Staff Capability Development Allied Command Transformation, presented the vision of Multi-Domain Operations (Multi-Domain Operations, 2024). Lieutenant General Julazadeh revealed that the urgency for the Alliance to conduct MDO is based on the rapidly changing security environment, which is reflected in the new NATO Strategic Concept. It requires the Alliance to re-think warfighting and warfare development in the short, medium and long term to maintain NATO's military credibility. *"Our adversaries are aggressively influencing NATO members in all five operational domains. Adapting the Alliance to a Multi-Domain Operations approach enables NATO forces to operate with agility and unity across all domains and environments to successfully address those challenges,"* said Lieutenant General Julazadeh.

In the past, warfighting in mountainous environments took place mainly in two domains, land and air, with air operations focused almost exclusively on providing support to ground troops. Future large-scale operations against a peer competitor would present altogether different operational challenges and a massive expansion of the operating environment beyond anything today's generation has ever experienced. The dynamics caused by the greater intensity in combat across all these domains will inevitably put increased pressure on the relationships between the services and demand greater integration across service and domain boundaries. In the future, adaptation, innovations and flexibility will play an important role.

"The concept of MDO extends joint concepts and emphasizes the importance of domains rather than the military force operating in them. For example, the army, navy, marines and air force of some nations can all operate in the air domain. The delivery of effects in the air domain is the critical factor, rather than what brand of force carries out the activity. New structures for command-and-control help amplify this focus on domains and provide increased options for warfighting commanders" (Reynolds, 2022, p 38).

The changed operating environment will require changes in mindset, culture, strategy and a changed way of working at all levels: strategic, operational and tactical. As a consequence, changes and additions to military capabilities will also be required.

The land domain in the mountainous environment will remain pre-eminent, because battles are won or lost only on land. The other domains will support the land domain. It is possible to win battles only in the land domain at the tactical level, but in general it is not possible to win campaigns at the operational level without the other domains. Air superiority can provide decisive conditions so that land forces can operate effectively, because air forces are able to target the critical parts of the adversary's land forces (logistics, lines of communication, command posts, critical infrastructure).

Land forces will fight on the same mountainous terrain as today or in the past. It will still be valid that mountains are physical barriers to the freedom of movement of ground forces; it is enduring that movements are restricted or even severely restricted. The result is that forces can be canalized to existing road or railway networks, making them vulnerable to attacks and ambushes. Effective cross-country movement of dismounted forces is very exhausting, slow, and restricted by terrain obstacles (ATrainp-6, 2020, p 2–7)

Land forces will fight in the mountains as combined arms systems in the future. Understanding their strengths and weaknesses will be key to this. For example, infantry units (especially mountain units) have, as their strengths, the ability to operate in restricted and severely restricted terrain, to control terrain, and to move silently. But they also have serious weaknesses: they move slowly when dismounted, especially in open terrain, and they have limited fire power. Slower dismounted

units will be critically vulnerable because modern highly capable sensors and reconnaissance units make them easier to block and neutralize. Likewise, armoured units have strengths such as speed and great line-of sight firepower, but in the mountains, they are mainly limited to the roads and are very vulnerable in close terrain. Each of the other combat arms likewise has both strengths and weaknesses. According to the complementary principle (Leonhard, 1991, p 93), the solution is to compensate for each arm's weakness through another arm's strength.

However, on the other hand, dismounted infantry in the mountains have high survivability when static, by virtue of the complex terrain being resource intensive to detect. Although personnel need the logistic support of a dismounted infantry unit, it is drastically smaller and therefore less conspicuous than any mechanized force.

It is possible to adapt the same principle in MDO in relation to combined arms, joint and multi-domain operations. For example, limited land reconnaissance can be strengthened by air, cyber, space and electronic capabilities.

In the mountains, distance and time will play a new role in the future. Forces will still be limited by speed and maneuverability due to the terrain, but it will be necessary to take into account technologically advanced weapons systems operating at operational and strategic distances, and the impact of other domains which will significantly increase the speed and availability of information. Land forces in the mountains will continue to operate in a dispersed manner, occasionally in isolation, but they will be much more interconnected than in the past. A mountainous environment can be a physically and geographically isolated area, but not from a military perspective as a battlefield (MWCOE, 2023, p 7).

Technology will continue to expand and empty the battlefield, including moving it into the difficult terrain in the mountainous environment. The introduction of modern technologies and a multi-domain environment will also require changes at the tactical level, particularly in the areas of mobility, manoeuvre and force protection.

The Mountain Warfare Capstone Concept pointed out that *"in the future, the mountains will continue to be an area of interest and an area of operation for NATO forces. For this reason, it is necessary to train and equip a part of forces that will be able to respond quickly, effectively and efficiently to all threats in the mountains, regardless of weather conditions. In addition, as the land domain cannot be considered in isolation, thus the land also in the mountains will continue to be supported by action in and from the other domains. Effective integration across domains, and within the land domain will be vital for effective action."* (MWCOE, 2023, p 8).

Conclusion

NATO documents are clear on the commitment that the Alliance is required to maintain trained, interoperable, multinational forces capable for missions in mountainous terrain (ATP 3.2.1.3, p XV). The mountainous environment is specific, because the terrain, climate and weather have a major impact on human, technology and combat systems.

As in the past, tactical military operations in the mountainous environment will continue to be dominated by highly trained light infantry. It will remain important for land forces to be mentally, physically and technically capable of surviving, moving and fighting in this harsh environment. The huge advantage of trained and equipped light infantry is that they can go anywhere they are required. However, slower dismounted units will be critically vulnerable because modern, highly capable sensors and reconnaissance units make them easier to block and neutralize. The solution is to integrate land forces in the future mountainous operating environment as combined arms and joint capabilities, orchestrated in the multi-domain concept. However, the new operating environment will require changes in mindset, culture, strategy and a changed way of working at all levels: strategic, operational and tactical.

Technological progress is fundamentally changing and expanding the modern battlefield. The experience and lessons identified of the past wars and conflicts, and the new technologies, are changing military concepts and doctrines. There is also the new NATO MDO concept, although it is not yet fully implemented in operations. This will be one of the key tasks in the very near future for NATO and its members. This logically highlights the question of how to implement the MDO concept in a mountainous environment. The new challenge will require knowledge and skills of land-based mountain warfare supported by an air and combined arms system. Joint will be necessary but not enough. There are opportunities for new research and development in this field, and a particular challenge for the NATO Mountain Warfare Centre of Excellence. The development of possible scenarios which could be the basis for modelling and simulations will be the first step to show the direction, challenges and opportunities, and to find the answers to the questions of how to effectively reinforce and support land forces in the mountainous and multi-domain environment.

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OD PRETEKLOSTI DO SEDANJOSTI: RAZVOJ AVSTRIJSKIH IN AVSTRO-OGRSKIH ENOT ZA GORSKO BOJEVANJE IN TRENUTNI IZZIVI

FROM PAST TO PRESENT: THE DEVELOPMENT OF AUSTRIAN AND AUSTRO-HUNGARIAN TROOPS FOR MOUNTAIN WARFARE AND THE CURRENT CHALLENGES

Povzetek Po novi politični usmeritvi Habsburžanov proti jugovzhodni Evropi konec 19. stoletja, je avstro-ogrska vojska ugotovila, da potrebuje specializirane gorske enote. Leta 1882 so začeli ustanavljati stalne gorske brigade. Preobrat je nastopil leta 1906, ko so tirolske deželne strelce preoblikovali v usposobljene gorske in obmejne obrambne enote. Med prvo svetovno vojno so se slednji bojevali na vzhodni in italijanski fronti. Po porazu Avstrije v prvi svetovni vojni in izgubi suverenosti leta 1938 se je njena alpska vojaška tradicija ohranila v zvezni vojski, ponovno pa je zaživela po letu 1955. Center za gorsko bojevanje in 6. gorska brigada ohranjata in razvijata strokovno znanje o gorskem bojevanju ter delujeta kot pomembno evropsko središče za gorsko usposabljanje, prilagajanje okolju in mednarodno sodelovanje v času spreminjajočih se varnostnih groženj.

Ključne besede ***Avstro-ogrska vojska, Bosna in Hercegovina, tirolski deželni strelci, 6. gorska brigada, center za gorsko bojevanje.***

Abstract After the new political orientation of the Habsburgs towards South-East Europe in late 19th Century, the Austro-Hungarian Army recognized the need for specialized mountain troops. From 1882 onwards, permanent mountain brigades were created. A turning point came in 1906 when the Tyrolean Landesschützen were restructured into trained mountain and border defence units. During World War I, they fought on the Eastern and Italian fronts. Following Austria's loss of World War I and of its own sovereignty after 1938, its alpine military tradition endured through the Federal Army, and later re-emerged post-1955. The 6th Mountain Brigade and the Mountain Warfare Centre preserve and advance mountain warfare expertise, serving as a hub for European mountain training, environmental adaptation, and international cooperation amid evolving security threats.

Key words ***Austro-Hungarian Army, Bosnia-Hercegovina, Tyrolean Landesschützen, 6th Mountain Brigade, Mountain Warfare Centre.***

Introduction

This article provides an in-depth analysis of the development, organization, and strategic deployment of Austro-Hungarian and later Austrian mountain troops from the late 19th century to the end of World War II. It begins with the challenges faced by the Austro-Hungarian army during the occupation of Bosnia-Herzegovina, which exposed the inadequacy of conventional tactics in mountainous terrain and led to the creation of specialized mountain brigades. Further institutional reforms, especially under Franz Conrad von Hötzendorf, emphasized the need for permanent, well-trained alpine forces capable of defending the Monarchy's rugged borders. These military traditions somehow continued in the First Republic despite postwar restrictions, and Austrian alpine expertise was also integrated into the Wehrmacht following the Anschluss of 1938. By tracing these developments, the enduring significance of mountain warfare in shaping military doctrine, identity, and national defence strategies is also highlighted. The second part investigates the structural development, operational specialization, and geostrategic function of Austria's modern alpine military forces, with particular emphasis on the 6th Mountain Brigade and the Mountain Warfare Centre. In the context of Austria's post-1955 neutrality and its subsequent military doctrine, these institutions have emerged as central pillars of high-altitude defence and resilience. Through a historical-institutional lens, the analysis traces the transformation of alpine units within the framework of territorial defence, civil protection, and multinational interoperability, and the way in which Austria leverages its topographical specificity and doctrinal neutrality to position itself as a European hub for mountain warfare expertise, training, and innovation is further explored.

1 THE PERIOD 1869–1918

For the Austro-Hungarian army, the fundamental question of whether to make a greater adaptation to the peculiarities of mountain warfare was posed after the defeat by Prussia in 1866. The first military operation in the mountainous areas of the Balkans occurred in 1869, when the rebellion in Krivosije had to be quelled. The campaign, which was conducted in Austro-Hungarian territory, contained the first elements of a modern war in the mountains. However, ultimately the occupation of Bosnia-Herzegovina in 1878 was to provide the decisive stimulus for the formation of special mountain troops. Initially, to occupy these partly mountainous provinces only one corps (the XIII) was to be mobilized. However, the troops were not specially trained for mountain warfare. It was only in the organization of supply (called 'Train' in Austrian military jargon) that account was taken of special conditions in the mountains (k. k. Generalstab, 1883).

At the beginning of the campaign there was 'normal', 'restricted' and 'mixed' mountain equipment (Ortner et al., 2005, p 19). The first was issued to units which had to operate in difficult mountain country for a lengthy period. Restricted equipment was used by units which could find themselves in difficult country for a short time, e.g. during deployment or to reach a staging area. Mixed mountain equipment was issued if the operational area was in mountainous country, but there

were suitable lines of communication, at least in the valleys, and mule-tracks and footpaths on the heights. With normal and restricted equipment, the entire supply was carried by pack animals. In this case the troops did not set up their own baggage train, but were allotted the appropriate columns of pack animals by the mountain baggage train squadrons. With mixed mountain equipment both pack animals and carts were used. During the course of the campaign it turned out, after only a short time, that the troops originally intended were by no means enough, not only to occupy Bosnia-Herzegovina, but to 'pacify' it permanently. Further corps had to be mobilized and transported to the Balkans. The guerrilla war waged by insurgents and rebels could hardly be brought under control at the beginning of the advance. By and by the whole campaign developed in a disastrous way. On 13 August 1878 one of the generals reported: *'Losses among officers severe…attacked from all sides – troops very dutiful, but completely exhausted. Pack animals all unfit. Army carts must be pulled and pushed by the men … on the other hand the carts cannot cross the mountains and swamps and catch up. Not in safe contact with any column, without secure supply line, with extremely inadequate food as the supply and baggage train cannot get forward in the country here…*' (Austrian State Archives/War Archives: MKSM 1878 69 – 1: 30–53)

This dramatic situation report makes it very clear how little standardized and traditional tactics were worth in the mountains. The nine Austrian mountain brigades (of a total of eleven brigades), which formed the majority of the fighting troops, were to carry the main burden of the fighting. The soldiers themselves were regular infantry, although many of the units came from mountainous areas or the south-east of the Monarchy. In principle, these brigades owed their additional designation 'Mountain' solely to their modified baggage trains, not to adapted tactics or special mountain training. The quantity of troops finally employed – Austrian strength had almost doubled since the beginning of the campaign – brought the desired success. By occupying important features such as roads, villages and bridges, the freedom of movement and the possibilities of supply of the insurgents could gradually be restricted and ultimately completely interdicted. At the conclusion of the fighting during the occupation in 1878, three mountain brigades were left in the occupation area, and thus made up the majority of the occupation troops. They continued to be designated the 1st, 2nd and 3rd Mountain Brigades.

The fighting in the mountains showed that a complete rethinking of the employment of forces was necessary. It was realized that the brigade level functioned optimally as the senior command echelon, and in combat the battalion was the best tactical unit, not the regiment. For this reason tactically 'tailor-made' brigades should be formed, consisting of merely three to five battalions. The massed artillery present at divisional level was useless in the mountains, so the idea of the 'brigade battery' was revived, and the commanders of mountain brigades were again given an artillery arm with the four guns of their mountain batteries. Beginning in spring 1882, when a rebellion in southern Dalmatia and southern Bosnia and Herzegovina had to be brought under control, more mountain brigades were established. As a direct result

of the fighting of 1882, the idea emerged to station the troops which were to fight in the Balkan theatre in the event of war there in peacetime as well (Aufstand, 1883 p 38). To avoid the possible unreliability of locally recruited soldiers, units from other regions of the Monarchy were to be transferred to Bosnia-Herzegovina. The units were to be stationed there for a limited period, within the framework of the usual garrison exchange, and trained in mountain warfare. By the outbreak of WWI the number of mountain brigades had increased to 14, all located in areas of the Western Balkans.

A second development strand with regard to special skilled and equipped mountain troops was directly connected to the later Chief of the General Staff, Franz Conrad von Hötzendorf (1852–1925). From 1903 to 1906 he commanded an Infantry Division stationed in Tyrol and had the opportunity to get to know the special terrain conditions of this part of the Monarchy. He drew up numerous tactical analyses, which were almost exclusively concerned with the possibility of war against Italy. For Conrad the insights gained produced an urgent need for action. The small number of troops in Tyrol made a swift reaction to a possible advance by their southern neighbour scarcely possible, especially as there was no organized border protection in peacetime and even the fortifications could not put up lasting resistance. The reserve companies, which had been intended for border protection since 1902, were seen by Conrad as being completely inadequate, as they had not been specially trained for their mission apart from their operational readiness (Hötzendorf, 1922).

For him this was a completely unsatisfactory state of affairs, which he tried to improve by creating a permanent core of such border protection troops. In his estimation, the conversion of existing Landesschützen regiments (territorial units part of National Defence) for this purpose would have been the most appropriate measure. At least 152 companies would have been necessary to completely control all the routes leading from the south into Tyrol; Conrad had identified three roads, 20 mule tracks and 18 footpaths alone between the Stilfser Joch and Lake Garda, while up to the Plöcken Pass there were twelve more roads and countless paths (Conrad, 1921–1925 p 478). In Conrad's estimation, in peace as in war, they would not only have had the task of controlling the border, but also of reconnaissance and gathering intelligence. In wartime the companies were to keep contact with the enemy, report his movements continuously to the regional defence commander and '*at favourable opportunities, as on the offensive altogether[…], act as intelligence detachments and patrols, raid enemy territory, interrupt and disturb enemy communications etc. The commander would have the obligation and the opportunity of achieving excellent things in guerrilla warfare.*' (Hötzendorf, 1922, p 478).

