# SUMMARIES

## War and Warfare between Global North Countries in the 21st Century

*Hans-Georg Ehrhart*

Nowadays, the manner in which the countries of the Global North wage war has become more complex than ever before. Its various forms are more difficult to distinguish, its course is more volatile, its focus is more people-centric, and it is more high-tech. More specifically, the actors increasingly use tactical and operational measures originating from the areas of information space, networking, indirect and covert operations, and technological innovation. This allows in the Global North to preserve their own political room to manoeuvre at low cost and risk.

## The XGW Theory and the 6th Gradient of Warfare

*Veiko Dieves*

The study of war as a phenomenon requires a theoretical framework, a general theory of warfare, which goes beyond armed conflict in warfare. A general theory of warfare is also needed for the creation and development of systems for warfare, as all systems, including organizations, are optimized to operate under certain specific conditions. A comprehensive understanding of these conditions, and thus an understanding of the constraints of these systems, is necessary for creating new successful systems.

This article presents a new addition to the gradient theory of warfare, otherwise known as XGW theory. Thus far, this theory has been described in individual essays and in discussions among researchers; the author compiles the previous discussions into a comprehensive, unified description of the theory. In addition, the article introduces a novel element – the 6th gradient of warfare. In summation, the article provides an overview of the XGW theory, along with the author's insights.

The XGW theory describes Gradients 1 to 5 as attacking specific parts or sections of the opponent's OODA (observe-orient-decide-act) loop, with each

subsequent gradient attack moving deeper into the opponent's OODA loop. The first gradient of warfare focuses on attacking the opponent's decision and action phase. The second gradient of warfare attacks the opponent's decision-making. The third gradient of warfare attacks the opponent's ability to orient itself. The fourth gradient of warfare focuses on enemy orientation and observation. The fifth gradient of warfare focuses on the opponent's ability to observe, manipulating the context of its observation. The article brings together prior research on XGW theory for a more comprehensive overview.

Additionally, this article also describes the sixth gradient of warfare, where the attack moves out of the opponent's OODA cycle and becomes part of the outside world as its passive agent, causing changes in the motives of other subjects in the world. The 6$^{th}$ gradient force shapes a favourable environment for itself, summing up the proper behaviour of other forces, the motivators of which are predetermined by the 6$^{th}$ gradient force. Thus, a discussion of the XGW theory of warfare must address gradients from 0 through 6.

## Situational Judgment Tests for Assessing Platoon Level Military Commanders' Decision-Making Skills in Simulated Battle Situations

*Tõnis Männiste, Robert Rajaste, Reelika Suviste, Margus Pedaste*

The aim of this study was to assess the differences in decision-making skills between experienced (cadets of the Estonian National Defence College (ENDC)) and novice (conscripts) test-takers by constructing a simulated Situational Judgment Test (SJT) for platoon level battle commanders, and to find out whether the testing format influenced the performance outcomes.

To this end, four tests were conducted in two formats: paper-and-pencil tests for one group, and a video test for another group. The sample consisted of ENDC cadets (134) and Reserve Platoon Leader Course (RPLC) conscripts (80). Half of the participants were given the paper-and-pencil version, and the other half completed the video simulation version of the test.

The results showed that SJTs are reliable instruments for measuring the decision-making of platoon level battle leaders, indicating a significant difference between the more experienced ENDC cadets and less experienced

RPLC conscripts. No differences in results were found between the formats of the tests. The authors of the study recommend using SJTs in the Estonian Defence Forces for personnel selection and in training programmes.

## Changes in the Teaching Practices of Instructors in the Estonian Defence Forces

*Sigrid Sinnep*

The importance of the new concept of learning has gained more prominence also in teaching practices. In light of the new training regulation (in force since January 2017) it is also important to acknowledge these new concepts and practices in the Estonian Defence Forces (EDF). The regulation prescribes the SAT model (Systems Approach to Training), which consists of four stages: analysis, design, implementation and evaluation.

This article provides an overview of a study that examined the teaching practices of the instructors at EDF specialty schools and the important role played by the regulations governing military training. The theoretical part of the study describes different approaches to teaching, various learning approaches and the structure of the learning process. In addition, the training of the instructors at the EDF was also examined.

Qualitative research was carried out based on semi-structured interviews with nine specialty school instructors. Data was analysed using inductive content analysis.

The results showed that the instructors' teaching practices are quite similar and are related to their previous training and approaches to teaching, with the most common practices being the teacher-centred approach, traditional learning approach and frontal teaching methods. Additionally, there were also similarities in how the instructors structured the learning process – descriptions provided by the participants covered all the stages outlined in the new EDF training regulation. The importance of the regulations governing the training process was also revealed – the instructors' awareness of the new training regulation was generally low, but they did use it for devising new training programmes.

In conclusion, the analysis of the teaching practices of the instructors indicates room for improvement. This would require the creation of a collaborative network for EDF instructors, expanding learning opportunities and ensuring more resources for training.

## Application of Hyperspectral Sensor Technology for the Detection and Concealment of Military Objects

*Martin Jürise, Andres Udal, Jaanus Kaugerand*

Spectral distribution of the reflected light over wavelength values is a unique signature that can be used to distinguish different objects. Hyperspectral (HS) technology represents a new modern supersensor technology that can provide the detailed spectral content of the visible, ultraviolet or infrared light for every pixel in the image field. Multispectral cameras, precursors to the HS camera, appeared in the beginning of the 1980s and were able to register the image field only for a restricted number of wavelength values. The expensive HS cameras, capable of registering hundreds of wavelength values, were put into military application at the end of the 20th century but, at that time, their price remained too high for civil applications. In scientific literature, the appearance of publications on HS technology may be associated with the year 2001. The explosive exponential growth of HS research publications started around 2010–2011 when the cost of this efficient technology had dropped to a sufficiently low level to facilitate its wider take-up.

