DOCTRINE CENTRE

WARGAMING HANDBOOK

Bundeswehr

BUNDESWEHR

This handbook was prepared by the *Bundeswehr Doctrine Centre* in cooperation with the *Bundeswehr Command and Staff College*, the *Bundeswehr Office for Defence Planning* (sub-working group for wargaming), the *Leadership Development and Civic Education Centre*, the *Center for Intelligence and Security Studies* at the Bundeswehr University Munich and other Bundeswehr experts.

GENERAL CARSTEN BREUER
Chief of Defence

What is it that makes wargaming so indispensable to the Bundeswehr at this very moment in time? The answer is simple: we want to make the Bundeswehr fit for war. To do so, we need to rethink just about everything. We need to bring about a change in mentality – and this includes adding a new quality as to how we lead, how we educate and how we train our servicemen and women.

Wargaming can be part of this change. This method enables easy simulation of different scenarios from the tactical to the strategic level. Playing these scenarios can be beneficial for planning and training purposes alike. The spectrum of potential scenarios ranges from challenges caused by hybrid attacks on the Bundeswehr to attacks on NATO's eastern flank. Wargaming promotes strategic thinking and will thus also contribute to strengthening the Bundeswehr's strategic culture, as will be illustrated in the wider context set by the Bundeswehr's first ever Military Strategy.

Wargaming is not only a decision-making tool; it is, above all, a means of critically thinking through complex military challenges in a safe-to-fail environment. Moreover, it helps participants to personally experience the underlying command and decision-making processes.

I myself have seen the added value wargaming can offer. When I was head of the Federal Government's crisis management team during the coronavirus pandemic, this is exactly what my team and I did: we thought through the next wave of infections using the Prussian wargame method, critically questioning our situation as to whether we were sufficiently prepared and what specific implications different decisions would have. Our findings came as a surprise – not only to us, but to the experts as well.

I am, therefore, convinced that wargaming can efficiently accompany the necessary change in mentality and help us become fit for war. If done correctly, wargaming has the potential to positively influence all levels of command by sharpening both the awareness of problems and the understanding of current challenges and by strengthening the courage to take decisions.

Ultimately, wargaming also lays the foundations for us to be able to perform better on the battlefield, to become more agile, faster and more flexible and to prepare ourselves for the future in the best possible way.

This handbook is intended to help unlock the full potential of wargaming. It is intended to be the first step on the path towards the increased and targeted use of this method throughout the Bundeswehr and to further advance the *Zeitenwende*, the watershed moment proclaimed by Chancellor Scholz. In short: it is to help make us fit for war. So, use it!

HyDRA is an educational wargame where participants deal with a hybrid attack on a Bundeswehr agency. It was designed in 2022 by students of the National General/Admiral Staff Officer Course.

CONTENTS

1. WHAT IS WARGAMING?

Wargaming is not new – in the form of the Prussian *Kriegsspiel*, it has existed for more than 200 years.[1] This handbook focuses on the current military context and is intended to provide guidance for the use of wargaming in the Bundeswehr.

In order to be able to explain why and how wargames are conducted, we need a common understanding of what wargaming is and a *working definition* of the term.

1.1. The Challenge: How to Define Wargaming

Providing a conclusive definition of wargaming is anything but trivial because:

- wargaming is a multidisciplinary and versatile method;
- so far, there is no generally accepted definition of wargaming;
- and different stakeholders focus on different aspects.

Peter Perla[2] describes the dilemma as follows: 'What wargaming is not is often even less obvious than what it is.'[3] Therefore, it is necessary to clearly distinguish between similar and overlapping terms, such as *model*, *simulation* and *exercise*. The considerations outlined below provide the foundation for the working definition of wargaming, which will, therefore, only be presented at the end of this chapter.

1.2. Elements of Wargaming

When trying to understand what wargaming is all about, looking at the method's individual elements is the first step. For this, the *layer model* (Fig. 1) shown on the right is a good starting point. In the armed forces, the terms *model*, *simulation* and *wargame*[4] are often used synonymously. However, while models and simulations are elements of wargames, we must distinguish between these terms.

1.2.1 Models

Models are *representations* of objects, systems or processes that have been abstracted and simplified in specific aspects according to specific requirements. They enable us to study connections and interdependencies under controlled conditions, which allows us to draw specific conclusions with regard to reality.