The k.u.k. War Ministry agreed to this proposal, so the question of border protection became a pure matter of the Landwehr (Ortner et al., 2005, p 31). In May 1906 the two Tyrolean Landesschützen regiments and the Landwehr Infantry Regiment No. 4 (Klagenfurt) were converted into border protection regiments to be employed in the mountains. Even in peacetime each of the three Landwehr mountain regiments

was allocated a designated sector of the border, which became the main base of the companies in the summer months. The troops got to know their sectors so that they became completely familiar with the conditions of the terrain, even if they did not come directly from the region.

However, during the allocation of the border sectors it was seen that the existing companies would not suffice. The requirement for more troops even in peacetime was a given from the very start. As the population in Tyrol and Vorarlberg was growing, and higher recruit contingents could be achieved by the Landwehr authorities, in 1909 it became possible to re-establish a third Landesschützen Regiment (No. III). As well as the Austrian territory, the troops were also to get to know the ground beyond the border, i.e. Italian territory. On summer station the companies acted largely independently, and the battalion and regimental commands functioned only as inspectorates. 1911 brought further reinforcements for the now named ´Landwehr mountain troops` – the Landwehr Infantry Regiment Laibach No. 27 (today Ljubljana in Slovenia), which had been formed in 1901, was newly redesignated as a Landwehr mountain regiment (Schematismus, 1914, pp 227, 279).

The internal structure of the Landwehr mountain regiments was adapted to the peculiarities of mountain warfare. As in the mountain brigades of the army, the entire baggage train could be transported by pack animals, and the ammunition supply and provision for the wounded was adjusted for operations in the mountains. Ration transport in boxes was carried out both by pack animals and by two-wheeled, narrow gauge carts. This was a logical continuation of the experience that had already been gained by the mountain brigades of the army. The equipment of the men was already suitable for the (high) mountains: there were crampons and alpenstocks for every man, and officers had ice axes. Then there were the skis, of which there were already 90 pairs in every company by 1914, and twenty rolls of 50 m-long hemp rope. With regard to the issue of machine guns, the Landwehr mountain troops played a pioneering role by receiving the first machine gun (MG) detachments from spring 1907 onwards. An MG detachment was planned for every battalion. Like the later standard MG detachments of the infantry, these ‘mountain machine gun detachments’ consisted of two platoons, each with two MGs. The Tyrolean Landesschützen Regiments Nos. I to III formed the 88th Landesschützen Brigade in Bozen; the Landwehr Infantry Regiments Nos. 4 and 27, together with Regiment No. 5 (Pola), formed the 44th Landwehr Infantry Brigade (Laibach).

Within the framework of mobilization in 1914, all the Landwehr mountain troops were intended for the Russian theatre of war (the aforementioned mountain brigades stayed in the Balkans). It was only in 1915, after the Italian declaration of war, that they returned to their peacetime operational areas, weakened by high losses in the first months of the war (Ortner et al., p 36). So the issue of k.u.k. Mountain Troops had to – more or less – find a full restart to match the new challenges of high mountain warfare in the Italian theatre of war. Although there was a clear difference between mountain brigades, mostly envisaged for medium mountain warfare in the

Balkans, and Landwehr mountain troops, determined for high mountain missions in the Alps, before the war, units of the two branches mingled during WWI due to war necessities. The number of mountain brigades, including both types, increased to 36 by 1918.

2 THE INTERWAR YEARS, THE FIRST REPUBLIC AND WORLD WAR II

Following the collapse of the Austro-Hungarian Monarchy in 1918, the Treaty of Saint-Germain (1919) placed strict limitations on Austria's military capacity. The newly formed Republic was allowed only a small professional army, capped at 30,000 men, designated solely for territorial defence (Stourzh, 1998, p 21). This limitation drastically impacted Austria's ability to maintain a robust military force, yet the strategic importance of the alpine regions, particularly in the west and south, remained. In summary, 12 infantry regiments were formed, of which six were named '*Alpenjäger*' – these owed their additional designation 'Mountain' solely to the area in which they were recruited and stationed (Streitkräfte, 1968, p 37). Veterans of World War I, especially those who had fought along the Dolomite front and in the Carnic Alps, brought substantial experience in mountain warfare. Their operational expertise was instrumental in preserving alpine military traditions in the newly formed republican army (Bartov, 1991; Rabensteiner, 1961, p 7–9).

Although constrained by international treaties and budgetary limitations, the Austrian Federal Army (Bundesheer) also began to form units with some kind of alpine character. Soldiers were trained in skiing, mountaineering and navigation. Civilian alpine clubs and mountain guide associations provided significant support in shaping the training regimes. Their equipment was mostly obsolete, with much of it consisting of surplus from World War I, which restricted their operational capabilities (Streitkräfte, 1968, pp 37–48). During the authoritarian phase of the First Republic (1933–1938), the government sought to revive Austrian national pride through symbols of military tradition, including the mountain troops (Khol, 2018, p 45; Streitkräfte, 1968, pp 53–57). These forces were valorized in public parades and propaganda, aligning military identity with national symbolism. In March 1938, Austria was annexed by Nazi Germany in the 'Anschluss', which led to the immediate dissolution of the Austrian Federal Army. With the Anschluss, Austria's military personnel were incorporated into the Wehrmacht (Wette, 2006, pp 31–33). This integration included many alpine specialists who were assigned to German mountain divisions. Austrian troops were significantly represented in mountain divisions, especially the 2nd, 3rd and 5th Mountain Divisions (military district XVIII). These troops were prized for their endurance and experience in alpine conditions (Lexikon der Wehrmacht, n.d.). The mountain troops operated in various challenging environments (Poland, Norway, France, the Balkans, the Invasion of Crete, the Caucasus, the Soviet Union, Finland, Italy). Operations often also involved counterinsurgency and anti-partisan measures, sometimes associated with war crimes and atrocities (Müller & Ueberschär, 2000, pp 248–252).

The Wehrmacht mountain divisions emphasized intensive alpine and winter warfare training, the use of pack animals and specialized mountaineering equipment, and the preservation of traditional insignia, such as the edelweiss, not only symbolizing continuity with Austrian heritage. Following the collapse of Nazi Germany in 1945, the mountain divisions were dissolved. Many Austrian veterans returned home, while others were detained. In the postwar period, Austria engaged in a prolonged process of dealing with the legacy of its wartime service, including a critical reassessment of its involvement in Nazi military operations and war crimes (Shepherd, 2013).

3 REGAINING MILITARY SOVEREIGNTY AND PRESENT STATUS

After 1945, Austria was divided into Allied occupation zones. In the western zones, local defence units such as the B-Gendarmerie emerged. These formations, supported by the Allies, focused on internal security and laid the groundwork for a future national army with alpine capabilities (Bischof & Pelinka, 2000, p 109). In 1955, the Austrian State Treaty restored sovereignty. With the Declaration of Neutrality, Austria committed to abstaining from military alliances. This reaffirmed a defensive military orientation, including the strategic protection of its alpine borders. These efforts culminated in the establishment of mountain brigades and the incorporation of alpine training programmes, drawing upon the historical experience of Austria's mountain troops (BMLV, 2005, p 23). So in 1956, four mountain brigades and one high mountain company were established (although they were disbanded in 1962) as part of the Austrian Army's force structure reorganization. One of them was the 6th Mountain Brigade; initially composed of three infantry battalions, an artillery unit, and support companies, it was oriented from the start towards mountain operations (BMLV, 2015, p 42). In 1957, one company was transformed into a high-alpine company, and additional specialized units such as an anti-tank and a pack animal company were formed. In 1962, the brigade was restructured into the 6th Infantry Brigade, but retained its mountain warfare specialization. Over the years, the unit underwent several reforms and reorganizations. As part of the 2016 Austrian Armed Forces reform, the 6th Infantry Brigade was dissolved and its components largely transferred to the newly created 'Mountain Warfare Command' (BMLV, 2023, p 17; Heeresgeschichtliches Museum, 1968). However, this decision was reversed in 2019, and the unit was re-established as the 6th Mountain Brigade, restoring its traditional structure and tasks. Headquartered in the Andreas Hofer Barracks in Absam, Tyrol, the 6th Mountain Brigade is stationed throughout the western half of Austria. It currently includes the following battalions:

- **Staff Battalion 6** (Innsbruck): Responsible for command support, logistics and communications;
- **Infantry Battalion 23** (Bludesch): Specialized in high-alpine terrain operations;
- **Infantry Battalion 24** (Lienz): Also alpine capable, with a company located in St. Johann in Tyrol;
- **Infantry Battalion 26** (Spittal an der Drau): Includes a company in Tamsweg and focuses on mountain warfare;

– **Engineer Battalion 2** (Wals-Siezenheim): Provides combat engineer support in rugged and mountainous terrain.

The brigade also maintains a Pack Animal Centre in Hochfilzen, using Haflinger horses to transport equipment in areas inaccessible to vehicles. Today the 6th Brigade is a key actor in territorial defence, disaster relief and international cooperation.

3.1 Strategic relevance

Austria's mountain troops will remain a pillar of national defence, and have the potential to establish themselves as a leading European hub for alpine military strategy, training, and sustainability (European Defence Agency 2022, pp 5–7). Hybrid security threats must also be faced. The alpine region contains critical infrastructure such as pipelines and energy facilities. Mountain troops must adapt to cyber-enabled sabotage, covert incursions and asymmetric threats. Today their specialized capabilities are unmatched in Europe: high-altitude combat, search and rescue, and alpine logistics (Zagajsek, 2007, pp 2–3). With regard to innovation and technological development, future alpine operations will integrate:

– Lightweight vehicles adapted to rugged terrain
– Autonomous drones for reconnaissance and resupply
– Energy-efficient, sustainable base camps
– Smart navigation systems and wearable tech

Austria should and will position itself as a European centre for alpine military education (Rodewald, 2019, pp 6–8):

– Expansion of the 'Heeresbergführer' education and training
– Joint certifications and standardized curricula
– Exchange programmes with partner nations

Austria's neutrality allows it to serve as a unique player in multinational missions, and allows flexible international collaboration:

– Participation in international humanitarian and disaster relief missions
– Hosting and leading international alpine training programmes (e.g. training with NATO and EU troops
– Acting as a mediator in security initiatives in mountainous regions (joint exercises with Germany, Italy, and Switzerland; hosting summits on mountain warfare innovation)

To maintain its strength, the mountain force must also remain anchored in Austrian society:

– Emphasizing disaster relief efforts
– Highlighting historical continuity through public relations and education
– Recruiting campaigns targeting alpine sports communities

A main task is also environmental sustainability. As guardians of sensitive ecosystems, mountain units must reduce their ecological footprint, especially practising environmentally friendly training routines, and reduce emissions and waste management during operations. Climate change exacerbates the frequency and intensity of natural disasters in alpine areas. Troops must respond to avalanches, rockfalls and wildfires (IPCC, 2021, p 11).

The 6th Mountain Brigade also hosts the '*Edelweiss Raid*', an elite international military competition for mountain troops held biennially since 2004. This event involves demanding winter mountain warfare challenges, including navigation, combat tasks, and endurance trials. The raid is widely regarded as the unofficial world championship for mountain soldiers. In 2023, teams from Bulgaria, China, Germany, Poland, Romania, Switzerland, the Czech Republic, the USA, and Austria participated. The event was won by Germany's Mountain Infantry Battalion 233 from Mittenwald (BMLV, 2023, p 22).

4 AUSTRIA'S ARMED FORCES' MOUNTAIN WARFARE CENTRE

The '*Mountain Warfare Centre*' of the Austrian Armed Forces is the country's primary training facility for alpine and high-altitude operations, and the second main pillar of Austria´s mountain warfare expertise (BMLV, 2005, p 30). Located in the Wallner Barracks in Saalfelden, Salzburg, it is under the command of the Army Troops School. Here, soldiers are trained to operate in some of the most extreme climatic and geographical conditions. The history of the centre is directly connected to the history of the aforementioned 6th Mountain Brigade. First founded as the Jägerschule in Saalfelden, it became a centre of excellence for this discipline. When the Jägerschule relocated to Bruckneudorf in 2008, the Mountain Warfare Centre was established in Saalfelden to continue and expand alpine training. Between 2016 and 2018, the Mountain Warfare Command in Absam attempted to centralize alpine capabilities. After its dissolution, most tasks were returned to the Mountain Warfare Centre and the reestablished 6th Mountain Brigade. Today the centre provides highly specialized training in the following areas:

- Mountain Warfare: Tactics and survival in alpine terrain;
- Winter Combat: Fighting in extreme cold;
- Army Mountain Leader Training: Preparing elite guides for operations in high-alpine zones;
- Helicopter Rescue Operations: Collaboration with air units in mountainous terrain;
- Military Ski Instruction: Techniques and pedagogy for ski operations.

The centre regularly hosts soldiers from partner nations, such as Germany, the USA, and France, highlighting its international relevance. Saalfelden's centre participates in the EU Pooling and Sharing Mountain Training Initiative (European Defence Agency, 2022, p 12), which fosters cooperation between European nations in alpine warfare. This makes the centre a bridge between Austrian competence and

European military integration. As mountain warfare grows in global relevance, the centre will enhance its role as a hub for multinational training. It aims to become a NATO-certified training platform, enabling seamless joint operations. Closer integration with EU and NATO training frameworks is a key strategic goal.

The Wallner Barracks are ideally situated in the foothills of the Alps. The surrounding terrain offers steep slopes, climbing routes, and ski areas, all of which are used for realistic military training. The Mountain Warfare Centre not only preserves Austria's long-standing alpine military tradition – it is also preparing for the future. As international interest in operations in difficult terrain increases, the centre is poised to take on a key strategic role.

Looking ahead, the centre will increasingly integrate modern technologies such as drones for reconnaissance, digital topographic tools, virtual training simulations, and advanced cold-weather and high-altitude gear. Collaboration with research institutions – especially in high-altitude medicine and mountain climate science – will be deepened.

Climate change is rapidly altering conditions in alpine regions. Melting glaciers, unstable slopes, and more frequent weather extremes demand updated curricula. The centre is currently developing training modules for crisis response in mountain environments, including avalanche rescue, landslide response, and high-altitude wildfire management (IPCC, 2021, pp 16–17).

Conclusion

In conclusion, this study outlines the development of Austria's alpine military forces, focusing on their transformation from the late 19th century through the interwar period and WWII. Following the Austro-Hungarian Monarchy's defeat in 1866, there was a critical realization of the necessity to adapt to mountain warfare, which led to the creation of specialized mountain brigades after the occupation of Bosnia-Herzegovina in 1878. These units were initially characterized by modified baggage trains, but lacked formal mountain warfare training, revealing significant operational deficiencies. Before WWI, the integration of specialized Landwehr mountain regiments and the operational adaptation to high-altitude warfare were pivotal in the evolution of Austria's alpine military doctrine. Despite the restrictions of the Treaty of Saint-Germain (1919), which limited Austria's military capabilities, the strategic importance of alpine defence persisted. After the 'Anschluss' of Austria in 1938 and during WWII, soldiers from (former) Austria, with extensive alpine warfare experience, contributed significantly to the Wehrmacht's mountain divisions. Post-1945, Austria grappled with the legacy of its wartime participation, leading to a critical reassessment of its military heritage and involvement in Nazi operations. After regaining full sovereignty Austria's alpine military forces played a major role in shaping the nation's defence strategy post-1955. The evolution of the 6th Mountain Brigade and the Mountain Warfare Centre underscores Austria's strategic adaptation to its unique topography while maintaining its commitment to neutrality. The integration of specialized mountain warfare capabilities into both

national and international defence frameworks has solidified Austria's position as a European leader in alpine military expertise. Moving forward, the focus on enhancing multinational cooperation, integrating advanced technologies, and addressing climate-induced challenges will ensure that Austria remains at the forefront of mountain warfare innovation and resilience.