This article gives an overview of the new capabilities offered by HS technology, able to transcend the capabilities of the human eye, which is limited to an only 3-color biological sensor system supporting a relatively narrow colour distinction wavelength window of 450–650 nm. Thus, for example, the strong "red step" between 700 and 750 nm that is an essential feature of all forests and backgrounds, and critical for all military concealment and detection tasks/operations, cannot be observed by the human eye without additional infrared vision devices.

The experiments conducted with two HS cameras for the 400–1700 nm range emphasize the overall conclusion that in the modern information age, the concealment of objects has become more difficult and therefore we must begin the development of corresponding defence technologies to counter those threats. In particular, the measurements show that, although the colours of the Estonian Defence Forces correspond to the requirements of NATO standards (4360, 2836, 4698 + NATO AEP 59–65) in the infrared range, vehicles are clearly visible with hyperspectral cameras. The most serious attention should be paid to wavelengths between 600 and 700 nm, where the colour tones of the vehicles and also that of the soldiers' clothing differ significantly from natural background colours due to the lack of chlorophyll and other biochemical compounds. In summary, the Estonian Defence Forces

need a better concealment methodology that protects both military objects and people from hyperspectral monitoring systems. It is still a good idea to use natural ingredients to imitate natural backgrounds. However, for the development of effective concealment methods, modern HS technology is definitely required.

## Life-Cycle Cost Model for Land Vehicles in the Estonian Defence Forces

*Mario Evestus*

This article describes a new cost estimation model that can be used for decision-making in the procurement of next generation land vehicles for the Estonian Defence Forces. The analysis revealed that the cost model focuses on two functions – on the one hand, it is a practical decision-making tool for planning processes and, on the other hand, it is also an excellent fiscal tool for analysing total life-cycle costs and for assessing sustainability and risks.

In the end, the cost model criteria and desired outputs were combined with all the necessary data sources. Based on these three inputs, a new cost estimation model was devised in line with expert recommendations. The proposed MS Excel spreadsheet-based cost model takes into account all the costs that experts deemed necessary and gives numerical values for all the required outputs. By utilising the proposed cost model, the Estonian Defence Forces could improve the quality of the data needed in capacity planning for the procurement of land vehicles for the next ten-year period.

## Training Estonian Naval Officers 1919–1940

*Taavi Urb*

During the Estonian War of Independence, the quality of officer training for the Estonian Navy was barely satisfactory. There were only a few officers that had acquired proper training from the naval schools of the Russian Empire. In most cases they were civilian mariners with only minimal wartime officers' training. A major blow was served to the Estonian Navy when many officers of German and Russian background joined the Russian White Guard in 1919. On the other hand, that was also the reason why naval officers' training was

started during the War of Independence. Unfortunately, the first attempt – the so-called Fleet Specialists School that opened its doors in the winter of 1919 – was not successful. However, at the end of the year, the Military School of the Republic of Estonia launched its first naval class.

The Navy Cadet School was established in September 1920 as an independent institution under the Commander of the Estonian Navy. The first course of line officers graduated in 1921, and the only naval engineers' course followed in 1923. The second course of naval line officers was admitted in 1921. They graduated in 1924 as the navy cadets' class of the Officers School of the Joint Military Educational Facilities. From 1925 to 1928, the third course of naval line officers was trained at the Joint Military Educational Facilities.

The training of naval officers was suspended at the Joint Military Educational Facilities from 1929 to 1937, leaving the Estonian Navy scrambling to compensate for the shortage of officers with various *ad hoc* solutions. For example, two officers were trained by the Navy itself, while two other men were trained by the Finnish Naval Academy. Some mechanics with higher education passed officers' final exams as external students. Those types of solutions served only as temporary remedies to the shortage of officers in the Estonian Navy. The next naval officers' course opened at the Joint Military Educational Facilities in 1938, with the last Estonian naval officers graduating in 1940.

During this time period, the training of naval officers in Estonia went through some developments that proved quite controversial. In the beginning, there were short wartime courses with no proper curriculum. Before the first course could graduate, their curriculum was switched to a peacetime programme. The following year was characterised by stable development and adaptation to peacetime conditions in a small state. This included the establishment of the Navy Cadets School that was later merged with the Joint Military Educational Facilities. This relatively stable development was interrupted in 1928 when the systematic training of naval officers was discontinued for almost ten years. At the same time, major reforms in officers' training were carried out and, consequently, the last naval officers' course was launched in 1938 based on the reformed curriculum. Unfortunately, the new training system did not manage to establish itself fully, e.g. the training of naval engineers was not started at all.

Despite the interruption in the natural development due to Soviet occupation, it must be stressed that during its relatively short spell of independence, Estonia managed to establish its own corps of naval officers. During

1939–1940, there was a generational shift in the Estonian Navy, with young officers educated in the newly established Republic of Estonia taking over the reins from older officers educated in the Russian Empire. The graduates of the first officers' course, hand-picked by the legendary Estonian rear admiral Johan Pitka, all took part in the War of Independence, and comprised the elite of the Estonian naval officers' corps.