1.2.2 Simulations

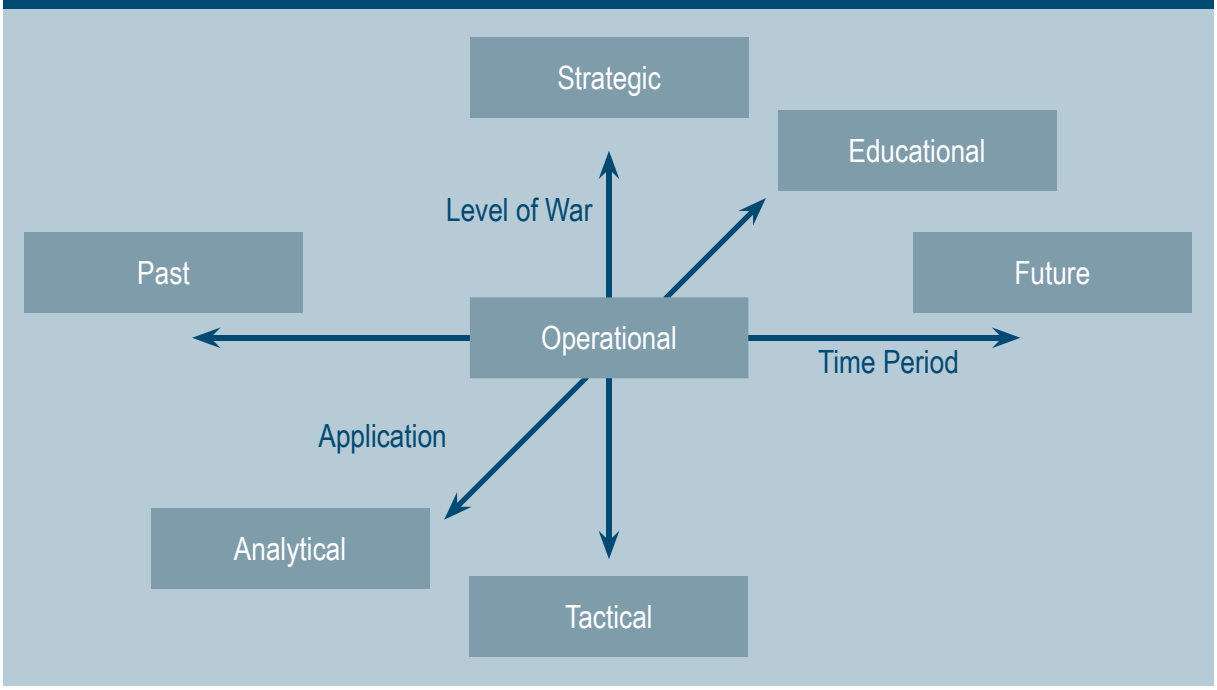
If models are examined over a period of time, they become simulations. The purpose of simulations is to generate data that, on the one hand, can be used to answer questions and, on the other hand, will form the basis for subsequent steps.

1.2.3 Simulation Games

A *simulation* becomes a simulation game if at least two parties characterised by *human behaviour* interact in a *safe-to-fail environment*. In this context, 'safe-to-fail' means that decisions made by humans have *no direct physical impact* on reality.[5] A simulation game becomes a wargame if it involves a *conflict situation*.[6]

FIGURE 1: FROM MODELS TO WARGAMES – A LAYER MODEL

FIGURE 2: THE SCOPE OF WARGAMING



1.3. The Scope of Wargaming

Wargaming can be used in a variety of ways, with wargames taking many different forms. Matthew Caffrey's approach enables the classification of wargames, identifying the *level of war*, the *time period* and the *application* as the most important categories in the spectrum of wargame uses (Fig. 2).[7]

1.3.1 Category 1: Level of War

The level of war category (y-axis) ranges from the *tactical* to the *operational* to the *strategic level*, as shown by the following examples:[8]

Tactical Wargaming – Sand Table Training in the Army

Traditionally, the Army has made use of sand table training to teach military leaders the principles of combat.

Depending on the design, sand table training that uses miniature objects to recreate battles may actually be a tactical wargame. In 2018, the Infantry Training Centre in Hammelburg published a comprehensive guide to sand table training. It describes how the training can be designed and conducted depending on the objectives to be achieved.

Cf. Ausbildungszentrum Infanterie (2018): Sandkastenausbildung.

Operational Wargaming – NATO Forces Defending the Baltics

In 2014 and 2015, the RAND Corporation, together with the US military, conducted a series of operational wargames dealing with various aspects of a Russian invasion of the Baltic States.

Among other things, it was examined how long NATO forces stationed there would be able to withstand various Russian attacks. It turned out that the number of NATO forces was so small that they would most likely be overrun within a few days.

As a result, NATO decided to reinforce its troops stationed in the Baltic region. Russia's full-scale invasion of Ukraine in 2022 has given further momentum to this development. In this context, Germany has decided to permanently station a combat brigade in Lithuania ready to defend NATO territory by 2028.

Cf. Shlapak/Johnson (2016): Reinforcing Deterrence on NATO's Eastern Flank.

Strategic Wargaming – Politico-Military Wargaming in the Weimar Republic

Following the end of World War I, Germany was keen on identifying the reasons for its defeat. The politician Hans Delbrück regarded Germany's sole focus on the military aspects of warfare as the main reason for losing the war. In a committee of inquiry, he therefore argued in favour of involving civilian actors in future military planning.