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OD LEDU IN SKALE DO TEHNOLOGIJE: KAKO SE BODO MORALE GORSKE ENOTE SPOPASTI Z IZZIVI NABORA, USPOSABLJANJA IN INOVACIJ

FROM ICE AND ROCK TO TECHNOLOGY: HOW MOUNTAIN TROOPS WILL NEED TO FACE THE CHALLENGE OF RECRUITMENT, TRAINING, AND INNOVATION

Povzetek Članek poudarja nujnost inovacij, predvsem v usposabljanju, opremi in strateški doktrini gorskega bojevanja. Tehnološki napredek postaja bistven ne le za izboljšanje operativne učinkovitosti, temveč tudi za izravnavo zmanjšane fizične pripravljenosti novih rekrutov, medtem ko učinki podnebnih sprememb zahtevajo razvoj programov usposabljanja in taktičnega načrtovanja, da se prilagodijo novim okoljskim realnostim. Članek združuje zgodovinsko analizo z operativnimi študijami primerov, demografskimi trendi in spoznanji iz najnovejših raziskav ter uporablja multidisciplinarno metodologijo, ki omogoča natančno raziskovanje, kako je treba nova orodja in prilagodljive strategije sistematično vključiti v modele rekrutiranja in vojaško doktrino.

Ključne besede ***Gorsko bojevanje, vojaška tehnologija, umetna inteligenca, vojaška geografija, pridobivanje kadra.***

Abstract This article emphasizes the critical need for innovation, particularly in training, equipment, and strategic doctrine of mountain warfare. Technological advances are becoming essential not only to enhance operational effectiveness but also to offset the reduced physical readiness of new recruits, while the effects of climate change require training programmes and tactical planning to evolve to accommodate new environmental realities. Combining historical analysis with operational case studies, demographic trends, and insights from cutting-edge research, the article adopts a multidisciplinary methodology, allowing a nuanced exploration of how new tools and adaptive strategies must be systematically integrated into both recruitment models and military doctrine.

Key words ***Mountain warfare, military technology, artificial intelligence, military geography, military recruitment.***

Introduction

Mountain warfare requires unique physical and mental resilience, advanced survival skills, and specialized equipment. Historically, elite units such as the U.S. Army's 10th Mountain Division, Austria's Gebirgsjäger, and Italy's Alpini have exemplified the importance of rigorous selection and training (Fadella, 1972). The harsh mountain environment itself poses one of the greatest threats to soldiers, with extreme cold, avalanches, and treacherous terrain causing significant casualties. During World War I, particularly in the Alps, avalanches claimed thousands of lives – in some sectors, far more than enemy combat did. Historical records estimate that between December 1916 and March 1917 alone, more than 10,000 soldiers perished due to avalanches (notably about 4,000 in a single day in 1916 in the Dolomites) (Valanghe, 2013).

However, as warfare evolves, traditional methodologies must integrate cutting-edge technologies and adaptive strategies to mitigate such environmental hazards and improve survivability in high-altitude operations. Organizations such as the NATO Mountain Warfare Centre of Excellence are actively working on these challenges, developing strategies with a forward-looking perspective spanning the next 20 years. Their efforts focus on improving mobility, resilience, and technological integration for mountain troops, ensuring their effectiveness in increasingly complex and unpredictable environments, especially in a society experiencing a marked demographic decline.

Having said this, the changing nature of conflict, climate change, and the increasing reliance on advanced technologies necessitate a revaluation of the way mountain troops are selected, trained, and equipped. In the past, the harsh environment alone was enough to forge a strong, battle-ready unit, but modern combat in mountainous regions requires more than physical endurance. Soldiers must now be proficient in operating advanced technology such as drone surveillance, augmented reality-assisted navigation, and artificial intelligence-driven decision support systems.

Furthermore, climate change has introduced new challenges, including unpredictable weather patterns and shifting terrain due to glacier melt, necessitating adaptive training programmes. High-altitude military units must also develop survival skills suited to rapidly changing environmental conditions. Training regimens increasingly incorporate virtual simulations and biometric feedback to ensure optimal performance in extreme conditions (Buhrow, 2016).

Additionally, the importance of psychological resilience has grown, as soldiers must endure not only the physical strains of mountain warfare but also the mental challenges of isolation and prolonged exposure to harsh conditions. Recent research highlights the necessity of cognitive training and mental endurance programmes to prepare troops for such demanding environments, especially considering the additional psychological strain caused by the operation and maintenance of advanced technological systems, which require sustained concentration, technical proficiency, and resilience under pressure (Kumar, 2019).

Moreover, modern militaries can no longer rely on mass recruitment to fill their ranks. Each soldier is not only invaluable in terms of human life, but also represents a significant investment in training, equipment, and operational preparation. The cost of training a highly specialized mountain soldier, including survival techniques, environmental adaptation, and technology usage, is higher than ever before. As a result, retention and maximizing each recruit's operational effectiveness have become strategic priorities (Drillthorn, 2024).

1 RECRUITMENT CHALLENGES AND SOLUTIONS – CHANGING DEMOGRAPHICS

It is beyond question that the recruitment of mountain troops is becoming increasingly difficult, due to shifting demographics and declining interest in military careers among the younger generations. Fewer recruits possess the necessary physical conditioning or familiarity with mountainous environments. Urbanization has led to fewer individuals growing up in rural or mountainous regions, reducing the number of recruits with inherent experience in navigating harsh terrain.

Historically, the recruitment of mountain troops was deeply rooted in local traditions and geographical familiarity. When the Italian Alpini were formed in 1872, recruitment primarily targeted men from mountainous regions, such as Piedmont, Lombardy, and the Veneto. These recruits, already accustomed to the harsh conditions of alpine life, had essential skills such as skiing, climbing, and high-altitude navigation. This localized recruitment strategy ensured that soldiers were naturally adapted to their operational environment, reducing the time required for acclimatization and training (Fadella, 1971).

To counteract these demographic shifts, recruitment campaigns must be adapted to reach a broader audience. The declining birth rates across NATO countries further exacerbate the recruitment challenges, as fewer young people are available for military service. According to a report by the United Nations Population Division (UN, 2024), the birth rate in many Western nations has fallen below the replacement level of 2.1 children per woman, with countries such as Italy and Germany seeing rates as low as 1.3. In the United States, the birth rate has similarly declined to 1.6 as of 2021, reducing the available pool of recruits. This demographic trend has led to a greater emphasis on retaining existing personnel and enhancing training efficiency to maximize the effectiveness of each soldier.

Additionally, modern young people are increasingly disconnected from the physical demands of military service. With the rise of urbanization, sedentary lifestyles, and increased dependence on digital technologies, fewer individuals possess the practical skills once commonplace in rural and mountainous regions. This shift has necessitated the redesign of training programmes to account for longer learning curves in critical areas such as endurance training, land navigation, and extreme weather survival (MilitarySphere.com, 2025).

Modern advertising strategies, social media outreach, and gamification methods are being explored to appeal to tech-savvy younger generations. Recruitment centres are also incorporating VR simulations which provide prospective recruits with first-hand experience of what serving in a mountain unit entails, making the role more appealing. Targeted incentive programmes, including financial bonuses, advanced educational opportunities, and career transition support, have been implemented in several NATO countries to boost enlistment figures (Weiss, 2025).

2 PSYCHOLOGICAL AND PHYSICAL SCREENING

Given the demanding nature of mountain operations, psychological resilience is just as crucial as physical strength. The ability to endure prolonged isolation, cope with high-altitude stress, and function effectively in severe environmental conditions requires more than just basic psychological stability. Psychological assessments should be refined to identify individuals with exceptional adaptability, problem--solving skills, and emotional regulation under duress. These traits are essential for handling long-duration deployments in remote, high-risk environments, where traditional support structures are unavailable.

Programmes implemented in some military organizations integrate detailed psychological testing in the early recruitment phases, ensuring that only those with the mental fortitude for such challenging conditions are selected (Murray, 2005).

Additionally, ongoing psychological training and support mechanisms, such as stress inoculation training and resilience workshops, are being explored to improve mental endurance. Research has shown that exposure to controlled high-stress scenarios before deployment can significantly enhance a soldier's ability to manage real-world battlefield conditions. Similarly, mindfulness and cognitive-behavioural techniques have been introduced to help recruits develop coping mechanisms for the mental strains of isolation and extreme conditions (Gonzales, 2013).

As military institutions recognize the critical role of psychological fitness, new methodologies for monitoring and supporting mental well-being throughout a soldier's career are being developed. Advances in biometric tracking, real-time psychological feedback systems, and AI-driven mental health assessments are emerging as tools to ensure sustained psychological resilience in elite mountain troops. These innovations provide early warning indicators for stress-related fatigue and help mitigate burnout, improving long-term operational effectiveness.

Additionally, comprehensive mental health training programmes are being integrated into military curricula, emphasizing stress inoculation, cognitive behavioural techniques, and resilience-building exercises. Studies have shown that pre-emptive exposure to controlled stress scenarios can significantly improve a soldier's ability to cope with high-intensity situations. Furthermore, the implementation of wearable biometric devices allows for real-time assessment of stress markers, such as heart

rate variability and cortisol levels, enabling commanders and medical teams to intervene before psychological strain compromises operational effectiveness.

To support long-term mental resilience, some military organizations have introduced post-deployment psychological debriefing programmes, ensuring that soldiers receive adequate care and counselling after exposure to extreme environments. Peer-support networks and digital mental health platforms are also being developed to provide continual assistance to active and retired personnel, addressing issues such as PTSD and reintegration stress (Moore, Penk, 2019). By leveraging these advancements, military institutions aim to create a more robust and psychologically prepared force, capable of enduring the extreme challenges posed by mountain warfare.

3 TRAINING ADAPTATIONS – PHYSICAL AND MENTAL CONDITIONING

Mountain troops must maintain peak physical fitness, endurance, and psychological resilience. Traditional training programmes emphasize high-altitude acclimatization, rock climbing, and cold-weather survival (Pascarella, 2016). Emerging strategies now include hypoxia chambers, biometric monitoring, and experimental research from the terraXcube project in Bolzano, an advanced climate simulation facility developed by Eurac Research (Eurac Research, 2023). This cutting-edge research centre is designed to replicate extreme environmental conditions, including high-altitude and sub-zero climates, making it an invaluable tool for studying human and technological performance in mountain warfare scenarios. The facility includes large climate chambers which can simulate temperatures ranging from -40°C to +60°C, wind speeds up to 30 m/s, and altitudes as high as 9,000 metres. Studies conducted at the terraXcube have provided crucial data on hypoxia adaptation, physiological responses to cold stress, and the performance of high-tech military equipment under extreme conditions (Eurac Research, 2023).

Endurance training is evolving, with emphasis on altitude training, acclimatization regimens, and strength conditioning tailored to mountainous operations. Special forces units in the Alps, for instance, incorporate long-duration survival training, requiring soldiers to spend weeks at high altitudes with minimal resources, testing their ability to survive in extreme conditions.

The Italian Alpini Paratroopers (Ranger Battalion Monte Cervino) exemplify a highly specialized approach to mountain warfare training. Their regimen includes extreme cold-weather survival, vertical mobility techniques, and high-altitude parachuting – essential for rapid deployment in inaccessible terrain. Training programmes emphasize a combination of mountaineering, combat tactics, and advanced winter warfare skills. A key aspect of their preparation involves extended missions in the Dolomites and the Alps, where they must operate autonomously in harsh environments while maintaining combat readiness. Furthermore, they conduct joint exercises with NATO allies to refine interoperability and integrate emerging

technologies, such as drone reconnaissance and augmented reality navigation systems, into mountain operations.

Similar training methodologies are employed by other elite forces specializing in extreme environments. The British Special Air Service (SAS) incorporates training in the extreme conditions of the Scottish Highlands and Norway, emphasizing long-range reconnaissance and survival tactics. The U.S. Navy SEALs and Marine Corps conduct rigorous cold-weather warfare training in locations such as the Sierra Nevada, focusing on vertical mobility, endurance operations, and survival in sub-zero environments (McNab, 2002).

4 INTEGRATION OF ADVANCED TECHNOLOGY IN TRAINING AND OPERATIONS

It is clear from the above that the integration of advanced technology in mountain warfare is becoming an absolute necessity, due to demographic challenges and the decreasing physical and mental readiness of new recruits. With declining birth rates across NATO countries and fewer individuals raised in physically demanding environments, traditional methods of mountain warfare training are no longer sufficient (AUSA, 2025). Technological advancements, such as exoskeletons, artificial intelligence, and drone reconnaissance, are being leveraged to compensate for these gaps, ensuring that modern soldiers can maintain operational effectiveness in extreme terrain despite reduced endurance and resilience levels.

Exoskeletons, for example, are being deployed to enhance mobility and reduce fatigue in soldiers operating in high-altitude environments. The ONYX exoskeleton by Lockheed Martin has been tested to improve load-bearing efficiency by reducing energy expenditure by up to 25% (Global Defence Technology, 2019). These advancements are critical, as newer generations of recruits often exhibit lower endurance levels and increased susceptibility to musculoskeletal injuries due to their more sedentary upbringing.

A recent test conducted by the NATO Mountain Warfare Centre of Excellence (NATO MW COE) evaluated the effectiveness of exoskeletons in mountain operations. The study highlighted both the benefits and challenges of exoskeleton deployment in rugged terrain, noting that while they reduce physical strain and improve endurance, they must be carefully adapted to the specific demands of mountain warfare to avoid becoming an operational burden (NATO MW COE, 2024b). The findings reinforce the importance of continuous refinement and customization of exoskeleton technology to fully integrate it into mountain troop strategies.

Additionally, augmented reality (AR) and artificial intelligence (AI) are revolutionizing mountain warfare training and operations. AI-driven decision support systems provide real-time analytics, aiding commanders in making rapid tactical adjustments based on environmental and enemy movement data. AR-assisted navigation enhances

situational awareness, allowing soldiers to traverse complex terrain with greater precision. These technologies not only mitigate skill deficiencies, but also improve operational success rates in the field.

In this context, the NATO MW COE is working on developing specialized training and planning systems for mountain operations. Their goal is to integrate commercially available technologies which are already used by thousands of mountaineers worldwide for planning, tracking, and generating reports of their activities in extreme environments. By leveraging existing tools and adapting them to military applications, the NATO MW COE aims to enhance the efficiency, safety, and adaptability of mountain troops, ensuring that they can operate effectively despite demographic and physiological challenges (NATO MW COE, 2024a).

The increasing reliance on technology further supports the adaptation of mountain troops to modern combat scenarios. Drones equipped with thermal imaging and AI-driven mapping capabilities are now essential tools for reconnaissance and target acquisition in difficult-to-access regions (AARC, 2024). By incorporating these technologies, military institutions are ensuring that the effectiveness of mountain troops is being sustained even as traditional physical fitness levels decline in younger generations. Continued investment in advanced technology is not just an option but a fundamental requirement for maintaining superiority in mountain warfare.

In short, as younger recruits increasingly lack outdoor skills due to their digital lifestyles, military training is shifting toward AI-enhanced systems – such as adaptive simulations, biometric monitoring, and AR navigation – to accelerate learning and bridge capability gaps. The future of mountain warfare will likely depend on the successful integration of these innovations, to ensure that soldiers remain agile, resilient, and fully prepared for the challenges of high-altitude combat.

5 OPERATIONAL AND STRATEGIC INNOVATION AND ADAPTATIONS – EQUIPMENT MODERNIZATION

The effectiveness of mountain troops depends not only on their rigorous training and psychological resilience but also on the continual modernization of their equipment. Operating in extreme environments – characterized by harsh weather conditions, unpredictable terrain, and altitude-related physiological challenges – requires highly specialized gear designed to enhance mobility, endurance, and survivability. Without constant innovation in materials, logistics, and tactical support systems, even the most well-trained units risk reduced operational efficiency and increased exposure to environmental hazards.

As we have already said, in recent years demographic decline and shifting societal trends have compounded the challenge of recruiting and maintaining physically capable mountain troops. To counteract these limitations, military organizations are making substantial investments in cutting-edge technologies which augment human

performance and compensate for reduced physical endurance. One of the most significant advances in this field is the integration of graphene-based materials into combat gear (EDA, 2019). These materials offer superior thermal insulation while maintaining breathability, significantly reducing the bulk and weight of traditional cold-weather clothing. This allows for greater agility and endurance, which are critical in high-altitude operations. Furthermore, adaptive footwear with self-regulating insulation and enhanced grip technology enables safer movement across snow, ice, and rock, minimizing the risk of injury in treacherous terrain (Graphene Investors, 2025).

Another crucial innovation is the development of portable heating systems equipped with biometric sensors, which adjust heat output based on a soldier's core temperature. This optimizes energy consumption while ensuring adequate warmth, preventing cold-related fatigue and hypothermia (Zoltowski et al., 2024). Alongside heating technology, self-sufficient survival packs are evolving to include solar-powered energy modules, lightweight emergency shelters, and compact water purification systems, allowing troops to operate independently for extended periods.

Autonomous logistics and drone-based supply delivery are revolutionizing the way mountain troops receive essential provisions. AI-powered drones with real-time weather adaptation capabilities can efficiently transport rations, medical kits, and ammunition to troops in isolated positions, eliminating the risks associated with traditional resupply convoys (Han, Masoud, 2024). Recent advancements have introduced heavy-lift drones, expanding the range and payload capacity of these systems, making them invaluable assets in mountainous warfare.

Additionally, mobility and climbing equipment have undergone significant upgrades, leveraging carbon-fibre reinforced materials for enhanced strength and reduced weight. Ice axes, crampons, and climbing harnesses now provide better durability and adaptability, allowing soldiers to traverse rugged landscapes with increased efficiency.

Beyond individual soldier enhancements, advances in logistics, mobility solutions, artificial intelligence driven support systems and new materials are transforming the way mountain troops train, equip, and carry out missions. Automated reconnaissance drones, AI-assisted decision-making tools, and exoskeleton technology are reshaping both the strategic and tactical approaches to mountain warfare. These advancements not only offset the declining physical performance of new recruits, but also introduce new capabilities which were previously unattainable, such as real-time environmental analysis, autonomous supply chains, and enhanced terrain navigation in GPS-denied environments.

As modern warfare continues to evolve, ensuring the adaptability of mountain troops through technological integration is no longer optional – it is a strategic necessity. By investing in next-generation materials and new doctrines, military forces can maintain

the effectiveness of high-altitude combat units despite shifting demographics and increasingly complex operational environments. The modernization of mountain warfare equipment is thus not just an improvement in soldier performance, but a critical element in preserving operational superiority in some of the world's most challenging combat theatres.

6 LOGISTIC ADAPTATIONS

Effective logistics are the backbone of any military operation, but in the context of mountain warfare they become exponentially more challenging, due to the extreme terrain, unpredictable weather, and supply chain vulnerabilities. Compounding these typical difficulties, declining birth rates and reduced physical resilience in modern recruits necessitate innovative approaches to sustain operational effectiveness. Traditional supply methods, such as ground convoys and airdrops, often struggle with the constraints imposed by steep inclines, snow-covered passes, and remote locations, making it imperative to integrate new logistical strategies which can compensate for a workforce with lower endurance and adaptability.

To address these challenges, modern mountain troops are integrating advanced logistic solutions, including autonomous resupply drones and adaptive transport technologies. High-altitude, all-terrain unmanned ground vehicles (UGVs) are being tested to transport heavy loads across rugged landscapes, reducing soldier fatigue and increasing operational sustainability.

The adoption of modular, lightweight, and extreme weather resistant materials for tents, shelters, and survival equipment further improves logistical efficiency, ensuring that mountain troops can sustain prolonged operations with minimal resupply requirements. Advances in nanomaterials and smart textiles enhance durability while reducing weight and improving mobility and protection in extreme climates. In addition, 3D-printing technology is emerging as a potential game-changer, allowing for the on-site production of essential equipment and replacement parts, minimizing dependency on traditional supply lines. Recent studies highlight the feasibility of 3D-printed food and medical supplies, which could significantly enhance operational resilience (Defence Industries, n. d.).

The integration of energy-efficient and self-sustaining technologies, such as portable solar power stations and fuel cells, ensures long-term operational sustainability in remote locations (Dannar, 2025).

Predictive analytics and machine learning models enable logistics teams to anticipate supply shortages, optimize distribution routes, and enhance the responsiveness of resupply missions. These adaptive strategies ensure that military forces can operate with greater autonomy, maintaining high-performance standards despite the demographic and physical challenges of modern recruits.

7 THE EVOLUTION OF TACTICAL DOCTRINE IN MOUNTAIN OPERATIONS

The introduction of new technologies into mountain warfare cannot be limited to merely adopting advanced tools; it must be accompanied by a comprehensive update of tactical doctrine to ensure that these innovations are effectively integrated into decision-making and operational processes. However, the pace at which doctrine is developed often fails to keep up with the rapid evolution of technology. NATO, in particular, must drastically accelerate the revision of its tactical doctrines to avoid a scenario where new capabilities exist but are not fully utilized due to the lack of clear operational guidelines (NATO MW COE, 2025b).

The integration of autonomous drones and advanced artificial intelligence is transforming surveillance and reconnaissance dynamics, reducing the need for physical patrols in high-risk areas and improving real-time threat identification (NATO MW COE, 2025a). However, the absence of a clear and shared doctrine among the Allied forces is slowing down the systematic adoption of these technologies. Without well-defined operational guidance, units risk integrating new capabilities in a fragmented manner, failing to maximize their effectiveness. It is therefore essential for NATO to speed up the formalization of specific protocols for the coordinated use of these tools, ensuring seamless integration among all forces.

At the same time, the adoption of unmanned vehicles and assisted navigation systems is significantly altering movement and combat strategies at high altitudes. Mountain units can now carry heavier loads and move with greater endurance across rugged terrain, increasing their operational autonomy. This requires a rethinking of movement formations, concealment techniques, and defensive procedures. NATO must take a more proactive approach in testing, adapting, and formalizing new tactics which fully exploit the advantages offered by these technologies (NATO MW COE, 2024a).

Finally, unit force structures must evolve to incorporate specialists in advanced technologies, responsible for managing the integration between human operators and automated systems. The use of technologies such as GPS-denied navigation (via SLAM and other methodologies) and predictive risk analysis systems requires the creation of new operational roles with both tactical and technological expertise. Relying solely on traditional doctrines without rapidly updating them to include these new realities means losing the competitive advantage to potential adversaries who may adopt these innovations more swiftly.

For these reasons, NATO must drastically accelerate the cycle of doctrine revision and implementation, reducing the time for experimentation and validation while adopting a more dynamic approach based on continual operational testing and real-time feedback from mountain units. Only by doing this can it maintain operational superiority in an increasingly technology-driven and hybrid battlefield environment.

8 ENVIRONMENTAL AND CLIMATE CHALLENGES

Climate change has significantly altered the environmental conditions of the traditional training areas used by mountain troops. The melting of glaciers, shifting weather patterns, and unpredictable snowfall have introduced new challenges which military forces must address to maintain operational readiness. High-altitude regions, once characterized by stable seasonal weather conditions, are now experiencing extreme and unexpected climatic variations. As a result, troops must be prepared for both prolonged droughts and sudden, intense snowstorms, making strategic planning and logistical support more complex than ever before.

One of the most immediate consequences of climate change is the transformation of the physical landscape. The rapid retreat of glaciers in mountainous areas has exposed unstable rock formations, increasing the risk of landslides and avalanches. Terrain that was once predictable for navigation and movement now presents new hazards, forcing soldiers to adapt to an environment in constant flux. Additionally, permafrost degradation in Arctic and subarctic training zones has led to unstable ground conditions, complicating the construction of forward operating bases, observation posts, and supply depots.

The unpredictability of snowfall has also complicated winter warfare training, exercises and operations. Whereas in the past programmes could reliably expect consistent snow coverage during certain months, new climate patterns have resulted in erratic snow distribution. Some traditionally snow-covered areas are experiencing reduced snowfall, forcing military units to seek alternative locations for winter exercises or to adapt their equipment and training to move in a mud environment (NATO MW COE, 2024b). Conversely, sudden heavy snowfalls have made logistics and resupply missions more difficult, increasing the need for specialized equipment such as all-terrain vehicles and autonomous resupply drones.

To address these challenges, training programmes, materials and doctrine must incorporate adaptability strategies which prepare soldiers for extreme weather unpredictability. The ability to operate in highly variable conditions is now a core competency for mountain troops, requiring both mental and physical resilience. Traditional training methods are being supplemented by new techniques emphasizing flexibility, rapid decision-making, and the integration of cutting-edge technology.

In this area, virtual simulations are becoming an essential component of mountain warfare training. Advanced climate simulation facilities, such as the aforementioned terraXcube project in Bolzano, allow military units to experience extreme weather conditions in a controlled environment. These high-tech training centres can replicate temperatures as low as -40°C, simulate hurricane-force winds, and adjust altitude settings to mimic the physiological effects of high-altitude operations. By training in such environments, soldiers can acclimate to extreme conditions before deployment to real-world mountainous battlegrounds.

Climate change affects not only the environment in which mountain troops operate, but also their physical and mental performance. Unstable weather, extreme cold, and sudden shifts in conditions can severely challenge endurance. In response, training increasingly incorporates methods such as stress exposure, cognitive conditioning, and biometric tracking. Wearable devices measuring indicators such as heart rate variability and oxygen levels help tailor training programmes to each soldier's physiological limits, enhancing overall resilience and operational readiness.

Technological advancements in equipment are also helping to mitigate the effects of climate change on military operations. The development of high-performance, lightweight clothing materials has improved soldiers' ability to withstand extreme temperatures while maintaining mobility. AI-assisted navigation tools are being implemented to help troops traverse unpredictable terrain, and drone-based reconnaissance systems provide real-time situational awareness in remote locations. These innovations not only enhance operational effectiveness but also reduce the physical burden on soldiers, making them more adaptable to extreme environments.

Looking ahead, the military must continue evolving in response to climate change. The ability to train and operate effectively in increasingly unstable mountainous environments will require a combination of technological innovation, strategic planning, and advanced training methodologies. By integrating AI-driven weather prediction, virtual training environments, and enhanced resilience strategies, modern mountain troops will be better equipped to face future challenges. Organizations such as the NATO MW COE play a crucial role in developing these solutions, ensuring that elite units remain prepared for the ever-changing nature of mountain warfare.

With continued investment in research and technological development, military forces can maintain their strategic advantage and continue to operate effectively in some of the world's most challenging environments.

9 THE NATO MOUNTAIN WARFARE CENTRE OF EXCELLENCE

It is absolutely clear that the evolution of mountain troops is inevitable, driven by advancements in materials, technology, and AI-driven systems. While physical endurance, survival skills, and mental resilience remain central to operational effectiveness, the rapid integration of state-of-the-art innovations is transforming the way elite mountain warfare units train, deploy, and engage in combat. As new threats emerge – ranging from asymmetric warfare in mountainous regions to climate-induced terrain shifts – military organizations must adapt proactively to maintain superiority in mountain warfare.

At the forefront of these efforts is the NATO MW COE, which plays a pivotal role in research, doctrine development, and training innovation for mountain troops. The centre actively collaborates with NATO member states, defence research institutions, and private sector partners to enhance the mobility, resilience, and technological

capabilities of mountain warfare units (NATO MW COE, 2024a). Recognizing the demographic challenges affecting recruitment, the NATO MW COE is also developing adaptive training solutions which leverage AI, virtual reality simulations, and physiological performance monitoring to optimize soldier readiness, even as the traditional sources of physically conditioned recruits decline.

In addition to training innovations, the NATO MW COE is leading efforts to modernize operational doctrine in response to climate change, evolving threats, and technological advancements. For example, the Centre is exploring exoskeleton deployment to enhance troop endurance, High Tech terrain analysis, a dedicated MWC4I system to improve tactical planning and mission execution, and drone-based reconnaissance to expand situational awareness in hostile environments and logistic resupply on the field. These advancements ensure that mountain troops remain highly effective, despite the increasing complexity of modern warfare.

Furthermore, the NATO MW COE is actively engaged in joint training exercises, interoperability programmes, and multinational research initiatives, reinforcing the strategic importance of mountain warfare in NATO's broader defence posture. By integrating real-world operational feedback, lessons learned from past conflicts, and the latest in military technology, the Centre ensures that mountain warfare units across NATO forces are prepared for future challenges.

As warfare continues to evolve, sustained investment in recruitment, training, doctrine and technological development will be essential. The NATO MW COE will remain a central hub for innovation, strategic planning, and doctrinal advancements, ensuring that mountain troops are not only prepared for today's battlefield but remain dominant forces in the high-altitude conflicts of the future. By embracing next-generation capabilities while preserving the elite physical and mental attributes that define mountain troops, NATO ensures that these specialized units continue to excel in the most extreme operational environments.

Conclusion

Mountainous terrain remains one of the most strategically crucial and operationally challenging environments within the Land Domain. Control over high-altitude areas has historically provided military forces with a decisive advantage in terms of observation, mobility, concealment, and defence. In today's evolving security landscape – marked by hybrid threats, technological disruption, climate change, and demographic decline – these regions are taking on an even greater significance. They are not only geographical features but arenas of geopolitical contestation where the resilience, adaptability, and technological edge of armed forces are put to the test.

NATO has long recognized the critical importance of mountain warfare capabilities, and has taken significant steps to maintain and enhance its relevance in these environments. Through the efforts of the NATO MW COE and allied institutions, the Alliance has invested in the development of forward-looking concepts, joint training programmes, and the integration of advanced technologies into operational planning

and execution. The MW COE in particular plays a central role in spearheading research on climate adaptation, autonomous systems, AI-supported mission planning, and cutting-edge training methodologies which simulate the realities of high-altitude combat.

These efforts signal a clear commitment: NATO does not consider mountainous regions a peripheral concern, but a core component of its land warfare posture. From doctrinal development to multinational exercises, the Alliance is proactively shaping the future of mountain warfare. Investments in adaptive training, mental and physical resilience, and new forms of tactical mobility are already underway.

However, as adversaries innovate and terrain becomes more unpredictable due to climate shifts, NATO must continue to scale its efforts. Despite the extensive progress made, further investment is required, in both in human capital and technological modernization, to counteract the long-term effects of declining birth rates and the decreasing physical readiness of new generations. Retention of skilled personnel, recruitment of specialized profiles, and the development of highly adaptive training ecosystems must remain strategic priorities.

The relevance of NATO across the entire Land Domain depends on its ability to dominate all types of terrain – including the most unforgiving and remote. Abdicating control over mountainous areas would not only create operational blind spots, but risk undermining the Alliance's credibility in future conflicts. Therefore, ensuring sustained superiority in these regions is not optional – it is an operational imperative.

NATO's ongoing commitment to innovation in this field must be matched by continued resource allocation, inter-agency collaboration, and accelerated doctrine development. Mountain troops represent the convergence of tradition and transformation; they carry forward the legacy of elite warfighting units while pioneering the use of emerging technologies in extreme conditions. By reinforcing these capabilities, NATO is ensuring that it will remain not only present but dominant in the high-altitude battlefields of tomorrow.

In conclusion, the Alliance is already doing much to anticipate and meet the demands of modern mountain warfare. But to maintain this strategic edge and secure its role as a fully capable land power, NATO must continue to invest boldly, act decisively, and think innovatively. Only by doing this will it remain prepared to face the complex operational realities that await above the treeline – and far beyond.

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MEDICINSKE KOMPETENCE VOJAKOV V GORAH: ŠTUDIJA PRIMERA POLJSKIH OBOROŽENIH SIL

MEDICAL COMPETENCIES OF SOLDIERS IN THE MOUNTAINS: A CASE STUDY OF THE POLISH ARMED FORCES

Povzetek Članek poudarja pomen ustreznega medicinskega usposabljanja za vojake, ki delujejo na gorskih območjih, kjer omejen dostop do zdravstvene oskrbe, spreminjajoče se vremenske razmere in težko dostopno ozemlje pomenijo edinstvene izzive. Analiza se nanaša na izkušnje Oddelka za gorsko usposabljanje Vojaške akademije in poudarja nujnost rednega razvijanja medicinskih veščin vojakov ter ozaveščanja o zdravstvenih tveganjih, kot so podhladitev, ozebline in plazovi. Sklepna ugotovitev je, da sta razvoj in nenehno izpopolnjevanje medicinskih kompetenc nepogrešljiva za gorske vojake, saj zagotavljata učinkovito in pravočasno pomoč v življenjsko ali zdravstveno ogrožajočih razmerah ter izboljšujeta operativno pripravljenost v gorski obrambi Poljske.

Ključne besede ***Gorske enote, medicinska tekmovanja, vojaško usposabljanje, nujna pomoč.***

Abstract This article highlights the significance of appropriate medical training for soldiers operating in mountainous regions, where limited access to medical care, changing weather conditions, and difficult terrain present unique challenges. The analysis refers to the experience of the Mountain Training Department of the Military Academy, underscoring the necessity for regularly developing soldiers' medical skills and health risks such as hypothermia, frostbite, and avalanches. In conclusion, the development and continual improvement of medical competence are indispensable for mountain soldiers, ensuring effective and timely assistance in life or health-threatening situations, and enhancing operational readiness in the mountainous defence of Poland.

Key words ***Mountain troops, medical competitions, military training, emergency care.***

Introduction

Mountain military units in Poland have a rich and complex history which dates back to the early 20th century. At this time, due to geopolitical changes and the defensive needs of the country, the importance of specialized units capable of operating in difficult mountainous terrain began to be recognized. The geographical conditions of Poland, especially the southern border running entirely through the Beskid, Tatra, and Sudeten regions, posed challenges, underlining the necessity of forming units which could operate effectively in this area (Moś, 2020). The first mountain units in Poland began to emerge in the 1920s. As early as 1921, divisions were organized for the purpose of defending the southern borders of the country. They were formed from the local community, taking into account the specifics of the terrain and tactical requirements for military defensive actions. Training in these units focused on climbing techniques, navigating difficult terrain, and mountain combat tactics.

1 POLISH MOUNTAIN TROOPS

During the period of Polish military history shortly after Poland regained independence in 1918, notable figures of commanders who played fundamental roles in the formation and development of mountain military units hold a special place. The first of these was Mariusz Zaruski, followed by Stanisław Sosabowski (Nowak, 2018). Both officers, through their approach to military affairs, contributed to the establishment and permanent strengthening of mountain units in Poland. General Mariusz Zaruski, born in 1868, was a world-renowned mountaineer and sailor, but above all, he was a soldier and social activist. His passion for the mountains and climbing, as well as his extensive knowledge in this area, inspired him to take action in creating military units and the first mountain rescue service in what was then Poland. In 1921, partly due to his initiative, the first military units with a mountain profile were established (Malinowski, 2019). As the head of this type of formation, Zaruski had a key influence on the organization and training of these units. He initiated training programmes which focused on mountain tactics, climbing, and terrain navigation, and importantly, on the use of equipment adapted for operations in exposed conditions. His efforts contributed to the formation of the 22nd Mountain Infantry Division, which played a significant role during World War II (Kowalski, 2015).

The second prominent figure who contributed to the formation of mountain military units in Poland was General Stanisław Sosabowski, born in 1892. His military career began before World War I, and after its conclusion, Sosabowski gained recognition as an experienced and battle-hardened commander. His views on the organization and use of mountain units were similar to those presented by General Zaruski, which resulted in a strengthening of the direction of development in this field within the country. Sosabowski was an advocate of modern military tactics, leading to the creation of narrowly specialized mountain units capable of operating under any conditions. His greatest achievement was the formation of the 1st Independent Parachute Brigade, which, although not a mountain unit in the strictest sense, utilized many techniques and tactical elements suitable for operations in difficult mountainous conditions.

This brigade participated in numerous operations, including the battle of Arnhem, where Sosabowski commanded his soldiers (Szymański, 2017).

Despite differences in their careers and approaches to tactics, the two generals shared many common goals. They both had a vision of creating units capable of operating effectively in mountainous conditions, and understood the importance of specialized training and innovative methods in military operations. Their initiatives and visionary approach enabled the establishment and development of military units specializing in mountain operations in Poland when it was emerging after the partition period (Gen. Zaruski), and in the post-World War II era (Gen. Sosabowski).

In 1939, in the face of the outbreak of World War II, the mountain units of the Polish Army actively participated in the defence of the country against the German aggression. The 22nd Mountain Infantry Division, formed during the interwar period, became one of the symbols of resistance against the aggressor. These units fought not only in Poland but also on the fronts of Europe as part of the Polish Armed Forces in the West. Mountain soldiers took part in intense battles, proving their skills, which contributed to their reputation as capable and versatile troops.

After the end of World War II, during the period of the People's Republic of Poland (PRL), the mountain military units were integrated into the newly established Polish Army. At that time, the 10th Mountain Mechanized Division was created, aimed at defending the southern border of the country and conducting operations in difficult terrain. The soldiers of this division were engaged in numerous training sessions aimed at enhancing their capabilities in operating in mountainous environments, which also served as an important propaganda element in the context of the defensive strategies of the then Polish state (Kowalski, 2020). This unit was disbanded in 1999 as a result of the political transformation in Poland.

Contemporary Polish military mountain units, such as the 21st Podhale Rifles Brigade, continue the traditions of their predecessors. They have participated in international peacekeeping and stabilization missions, including those in Afghanistan, Kosovo, and Iraq (Nowak, 2021). These units also possess unique traditions and values which shape their identity. Great determination, teamwork skills, and the ability to adapt to changing conditions are their fundamental characteristics. Currently, units capable of carrying out their primary tasks in mountainous areas are an integral part of the Armed Forces of the Republic of Poland, specifically within the Land Forces. Mountain units continue to play a crucial role in defending the country's borders and conducting operations in difficult terrain.

The key formation responsible for defence tasks in the Polish mountains remains the 21st Podhale Rifles Brigade (21 BSP). In 2001, this Brigade was incorporated into the 1st Warsaw Mechanized Division, named after Tadeusz Kościuszko, where it operated until March 31, 2011. After that date, the Brigade came directly under the command of the Land Forces. During its existence, the organization of the 21

BSP has undergone several changes concerning personnel numbers and the types and quantities of units and independent subunits, as well as their equipment and deployment. The changes implemented in the structure, as well as the development of armaments and military equipment, aim to ensure adequate preparation and readiness to fulfil the tasks outlined by the command, as well as to adjust the Brigade to modern standards.

It is worth mentioning that in 2008, as a result of Decision No. Z-29/Org/P1 by the Ministry of National Defence, the 22nd Mountain Infantry Battalion (JW 4161) from Kłodzko and the 14th Mechanized Battalion (JW 1497) from Przemyśl were added to the 21st Podhale Rifles Brigade. According to the change plan specified in the "Development Plan for the Armed Forces of the Republic of Poland for 2009-2018", significant transformations in the structure of the Brigade took place in 2010. At that time, the Polish-Ukrainian Peacekeeping Battalion, the 14th Mechanized Battalion in Przemyśl, and the 5th Mechanized Battalion in Rzeszów were disbanded. In their place, the 5th Podhale Rifles Battalion was established in Przemyśl, which inherited the traditions of the disbanded unit from Rzeszów. Based on the Order of the Commander of the Land Forces concerning the reorganization of the 21 BSP in 2011, the 16th Tczew Engineer Battalion was also integrated into the Brigade, which, according to the plan, relocated from the Tczew garrison to the Nisko garrison in Podkarpacie in October of the same year. Additionally, by virtue of the Order of the Commander of the Land Forces No. PF-15/Org, dated April 14 2011, following the previous disbandment of the 21st Maintenance Company and the 21st Supply Company, the 21st Logistics Battalion was established in Rzeszów. From January 2014 to 2018 the 21 BSP was directly subordinate to the Commander of the General Staff of the Armed Forces, and since 2018, it has been subordinated to the 18th Mechanized Division. Although the mountainous area constitutes about 3% of Poland's surface, it has posed logistical and technical challenges for over a century, as the southern border of the country runs entirely through this area. In order to meet these geopolitical challenges, the Mountain Operations Department is responsible for the technical and substantive preparation of Polish soldiers for combat in mountainous terrain.

2 THE MOUNTAIN COMBAT DEPARTMENT IN POLAND

The Mountain Operations Department is an organizational unit of the Command Faculty at the Tadeusz Kościuszko Military Academy of Land Forces in Wrocław. It implements its educational objectives in the area of skills for conducting operations in mountainous regions for the future officer cadre and soldiers of the Polish Armed Forces, whose personnel have the opportunity to receive training through advanced courses. Tasks in this area are carried out at the basic, advanced, and methodological-instructional levels as part of the guidelines concerning mountain training for the Armed Forces of the Republic of Poland (Figure 1).

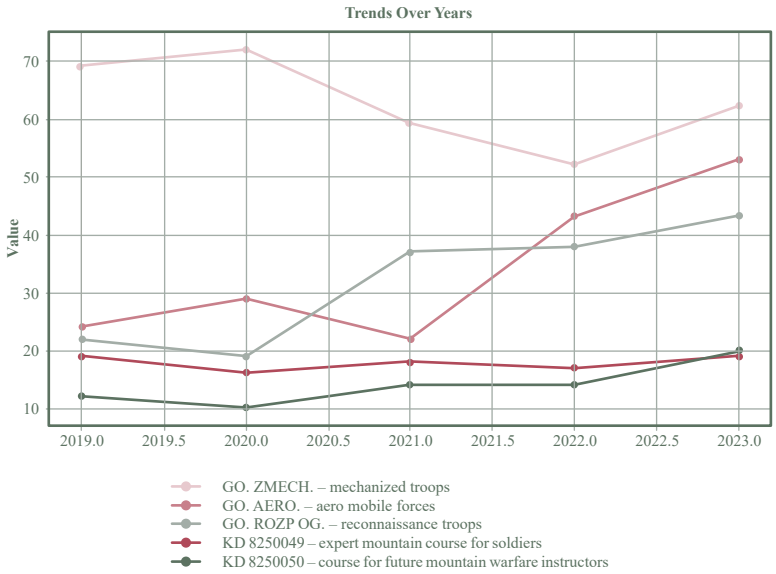

Figure 1. The figure presents the number of trained cadets and soldiers for the following groups and advanced training courses from 2019 to 2023 (Source: General Tadeusz Kościuszko Military University of Land Forces Development: P. Dąbrowski)

To summarize the presented numerical data, the total number of soldiers trained in mountain warfare by us amounts to 1,041 from 2019 to 2024. Furthermore, as part of the academic activities of the High Mountain Training Section, our department organized international conferences and training sessions attended by over 200 cadets from partner institutions of the Military Academy of Land Forces (AWL). The presented numerical data is sufficient to draw conclusions with regard to the direction and scope of education for soldiers fulfilling their professional duties in mountainous areas, in sectors such as equipment minimums, physical preparation, technical skills, and, notably, medical skills.

3 THE MEDICAL COMETENCIES OF SOLDIERS IN THE POLISH MOUNTAINS

The profile of medical competencies possessed by our students, which they acquire before undertaking mountain training, is derived from standards (English: Tactical Combat Casualty Care – TCC) (Smith, 2020; Holcomb, 2015). TC3 is a set of guidelines concerning medical care in the context of tactical operations, focused on minimizing preventable deaths and encompassing three main situational vectors: 1) Tactical Care: rapid actions taken with the casualty during combat, involving the assessment of the casualty's condition and administering first aid (Butler, 2018); 2) Care Under Fire: providing care to the injured during ongoing combat, which involves addressing risks and effectively managing time (Bledsoe, 2016); and 3) Tactical Evacuation Care: medical care during the evacuation of casualties from

the battlefield, ensuring their safety and stabilization before transport to a medical facility (McSwin, 2012).

The level of assistance activities carried out under the presented standard is closely correlated with the level of education and local protocols concerning the provision of health services. The highest level of expertise is represented by medical professionals, whose presence during operational activities is limited; this aligns with our experience. The vast majority of the participants in our courses possess basic competencies in providing assistance, corresponding to the level of CLS (Combat Lifesaver). A common feature across the presented areas of medical competencies is the procedure associated with the acronym MARCH (Bledsoe, 2015). This framework in medicine signifies the critical steps for saving the lives of casualties, especially in the context of battlefield medicine: M = Massive haemorrhage: immediate control of severe bleeding; A = Airway: ensuring airway patency; R = Respiration: assessment and support of breathing; C = Qualitative and quantitative assessment of the condition of the circulatory system, including the assessment of circulatory centralization, and H = Hypothermia: preventing heat loss.

The reflexive completion of this protocol in the event of a sudden health threat to the casualty increases their chances of survival in combat conditions (Anonymous, 2022). It is important to emphasize that this protocol was developed with the intention of assisting those suffering from injuries, and should be carried out as quickly as possible to initiate critical therapeutic interventions vital for survival, and to prepare the casualty for evacuation. Based on our observations obtained during previous training in mountainous terrain, including international contexts, we believe that a common denominator among our graduates is the level of medical skills classified as basic – CLS. In our assessment, these skills enhance the safety of soldiers in combat conditions; however, they do not meet the criteria in the context of mountain operations. The tasks of soldiers carrying out operations in mountainous areas are generally not oriented towards actions related to professional mountain rescue.

Nevertheless, the mountainous environment increases the risk of sudden health threats of various profiles, which compels the enhancement of medical skills acquired during education and professional development. We believe that the protocol for assessing the state of the casualty, in line with the MARCH framework, provides an excellent basis for this process. Considering the scenarios for preparing soldiers to carry out their duties in the mountains, a suitable direction involves the ones which account for prolonged care for the casualty, resulting from both the objective and subjective aspects of mountain activities (Sztajnkrycer, 2024). We are convinced that any mountain activity, regardless of its nature, should begin with an objective risk assessment and an analysis of physical and equipment preparedness. The factor that reduces the threats of mountainous areas for soldiers is the time dedicated to gaining appropriate experience in climbing, rope techniques, and improving skills in moving on skis. Proper risk management in the mountains also involves the analysis of

typical diseases associated with mountain activity. Early recognition of these health threats and the implementation of rescue and evacuation procedures will contribute to reducing the risk of health loss or death during missions.

Referring to the medical competencies of soldiers undergoing training at our facility, as well as our years of experience in this field, we have developed a programme for enhancing skills in mountainous terrain, based on the achievements of Polish and foreign experts in mountain rescue and emergency medicine. To optimize the delivery of the proposed content, this process is divided into three areas: 1) Theoretical preparation – prevention, symptomatology, and statistics; 2) Practical training in mountainous terrain – prevention, recognition, and treatment; and 3) Evacuation of the patient in mountainous terrain – prolonged care. The main substantive focus of this initiative remains the assessment framework for the casualty in accordance with the MARCH protocol. According to the literature on the subject, this framework can be adapted to the appropriate clinical-situational context (Ruddock, 2022). Moreover, this solution serves as a universal tool for assessing the patient's condition, not only in the context of injury; it should also resonate with commonly occurring emergencies in mountainous environments, among which we have identified: contact hypothermia, traumatic hypothermia, avalanche incidents, frostbite, snow blindness, and dehydration. In terms of practical assumptions aimed at preparing personnel to carry out tasks in high mountain areas, the substantive scope is expanded to include altitude sickness.

Contact hypothermia is a condition in which the body temperature drops below 35°C due to exposure to low temperatures, and to moisture and strong winds, resulting in disturbances in the body's energy balance. This condition typically develops in the context of prolonged exposure to low temperatures. In an educational context, the recognition and management of contact hypothermia is based on the Swiss symptom scale describing four stages of this illness (Paal, 2022) (Tables 1 and 2).

Table 1. Degrees of accidental hypothermia, depending on central body temperature. (Source: Own elaboration based on Kosiński S., Clinical Aspects of Cooling the Body)

Hypothermia degree	Clinical symptoms	Central body temperature
1	Casualty is conscious, has muscle tremors	35–32°C
2	Consciousness disorders, muscle tremors disappear	32–28°C
3	Consciousness disorders are deeper, casualty has vital signs	28–24°C
4	Vital signs are not detectable	< 24°C

Table 2. Showing the risk of cardiac arrest depending on central body temperature. It is a simplified version of the Swiss Staging Score, which is based on the vital symptoms of hypothermia victims. ACVPU – basic scale for assessing the state of consciousness. Glasgow Coma Scale (GCS) – A medical tool that is used to monitor a patient's consciousness. (Source: S. Kosiński)

NON-TRAUMATIC HYPOTHERMIA				
Central body temperature	35°C – 32°C	32°C – 28°C	28°C – 24°C	< 24°C
Clinical examination	Alert A – ACVPU, GCS: 15	Confused or reacting to voice C or V – ACVPU, GCS: 9-13	Reacting to pain or unresponsive P or U – ACVPU, GCS: <9 Blood circulation preserved	Unresponsive U – ACVPU, GCS: <9 Blood circulation not preserved
Risk of cardiac arrest	Low 25%	Moderate 36,5%	High 35,3%	**Cardiac arest** **67,4%**

Traumatic hypothermia is diagnosed when a casualty has sustained an injury and their core body temperature drops below 36°C. The symptoms of hypothermia are often masked by the consequences of the sustained injury. The severity of the injury has an impact on the condition of the patient with traumatic hypothermia; head and chest injuries in particular, as well as massive haemorrhages, are significant. The age of the casualty also plays an important role. Traumatic hypothermia is a significant predictor of death, which is why it is included in the MARCH assessment framework (ICAR MED, n.d). However, taking into account the specificity and experience of conducting rescue operations in the mountains, at the stage of developing rescue competences we take hypothermia into account immediately after the assessment of hemorrhages (M in MARCH), to clearly suggest that at the stage of assessing massive haemorrhages, actions should be taken to limit the onset or progression of traumatic hypothermia. Therefore, the framework may take the form of MHARCH or MhARCH. In our opinion, as well as in the view of recognized experts in the field of emergency medicine and mountain rescue in our country, this interpretation of the framework in pre-hospital conditions will optimize the care of casualties at risk of traumatic hypothermia (Table 3).

TRAUMA INDUCED HYPOTHERMIA (TIH)				
Central body temperature	36°C	35°C	34°C	< 34°C
Risk of death	9%	4,5%	20,5%	**32,5%**

Table 3. This table explains that the post-trauma risk of death increases with the decrease in central body temperature. In this clinical context, symptom scoring based on the central nervous system condition is often not possible. (Source: S. Kosiński)

In the context of an avalanche incident, prompt action is crucial, including immediate notification of the rescue services and searching the area using appropriate techniques and equipment. Individuals trapped under the snow may die from asphyxiation, injury or hypothermia, often preceded by asphyxia. In Europe, dozens of fatalities occur each winter as a result of avalanche incidents. Avalanches typically happen on slopes with an inclination of 30-45°. The scope of medical procedures in the event of an avalanche is based on an algorithm developed by experts from the International Commission for Alpine Rescue, published in the standards of the European Resuscitation Council in 2021 (ICAR MED, 2021). We are convinced that a necessary condition of effective medical preparation is provided by skills in using the avalanche ABC in real-time conditions. For this reason, we make an effort to ensure that training in this field takes place in natural conditions.

Frostbite represents one of the significant health threats in low temperatures or extreme climatic conditions. This phenomenon results from tissue damage due to exposure to cold, leading to serious health consequences that can result in disability. Understanding the mechanisms of frostbite and its effects is crucial for individuals exposed to cold (Smith, 2020). Frostbite can be fatal, especially if appropriate rescue actions are not taken. Experiencing thermal injury such as frostbite is associated with restricted mobility for the injured person, which increases the burden on the entire team. The main complication of frostbite *in situ* is hypothermia. In individuals who have suffered severe frostbite, tissue necrosis may occur, which can consequently lead to infections, sepsis, or other distant complications that pose a threat to life. Prevention of this health risk is therefore particularly important in the educational process concerning thermal injuries. First aid actions in open mountainous terrain

should focus on providing care for the frostbitten limb, aiming to prevent, as much as possible, the worsening of the frostbite, and, most importantly, to avoid thawing the limb until at least basic field ambulance conditions can be met (Manson, 2021).

Snow blindness or photokeratitis develops as a result of excessive exposure of the eyes to ultraviolet (UV) radiation. UV radiation, particularly UVB, is the main factor causing damage to the cornea. High levels of sunlight in winter, especially at high altitudes, significantly increase this risk. Snow reflects up to 80% of UV radiation, which means that even in the shade or on cloudy days the eyes can be exposed to excessive radiation. As altitude increases, the intensity of UV radiation rises, further amplifying the risk of corneal damage (López-Muñoz, 2019). Like frostbite, acquired dysfunction of the visual system can have a significant impact on the success of tasks carried out in mountainous terrain.

Dehydration, on the other hand, is a condition in which the body loses more fluids than it can take in, leading to disturbances in the water-electrolyte balance. It can be caused by various factors, including intense physical exertion, vomiting, diarrhoea, exposure to environmental factors, and lack of access to safe drinking fluids. Clinically, there are different degrees of dehydration, ranging from mild to severe, which can be life-threatening. Dehydration or hypovolemia in the mountains poses a serious threat, and its consequences can endanger life, making proper preparation, regular hydration, and awareness of symptoms crucial to minimize this risk.

An expanding element of the preparation of soldiers for carrying out tasks in mountainous terrain concerns mountain sickness. Based on our experience, we believe that this area of medical skills should be possessed by soldiers who present an advanced level of mountain competencies, as well as participants in methodological-instructional courses. This view has been developed based on several years of observation and the knowledge that only individuals with appropriate technical and substantive preparation, at an advanced and instructional level, are capable of carrying out tasks in areas where the risk of mountain sickness is significant.

Conclusion

The process of training soldiers in the mountains is a complex operation which should integrate both technical and medical elements. This approach provides soldiers not only with the skills necessary for effective operation in challenging terrain, but also with knowledge that can save their lives. Integrating technical skills with medical knowledge is crucial for the effectiveness of military operations in mountainous areas. Training scenarios should be conducted in open terrain and based on the applicable universal standard for assessing and managing casualties in the mountains. In our proposed approach, soldiers learn not only survival techniques in the mountains but also how to prevent, react to, and manage health crisis situations that the mountainous environment may present. The teaching framework we present is solely the result of our experience and those of Polish specialists in medicine and mountain rescue. We understand that rescue operations based on the MARCH framework, while universal, can take various forms. The teaching style of medical protocols is closely

related to the clinical experience of the teacher. Considering the above, and the fact that we are the only centre in the country providing this type of training, we are open to discussion and collaboration with regard to medical preparation in both the theoretical and practical contexts for soldiers in the mountains.

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RECENZIJA

O RAZVOJU VELIKE STRATEGIJE

John Lewis Gaddis, On Grand Strategy. New York: Penguin Press, 2017.

ISBN: 9780525557296.

Knjiga O véliki strategiji je delo Johna Lewisa Gaddisa, ameriškega politologa in zgodovinarja hladne vojne. Gaddis razume strategijo kot usklajevanje potencialno neomejenih ambicij z nujno omejenimi zmožnostmi. Povezava mora obstajati med »tem, kar je resnično, in tem, kar je zamišljeno«, kar povezuje trenutne okoliščine voditelja z želenim ciljem. Potreba po tem usklajevanju izhaja iz omejene narave sredstev, čeprav so cilji lahko neskončni.

Gaddis proučuje véliko strategijo z iskanjem vzorcev skozi čas, prostor in obseg. Knjiga ima deset poglavij, pri čemer vsako poglavje obravnava določene zgodovinske dogodke, zgodbe in osebnosti, iz katerih lahko prepoznamo strateške pristope ter uporabo ali ignoriranje načel. Avtor se osredotoča na antične in starejše dogodke ter zgodbe, kot zanimivost pa ne obravnava hladne vojne, ki sicer velja za njegovo strokovno področje. Njegov namen je namreč iskati in prepoznavati brezčasna načela, ki nam lahko pomagajo razumeti sedanjost in prihodnost.

Prvo poglavje govori o Kserksu I. in njegovih prevelikih ambicijah. Drugo poglavje obravnava peloponeške vojne in čustva, ki jih je nemogoče ločiti od abstraktne strategije. Tretje poglavje povezuje razmišljanja kitajskega misleca Sun Cuja in prakse rimskega cesarja Oktavijana ter poudarja pomembnost prilagajanja spremenjenim razmeram. Četrto poglavje omenja pojem sorazmernosti ter protislovja med idejami, ki jih pooseblja Avguštin, in pragmatičnostjo Machiavellija. Ta protislovja so ponazorjena v petem poglavju skozi glavna antagonista – španskega kralja Filipa II.,

ki predstavlja ideje, in angleško kraljico Elizabeto I., ki predstavlja pragmatičnost. Šesto poglavje govori o ameriški revoluciji, nastanku ZDA ter pomenu usklajevanja med različnimi skupinami in dojemanju kompromisa kot strateške zmage. Sedmo poglavje primerja pruskega vojaškega misleca Clausewitza ter ruskega pisatelja Tolstoja in njuno razumevanje razkoraka med teorijo in prakso vojne. Osmo poglavje predstavlja ameriškega predsednika Abrahama Lincolna kot primer voditelja, ki je znal usklajevati protislovja med idejami in pragmatičnostjo. Deveto poglavje opozarja na dinamičnost političnih razmer ter vpliv geografije in tehnologije, na kar ponazarja prenos moči z Združenega kraljestva na ZDA konec 19. in v začetku 20. stoletja. Zadnje, deseto poglavje, se konča s filozofom Isaiahom Berlinom, katerega ideje so navdih in osrednja nit celotne knjige.

Berlin je namreč ponovno oživil in dodatno razvil antično analogijo grškega poeta Arhiloha o ježkih in lisicah, ki ima osrednjo vlogo v Gaddisovem razumevanju vélike strategije. Pomemben okvir za razumevanje pristopov k véliki strategiji je razlika med lisicami in ježki. Ježki so osredotočeni na eno osrednjo vizijo, lisice pa sledijo številnim ciljem, pogosto nepovezanim in celo nasprotujočim si.

Gaddis meni, da učinkovita vélika strategija pogosto zahteva tisto, kar je ameriški pisatelj F. Scott Fitzgerald imenoval »prvorazredna inteligenca« – sposobnost hkratnega držanja dveh nasprotujočih si idej v mislih in ohranjanja sposobnosti delovanja. To vključuje združevanje ježkovega občutka za smer in lisičine občutljivosti na okolje. Tako razmišljanje ostaja pomemben izziv za voditelje, ki so pogosto ujeti v lastni samopodobi. Zgodovinski primeri iz knjige opisujejo in opozarjajo na voditelje, ki so znali usklajevati ta nasprotja, ter na tiste, ki tega niso želeli ali niso zmogli. Povečana avtoriteta vodi v večjo samozavest in ta omejuje svobodo prilagajanja. Tu se pogosto razkriva nesposobnost voditeljev, da bi razumeli omejitve virov na eni strani in želje na drugi strani, ki so, kot je bilo že omenjeno, lahko neskončne.

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Jaroš Britovšek

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REVIEW

ON THE DEVELOPMENT OF THE GRAND STRATEGY

John Lewis Gaddis, On Grand Strategy. New York: Penguin Press, 2017.

ISBN: 9780525557296.

The book *On Grand Strategy* is a work by John Lewis Gaddis, an American political scientist and historian of the Cold War. Gaddis understands strategy as the alignment of potentially unlimited ambitions with necessarily limited capabilities. There must be a connection between "what is real and what is imagined", linking the leader's current circumstances with the desired goal. The need for this alignment arises from the limited nature of resources, even though goals can be infinite.

Gaddis examines grand strategy by identifying patterns across time, space, and scale. The book consists of ten chapters, each addressing specific historical events, narratives and personalities, from which strategic approaches and the application or neglect of principles can be recognized. The author focuses on ancient and early historical events and narratives but, interestingly, does not address the Cold War, which is his area of expertise. His aim is to seek and identify timeless principles that can help us understand the present and future.

The first chapter discusses Xerxes I and his excessive ambitions. The second chapter deals with the Peloponnesian Wars, and emotions which cannot be separated from abstract strategy. The third chapter connects the thoughts of the Chinese thinker Sun Tzu with the practices of the Roman Emperor Octavian, emphasizing the importance of adapting to changing circumstances. The fourth chapter mentions the concept of proportionality and the contradictions between the ideas embodied by Augustine and the pragmatism of Machiavelli. These contradictions are illustrated in the fifth

chapter through two main antagonists – Spain's King Philip II, representing ideas, and England's Queen Elizabeth I, representing pragmatism. The sixth chapter discusses the American Revolution, the formation of the United States, and the importance of balancing different groups and understanding compromise as a strategic victory. The seventh chapter compares the Prussian military thinker Clausewitz and the Russian writer Tolstoy and their understanding of the gap between the theory and practice of war. The eighth chapter presents the American President Abraham Lincoln as an example of a leader who managed to reconcile contradictions between ideas and pragmatism. The ninth chapter highlights the dynamic nature of political conditions and the influence of geography and technology, illustrated by the transfer of power from the United Kingdom to the United States at the end of the 19th century and the beginning of the 20th. The final, tenth chapter concludes with the philosopher Isaiah Berlin, whose ideas serve as inspiration and the central thread of the entire book.

Berlin revived and further developed the ancient analogy of the Greek poet Archilochus about hedgehogs and foxes, which plays a central role in Gaddis's understanding of grand strategy. The key framework for understanding approaches to grand strategy lies in the distinction between foxes and hedgehogs; hedgehogs are focused on one central vision, while foxes pursue numerous goals, often unrelated and even contradictory.

Gaddis believes that an effective grand strategy often requires what the American writer F. Scott Fitzgerald called "a first-rate intelligence" – the ability to hold two opposing ideas in mind simultaneously while maintaining the capacity to act. This involves combining the hedgehog's sense of direction with the fox's sensitivity to the environment. Such thinking remains a significant challenge for leaders, who are often trapped in their own self-image. Historical examples from the book describe and highlight leaders who were able to reconcile these contradictions, as well as those who were unwilling or unable to do so. Increased authority leads to greater confidence, which in turn limits the freedom to adapt. Here, the inability of leaders to understand the limitations of resources on the one hand and desires on the other, which, as mentioned, can be infinite, often becomes apparent.

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SLIKOVNO GRADIVO

FIGURES

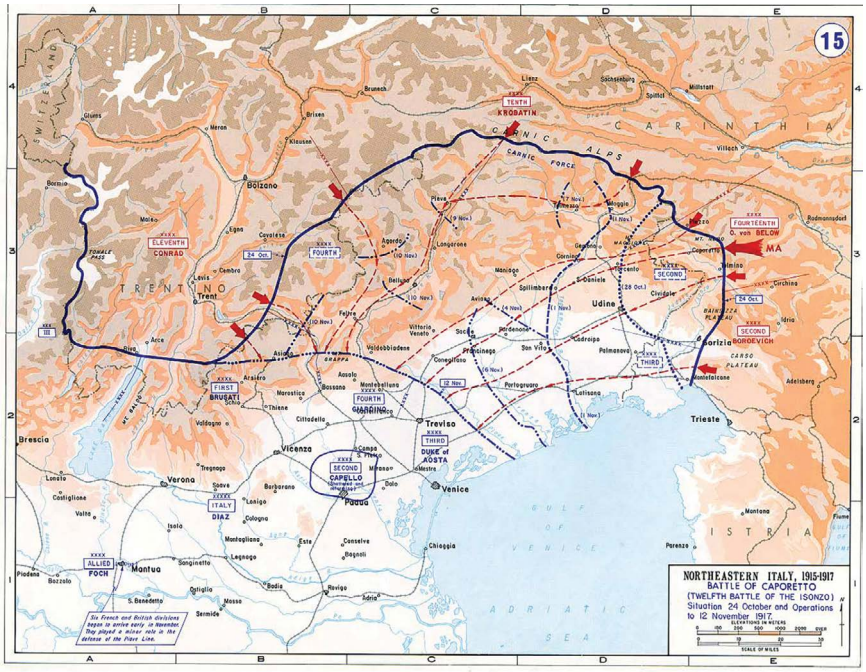


Figure 1. The Battle of Caporetto. (Source: https://en.wikipedia.org/wiki/Italian_front_(World_War_I), (30.5.2025))

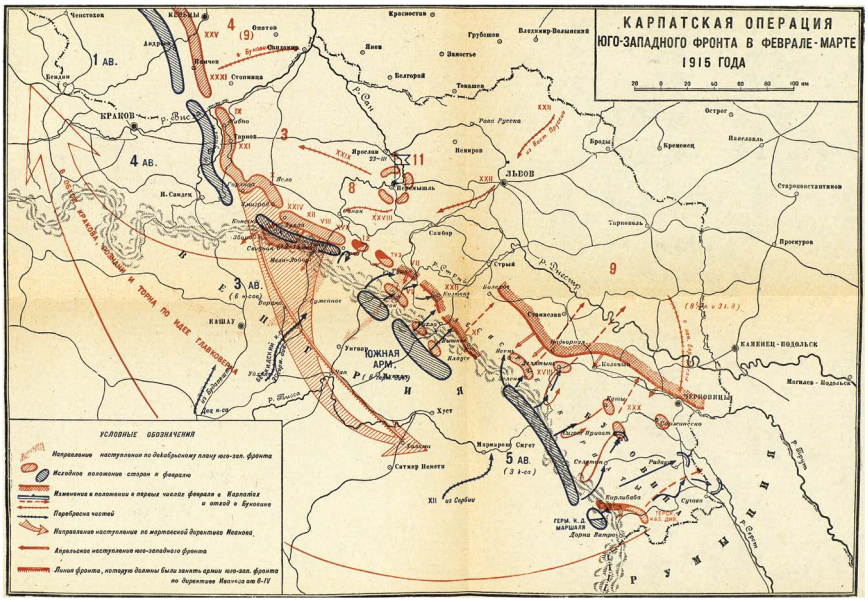


Figure 2. World War I Carpathian winter 1914-15 operation. (Source: https://en.wikipedia.org/wiki/Carpathian_Campaign, (30.5.2025))

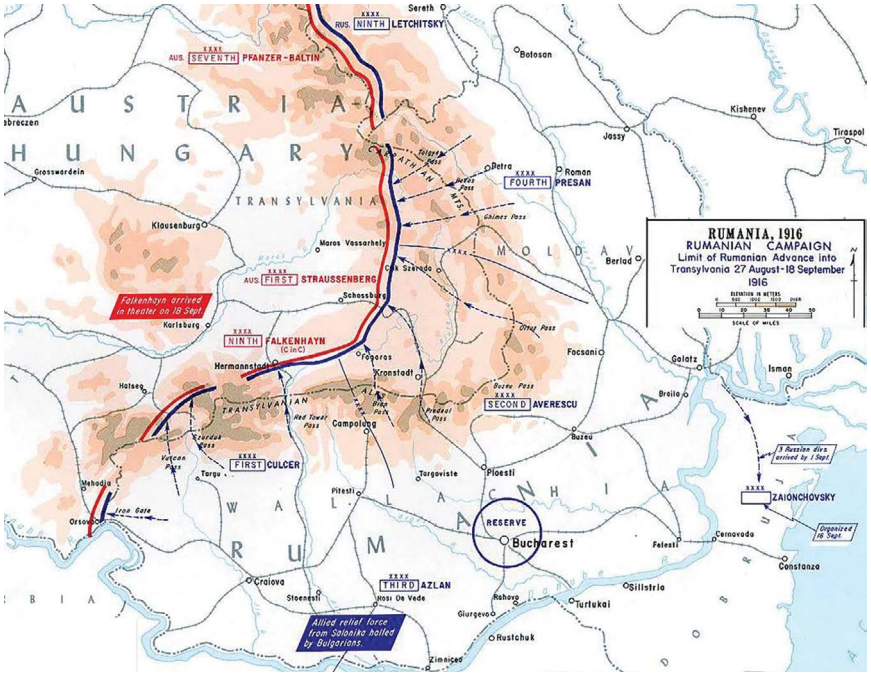


Figure 3. The counterattack of Central Powers, September-October 1916. (Source: https://en.wikipedia.org/wiki/Romanian_campaign_(1916), (30.5.2025))

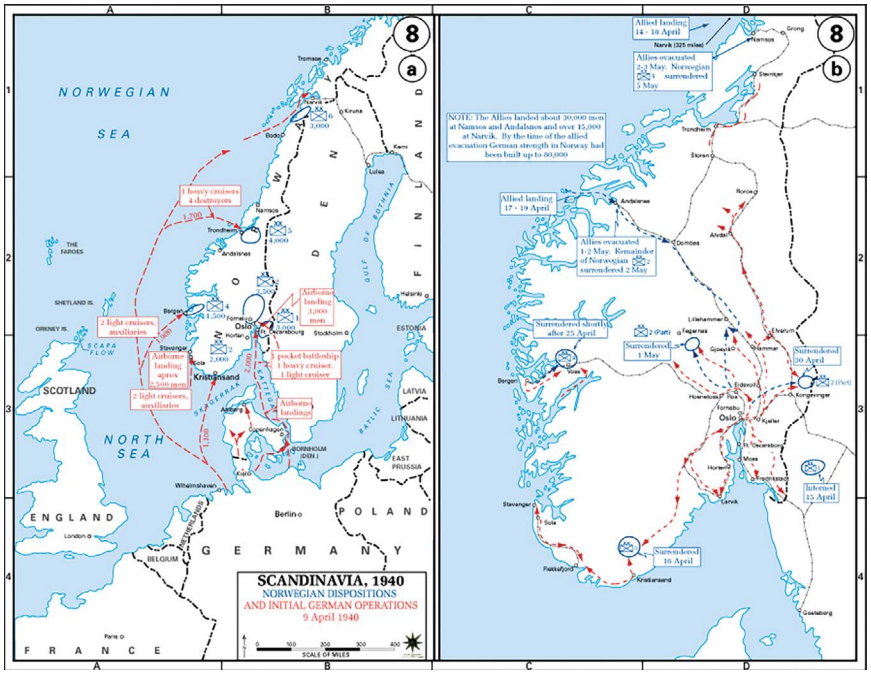


Figure 4. Initial German and Allied landings and operations in southern, central and northern Norway in April 1940. (Source: https://en.wikipedia.org/wiki/Norwegian_campaign, (30.5.2025))

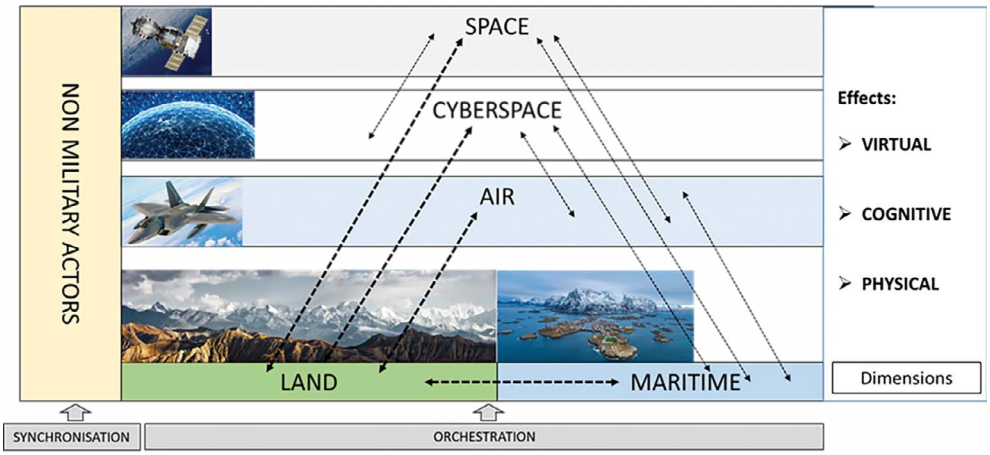


Figure 1. NATO MDO Concept in the Mountainous Environment (Kuhar)

AVTORJI

AUTHORS

Klemen Kocjančič

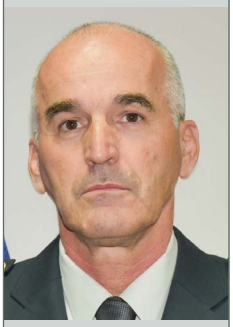
Dr. Klemen Kocjančič je po izobrazbi univerzitetni diplomirani teolog, magister obramboslovja in doktor zgodovine. Zaposlen je kot podsekretar za vojaško tehnologijo, raziskave in razvoj na Ministrstvu za obrambo RS in je habilitiran kot znanstveni sodelavec na Obramboslovnem raziskovalnem centru (Fakulteta za družbene vede, Univerza v Ljubljani). Njegovi raziskovalni interesi so s področij vojaške zgodovine, ekstremizma in terorizma, vojaške sociologije in kritične infrastrukture.

Klemen Kocjančič, PhD, *holds a graduate degree in theology, MA in defence studies, and a PhD in Defence Studies. He works as undersecretary for military technology, research and development at the Ministry of Defence of the Republic of Slovenia and is habilitated as a research associate at the Defence Research Centre (Faculty of Social Sciences, University of Ljubljana). His research interest are in the fields of military history, extremism and terrorism, military sociology, and critical infrastrukture.*

Peter Papler

Kapitan bojne ladje dr. Peter Papler je doktor obramboslovnih ved. Njegova raziskovalna področja vključujejo strategijo, vojaške operacije in kampanje, oborožene spopade ter oborožene sile. V Slovenski vojski je zaposlen od leta 1991. Od leta 2024 opravlja dolžnost načelnika Oddelka za razvoj konceptov in eksperimentiranje v Natovem centru odličnosti za gorsko bojevanje.

Captain (N) Peter Papler, PhD, *has a doctorate in Defence Studies. His research areas include strategy, military operations and campaigns, armed conflicts, and armed forces. He has served in the Slovenian Armed Forces since 1991. Since 2024 he has been Head of the Concepts and Experimentation Branch at the NATO Mountain Warfare Centre of Excellence.*



Miha Kuhar

Podpolkovnik Miha Kuhar je diplomirani socialni delavec, zaposlen v Slovenski vojski, kjer je opravljal različne dolžnosti na taktični in operativni ravni. Njegovi raziskovalni področji sta predvsem gorsko bojevanje in vojaška zgodovina. Je pisec vrste strokovnih člankov in publikacij s področij vojaškogorniških veščin, taktike gorskega bojevanja in vojaške zgodovine.

Lieutenant Colonel Miha Kuhar *has graduate degree in social work and is employed by the Slovenian Armed Forces, where he has performed various duties at the tactical and operational levels. His main areas of research are mountain warfare and military history. He is the author of a number of professional articles and publications on military mountaineering skills, mountain warfare tactics, and military history.*

Mario Christian Ortner

Dr. Mario Christian Ortner je magistriral iz vojaške zgodovine, sodobne zgodovine in zgodovine Vzhodne Evrope ter doktoriral iz vojaške zgodovine. Od leta 1995 do leta 2023 je deloval v Muzeju vojaške zgodovine na Dunaju, nazadnje kot generalni direktor muzeja. Od leta 2023 je vršilec dolžnosti direktorja Inštituta za strategijo in varnostno politiko na Nacionalni akademiji za obrambo avstrijskih oboroženih sil. Je avtor številnih publikacij o avstrijski vojaški zgodovini, strateških razvojnih usmeritvah, sodobnih izzivih varnostne politike in dolgoročnem vplivu vojaške zgodovine na aktualne razprave o obrambi in varnosti.

Mario Christian Ortner, PhD, *holds a master's degree in military history, contemporary history, and Eastern European history, as well as a doctoral degree in military history. From 1995 until 2023, he served at the Museum of Military History in Vienna, at the end as the museum's Director General. Since 2023, he has been serving as Acting Head of the Institute for Strategy and Security Policy at the National Defence Academy of the Austrian Armed Forces. He has published extensively on Austrian military history, military strategic developments, contemporary security policy challenges, and the long-term impact of military history on current defence and security debates.*

Italo Giacomo Spini

Polkovnik Italo Giacomo Spini je namestnik direktorja in načelnik štaba Natovega centra za gorsko bojevanje. Je častnik italijanskih gorskih enot z več kot 34 leti službovanja; ima diplomo iz vojaških strateških ved in političnih ved ter dva magistrska naslova italijanske skupne štabne akademije. Poveljeval je 6. alpinskemu polku in alpinskemu bataljonu »Morbegno« ter sodeloval v osmih mednarodnih misijah.

Colonel Italo Giacomo Spini *serves as Deputy Director and Chief of Staff at the NATO Mountain Warfare Centre of Excellence. An officer of the Italian Army Mountain Troops with over 34 years of service, he holds degrees in Military Strategic Sciences and Political Science, plus two Master's degrees from the Italian Joint Services Staff College. He has commanded the 6th Alpini Regiment and the Alpini Battalion »Morbegno«, and deployed on eight international missions.*

Michał Barski je diplomiral iz medicinske reševalne službe na Medicinski univerzi v Vroclavu in iz varnostnih ved na Vojaški univerzi kopenskih sil generala Tadeusza Kościuszka. Je aktiven akademski učitelj in udeleženec številnih nacionalnih in mednarodnih delavnic o reševalnih operacijah na zahtevnem terenu. Je doktorski študent vojaške medicine na Vojaškem medicinskem inštitutu v Varšavi. Njegovo raziskovanje se osredotoča na kakovost nujnih medicinskih storitev v ekstremnih okoljih in vpliv okoljskih dejavnikov na medicinske posege. Je avtor publikacij, ki obravnavajo ta vprašanja.

Michał Barski *graduated from Wrocław Medical University in medical rescue and the General Tadeusz Kościuszko Military University of Land Forces in security sciences. He is an active academic teacher and participant in numerous national and international workshops on rescue operations in challenging terrains. He is a PhD student in military medicine at the Military Medical Institute in Warsaw. His research focuses on the quality of emergency medical services in extreme environments and the impact of environmental factors on medical interventions. He is the author of publications addressing these issues.*

Stotnik Piotr Dąbrowski je izkušen častnik, specializiran za gorsko vojskovanje in vojaško izobraževanje. Diplomiral je na Vojaški univerzi generala Tadeusza Kościuszka v Vroclavu in vodil številne tečaje usposabljanja za vojake in kadete. Kapitan Dąbrowski razvija napredne programe usposabljanja, osredotočene na varnost in operativno učinkovitost na zahtevnem terenu. Njegova poklicna zanimanja vključujejo medicinske kompetence v oboroženih silah, s posebnim poudarkom na standardih Nata in gorskih reševalnih operacijah.

Captain Piotr Dąbrowski *is an experienced officer specializing in mountain warfare and military education. A graduate of the General Tadeusz Kościuszko Military University of Land Forces in Wrocław, he has conducted numerous training courses for soldiers and cadets. Captain Dąbrowski develops advanced training programs focused on safety and operational effectiveness in challenging terrain. His professional interests include medical competencies in the armed forces, with particular emphasis on NATO standards and mountain rescue operations.*

NAVODILA AVTORJEM

INSTRUCTIONS FOR AUTHORS

NAVODILA ZA AVTORJE

Vsebinska navodila

Splošno

Sodobni vojaški izzivi je interdisciplinarna znanstveno-strokovna publikacija, ki objavlja prispevke o aktualnih temah, raziskavah, znanstvenih in strokovnih razpravah, tehničnih ali družboslovnih analizah z varnostnega, obrambnega in vojaškega področja ter recenzije znanstvenih in strokovnih monografij (prikaz knjige).

Vsebina

Objavljamo prispevke v slovenskem jeziku s povzetki, prevedenimi v angleški jezik, in po odločitvi uredniškega odbora prispevke v angleškem jeziku s povzetki, prevedenimi v slovenski jezik.
Objavljamo prispevke, ki še niso bili objavljeni ali poslani v objavo drugi reviji. Pisec je odgovoren za vse morebitne kršitve avtorskih pravic. Če je bil prispevek že natisnjen drugje, poslan v objavo ali predstavljen na strokovni konferenci, naj to avtor sporoči uredniku in pridobi soglasje založnika (če je treba) ter navede razloge za ponovno objavo.
Objava prispevka je brezplačna.

Tehnična navodila

Omejitve dolžine prispevkov

Prispevki naj obsegajo 16 strani oziroma 30.000 znakov s presledki (avtorska pola), izjemoma najmanj 8 strani oziroma 15.000 znakov ali največ 24 strani oziroma 45.000 znakov.
Recenzija znanstvene in strokovne monografije (prikaz knjige) naj obsega največ 3.000 znakov s presledki.

Recenzije

Prispevki se recenzirajo. Recenzija je anonimna. Glede na oceno recenzentov uredniški odbor ali urednik prispevek sprejme, če je treba, zahteva popravke ali ga zavrne. Pripombe recenzentov avtor vnese v prispevek.
Zaradi anonimnega recenzentskega postopka je treba prvo stran in vsebino oblikovati tako, da identiteta avtorja ni prepoznavna.
Avtor ob naslovu prispevka napiše, v katero kategorijo po njegovem mnenju in glede na klasifikacijo v COBISS, spada njegov prispevek. Klasifikacija je dostopna na spletni strani revije in pri odgovornem uredniku. Končno klasifikacijo določi uredniški odbor.

Lektoriranje

Lektoriranje besedil zagotavlja OE, pristojna za založniško dejavnost. Lektorirana besedila se avtorizirajo.

Navajanje avtorjev prispevka

Navajanje avtorjev je skrajno zgoraj, levo poravnano.
Primer:
Ime 1 Priimek 1,
Ime 2 Priimek 2
V opombi pod črto se za slovenske avtorje navede, iz katere ustanove prihajajo. Pri tujih avtorjih je treba navesti tudi ime države.

Naslov prispevka

Navedbi avtorjev sledi naslov prispevka. Črke v naslovu so velike 16 pik, natisnjene krepko, besedilo naslova pa poravnano na sredini.

Povzetek

Prispevku mora biti dodan povzetek, ki obsega največ 1200 znakov (20 vrstic). Povzetek naj na kratko opredeli temo prispevka, predvsem naj povzame rezultate in ugotovitve. Splošne ugotovitve in misli ne spadajo v povzetek, temveč v uvod.

Povzetek v angleščini

Avtorji morajo oddati tudi prevod povzetka v angleščino. Tudi za prevod povzetka velja omejitev do 1200 znakov (20 vrstic).

Ključne besede

Ključne besede (3–5, tudi v angleškem jeziku) naj bodo natisnjene krepko in z obojestransko poravnavo besedila.

Besedilo

Avtorji naj oddajo svoje prispevke na papirju formata A4, s presledkom med vrsticami 1,5 in velikostjo črk 12 pik Arial. Na zgornjem in spodnjem robu naj bo do besedila približno 3 cm, levi rob naj bo širok 2 cm, desni pa 4 cm. Na vsaki strani je tako približno 30 vrstic s približno 62 znaki. Besedilo naj bo obojestransko poravnano, brez umikov na začetku odstavka.

Kratka predstavitev avtorjev

Avtorji morajo pripraviti kratko predstavitev svojega strokovnega oziroma znanstvenega dela. Predstavitev naj ne presega 600 znakov s presledki (10 vrstic, 80 besed). Avtorji naj besedilo umestijo na konec prispevka po navedeni literaturi

Struktu-riranje besedila

Posamezna poglavja v besedilu naj bodo ločena s samostojnimi podnaslovi in ustrezno oštevilčena (členitev največ na 4 ravni).
Primer:
1 Uvod
2 Naslov poglavja (1. raven)
2.1 Podnaslov (2. raven)
2.1.1 Podnaslov (3. raven)
2.1.1.1 Podnaslov (4. raven)

Oblikovanje seznama literature

V seznamu literature je treba po abecednem redu navesti le avtorje, na katere se sklicujete v prispevku, celotna oznaka vira pa mora biti skladna s harvardskim načinom navajanja. Če je avtorjev več, navedemo vse, kot so navedeni na izvirnem delu.

Primeri:

a) knjiga:

Priimek, ime (lahko začetnica imena), letnica. *Naslov dela*. Kraj: Založba.

Na primer:Urlich, W., 1983. *Critical Heuristics of Social Planning*. Chicago: University of Chicago Press.

b) zbornik:

Samson, C., 1970. Problems of information studies in history. V S. Stone, ur. *Humanities information research*. Sheffield: CRUS, 1980, str./pp 44–68. Pri posameznih člankih v zbornikih na koncu posameznega vira navedemo strani, na katerih je članek, na primer:

c) članek v reviji

Kolega, N., 2006. Slovenian coast sea flood risk. Acta geographica Slovenica. 46-2, str. 143–167.

Navajanje virov z interneta

Vse reference se začenjajo enako kot pri natisnjenih virih, le da običajnemu delu sledi še podatek o tem, kje na internetu je bil dokument dobljen in kdaj. Podatek o tem, kdaj je bil dokument dobljen, je pomemben zaradi pogostega spreminjanja www okolja.

Urlich, W., 1983. *Critical Heuristics of Social Planning*. Chicago: University of Chicago Press, str. 45–100. http://www.mors.si/index.php?id=213, 17. 10. 2008.

Pri navajanju zanimivih internetnih naslovov v besedilu (ne gre za navajanje posebnega dokumenta) zadošča navedba naslova (http://www.vpvs.uni-lj.si). Posebna referenca na koncu besedila v tem primeru ni potrebna.

Sklicevanje na vire

Pri sklicevanju na vire med besedilom navedite le priimek prvega avtorja in letnico izdaje. *Primer:* … (Smith, 1997) …

Če dobesedno navajate del besedila, ga ustrezno označite z narekovaji, v oklepaju pa poleg avtorja in letnice navedite stran besedila, iz katerega ste navajali.

Primer: … (Smith, 1997, str. 15) …

Pri povzemanju drugega avtorja napišemo besedilo brez narekovajev, v oklepaju pa napišemo, da gre za povzeto besedilo. *Primer*: (po Smith, 1997, str. 15). Če avtorja navajamo v besedilu, v oklepaju navedemo samo letnico izida in stran (1997, str. 15).

Slike, diagrami in tabele

Slike, diagrami in tabele v prispevku naj bodo v posebej pripravljenih datotekah, ki omogočajo lektorske popravke. V besedilu mora biti jasno označeno mesto, kamor je treba vnesti sliko. Skupna dolžina prispevka ne sme preseči dane omejitve.

Če avtor iz tehničnih razlogov grafičnih dodatkov ne more oddati v elektronski obliki, je izjemoma sprejemljivo, da slike priloži besedilu. Avtor mora v tem primeru na zadnjo stran slike napisati zaporedno številko in naslov, v besedilu pa pustiti dovolj prostora zanjo. Prav tako mora biti besedilo opremljeno z naslovom in številčenjem slike. Diagrami se štejejo kot slike. Vse slike in tabele se številčijo. Številčenje poteka enotno in ni povezano s številčenjem poglavij. Naslov slike je naveden pod sliko, naslov tabele pa nad tabelo.

Navadno je v besedilu navedeno vsaj eno sklicevanje na sliko ali tabelo. Sklic na sliko ali tabelo je: … (slika 5) … (tabela 2) …

Primer slike:

Slika 5: Naslov slike

Primer tabele:

Tabela 2: Naslov tabele

Opombe pod črto

Številčenje opomb pod črto je neodvisno od strukture besedila in se v vsakem prispevku začne s številko 1. Posebej opozarjamo avtorje, da so opombe pod črto namenjene pojasnjevanju misli, zapisanih v besedilu, in ne navajanju literature.

Kratice

Kratice naj bodo dodane v oklepaju, ko se okrajšana beseda prvič uporabi, zato posebnih seznamov kratic ne dodajamo. Za kratico ali izraz v angleškem jeziku napišemo najprej slovensko ustreznico, v oklepaju pa angleški izvirnik in morebitno angleško kratico.

Format zapisa prispevka

Uredniški odbor sprejema prispevke, napisane z urejevalnikom besedil MS Word, izjemoma tudi v besedilnem zapisu (text only).

Naslov avtorja

Prispevkom naj bosta dodana avtorjeva naslov in internetni naslov ali telefonska številka, na katerih bo dosegljiv uredniškemu odboru.

Kako poslati prispevek

Na naslov uredništva ali članov uredniškega odbora je treba poslati tiskano in elektronsko različico prispevka.

Potrjevanje sprejetja prispevka

Uredniški odbor avtorju pisno potrdi prejetje prispevka. Avtorjem, ki sporočijo tudi naslov svoje elektronske pošte, se potrditev pošlje po tej poti.

Korekture

Avtor opravi korekture svojega prispevka v treh dneh.

Naslov uredniškega odbora

Ministrstvo za obrambo
Generalštab Slovenske vojske
Sodobni vojaški izzivi
Uredniški odbor
Vojkova cesta 55
1000 Ljubljana
Slovenija

Elektronski naslov
Glavna urednica: liliana.brozic@mors.si

Prispevkov, ki ne bodo urejeni skladno s tem navodilom, uredniški odbor ne bo sprejemal.

INSTRUCTIONS FOR THE AUTHORS OF PAPERS FOR THE CONTEMPORARY MILITARY CHALLENGES

Content-related instructions

General

The Contemporary Military Challenges is an interdisciplinary scientific expert magazine, which publishes papers on current topics, researches, scientific and expert discussions, technical or social sciences analysis from the security, defence and military field, as well as overviews of professional and science monographs (book reviews).

What do we publish?

We publish papers, which have not been previously published or sent to another magazine for publication. The author is held responsible for all eventual copyright violations. If the paper has already been printed elsewhere, sent for publication or presented at an expert conference, the author must notify the editor, obtain the publisher's consent (if necessary) and indicate the reasons for republishing.
Publishing an article is free of charge.

Technical instructions

Limitations regarding the length of the papers

The papers should consist of 16 typewritten pages or 30,000 characters with spaces, at a minimum they should have 8 pages or 15,000 characters and at a maximum 24 pages or 45,000 characters.
Overviews of science or professional monograph (book presentation) shoud not have more than 3.000 characters with spaces.

Reviews

The papers are reviewed. The review is anonymous. With regard to the reviewer's assessment, the editorial board or the editor either accepts the paper, demands modifications if necessary or rejects it. After the reception of the reviewers' remarks the author inserts them into the paper.
Due to an anonymous review process the first page must be designed in the way that the author's identity cannot be recognized.
Next to the title the author indicated the category the paper. The classification is available on the magazine's internet page and at the responsible editor. The editorial board determines the final classification.

Proofreading

The organizational unit responsible for publishing provides the proofreading of the papers. The proofread papers have to be approved.

Translating

The translation of the papers or abstracts is provided by the organizational unit competent for translation or the School of Foreign Languages, DDETC.

Indicating the authors of the paper

The authors' name should be written in the upper left corner, aligned left.
Example:
Name 1 Surname 1,
Name 2 Surname 2,

Title of the paper

The title of the paper is written below the listed authors. The font in the title is bold, size 16 points. The text of the title is centrally aligned.

Abstract

The paper should have an abstract of a maximum 1,200 characters (20 lines). The abstract should include a short presentation of the topic, particularly the results and the findings. General findings and reflections do not belong in the abstract, but rather in the introduction.

Abstract in English

The authors must also submit the translation of the abstract into English. The translation of the abstract is likewise limited to a maximum of 900 characters with spaces (12 lines).

Key words

Key words (3-5 also in the English language) should be bold with a justified text alignment.

Text

The authors should submit their papers on a A4 paper format, with a 1,5 line spacing written in Arial and with font size 12. At the upper and the bottom edge, there should be approx. 3 cm of space, the left margin should be 2 cm wide and the right margin 4 cm. Each page consists of approx. 30 lines with 62 characters. The text should have a justified alignment, without indents at the beginning of the paragraphs.

A brief presentation of the authors

The authors must prepare a brief presentation of their expert or scientific work. The presentation should not exceed 600 characters (10 lines, 80 words). These texts should be placed at the end of the paper, after the cited literature. The author's photo should be at least 600 kb or 200 dpi in size.

Text structuring

Individual chapters should be separated with independent subtitles and adequately numbered.
Example:
1 Introduction
2 Title of the chapter (1st level)
2.1 Subtitle (2nd level)
2.1.1 Subtitle (3rd level)
2.1.1.1 Subtitle (4th level)

[1] *Co-operative Online Bibliographic System and Services*

Referencing

In the bibliography only the authors of the references you refer to in the paper have to be listed alphabetically. The entire reference has to be in compliance with the **Harvard referencing style**.

Example:
Surname, name (can also be the initial of the name), year. *Title of the work*. Place. Publishing House.

Example A:
Urlich, W., 1983. *Critical Heuristics of Social Planning*. Chicago: University of Chicago Press.
At certain papers published in a collection of papers, at the end of each reference a page on which the paper can be found is indicated.

Example B:
Urlich, W., 1983. *Critical Heuristics of Social Planning*. Chicago: University of Chicago Press. pp. 45-100.

Referencing internet sources

All references start the same way as the references for the printed sources, only that the usual part is followed by the information about the internet page on which the document was found as well as the date on which it was found. The information on the time the document was taken off the internet is important because the WWW environment constantly changes.

Example C:
Urlich, W., 1983. *Critical Heuristics of Social Planning.* Chicago: University of Chicago Press. p. 45-100. http://www.mors.si/index.php?id=213, 17 October 2008.
When referencing interesting WWW pages in the text (not citing an individual document) it is enough to state only the internet address (http://www.vpvs.uni-lj.si). A separate reference at the end of the text is therefore not necessary.

More on the Harvard referencing style in the A Guide to the Harvard System of Referencing, 2007; http://libweb.anglia.ac.uk/referencing/harvard.thm#1.3, 16 May 2007.

Citing

When citing sources in the text, indicate only the surname of the author and the year of publication. *Example*: ..... (Smith, 1997) …
If you cite the text literary, that part should be adequately marked »text«…after which you state the exact page of the text in which the cited text is written.
Example: …(Smith, 1997, p 15) …

Figures, diagrams, tables

Figures, diagrams and tables in the paper should be prepared in separate files which allow for proofreading corrections. The place in the text where the picture should be inserted must be clearly indicated. The total length of the paper must not surpass the given limitation.
Should the author not be able to submit the graphical supplements in the electronic form due to technical reasons, it is exceptionally acceptable to enclose the figures to the text. In this case the author must write a sequence number and a title on the back of each picture and leave enough space in the text to include it. The text must likewise contain the title and the sequence number of the figure. Diagrams are considered figures.
All figures and tables are numbered. The numbering is not uniform and not linked with the numbering of the chapters. The title of the figure is stated beneath it and the title of the table is stated above it.
As a rule, the paper should include at least one reference to a figure or a table.. Reference to a figure or a table is: … (Figure 5) …… (Table 2) ……

Example of a figure:

Figure 5: Title of the figure

Example of a table:

Table 2: Title of the table

Footnotes

Numbering footnotes is individual form the structure of the text and starts with the number 1 in each paper. We want to stress that the footnotes are intended for explaining thoughts written in the text and not for referencing literature.

Abbreviations

When used for the first time, the abbreviations in the text must be explained in parenthesis; therefore no additional list of abbreviations is needed. If the abbreviations or terms are written in English, the appropriate Slovenian term should be written along with the English original and possibly the English abbreviation in the parenthesis.

Format type of the paper

The Editorial Board accepts only the texts written with a MS Word text editor and only exceptionally those in the 'text only' format.

Author's address

Each paper should include the author’s address, e-mail or a telephone number, so that the Editorial Board can reach him or her.

Sending the paper

A print or an electronic version of the paper should be sent to the address of the Editorial Board or the members of the Editorial Board.

Confirmation of the reception of the paper

The Editorial Board sends the author a written confirmation regarding the reception of the paper. The authors who also list their e-mails receive the confirmation via e-mail.

Corrections

The author makes corrections to the paper within three days.

Editorial Board address

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The Editorial Board will not accept papers, which will not be in compliance with the above instructions.

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