In 1927, the government of the Weimar Republic established strategic wargaming in the Ministry of Defence for the purpose of analysing security issues. These games were played not only by military personnel but also by diplomats, industrialists, journalists and civil servants.

Cf. Vego (2012): German War Gaming.

Wargaming That Looks to the Past – The Prussian *Kriegsspiel*

In 1811, the Prussian civil servant Leopold von Reisswitz developed the Prussian *Kriegsspiel* – the first modern wargame of its kind – by constructing a table with a three-dimensional terrain map. Playing pieces in regimental colours were used to represent units.

Even today, the Prussian *Kriegsspiel* is still used at the Bundeswehr Command and Staff College, albeit in a modified form. Among other things, players replay historical conflicts with the troops that were present at the time. This allows them to compare their results with the actual outcomes of the conflicts.

Cf. Wintjes (2019): Das preußische Kriegsspiel.

1.3.2 Category 2: Time Period

As far as the time period (x-axis) is concerned, wargames can depict historical battles as well as future scenarios. There are advantages and disadvantages to both. Although historical wargames usually contain reliable information, this information can only be applied to present-day situations to a *limited extent*. This is because simply transferring successful strategies of the past to the future would mean to ignore changed conditions.

Future scenarios are of greater practical benefit; however, the validity of the conclusions decreases the further one looks ahead. In this respect, the focus is on identifying a variety of possible consequences that can arise from specific decisions. This is to ensure the participants' optimal preparation for possible scenarios. Moreover, wargaming helps participants to escape the trap of *normality bias*: assuming that things will continue as they have in the past. This alone results in a higher resilience to scenarios actually occurring.

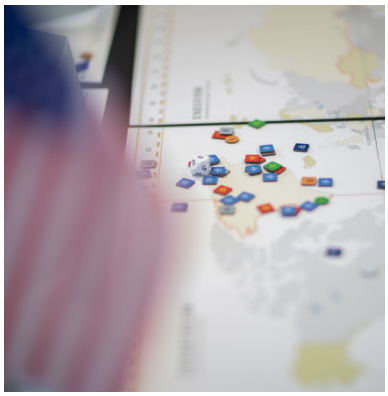
Wargaming That Looks to the Future – Planspiele in the West German Navy

In the 1960s, the Federal Navy, as it used to be called, conducted numerous *Planspiele* in order to adapt its strategy to probable attacks by Warsaw Pact forces.

By running the *Planspiel Hamlet*, a strategic planning game – as wargames were called back then – with three future operational scenarios, all of which were set in 1975, the Federal Navy examined how best to protect maritime traffic in the North Sea, use submarines and aircraft in the Baltic Sea and defend against enemy landing forces.

The wargame's outcome led to the then Chief of Defence Thomas de Maizière demanding the creation of a 'Navy with clearly defined capabilities, a Navy that is part of a triphibian solution when it comes to defending the area north of the Elbe River'.

The fact that the Federal Navy conducted wargames in the 1960s and 70s is documented by files stored in the Federal Archives' military department in Freiburg.



1.3.3 Category 3: Application

The application (z-axis) of wargaming ranges from *analytical* to *educational* purposes.

Analytical wargames help to answer specific questions and to find solutions in complex and uncertain situations. They are primarily used to generate knowledge and support the decision-making process by assessing, for example, plans, concepts, strategies and courses of action.

Educational wargames impart knowledge, promote understanding and enable participants to experience first-hand, among other things, the processes underlying command and control and decision-making. Above all, they are used for *education and training*. Wargaming has a positive effect on *decision-making and leadership qualities*. Players are able to experience the decision-making process and take relevant decisions that affect the further course of the game. They also learn to deal with the consequences of wrong decisions – usually, people experience a steeper learning curve when they make mistakes.

Educational Wargaming – HyDRA

In 2022, the Bundeswehr Doctrine Centre developed the Hybrid Warfare Defence, Resilience & Awareness Game (HyDRA) together with students from the *National General/Admiral Staff Officer Course*.

Dealing with a hybrid attack on a Bundeswehr agency, HyDRA is a realistic conflict simulation that can be used for a variety of training purposes. A flexible *script* with fictitious hybrid vignettes promotes interactive communication and decision-making processes and provides a deeper understanding of hybrid threats.

Analytical Wargaming – Jobas North

From the 1960s onwards, the Bundeswehr used computer-assisted wargames and simulations summarised under the term *Planspiele* to study operational scenarios. For this purpose, it set up a *planning game centre* with the necessary infrastructure in Taufkirchen. This centre was in operation until 1994.

In 1982, German and American officers got together at the planning game centre to conduct a secret computer-assisted *Planspiel* called Jobas North. Its principal aim was to evaluate how efficiently NATO's air and land forces would be able to interact in a potential attack by Warsaw Pact forces.

The results of this wargame influenced later approaches involving joint operations in both the Bundeswehr and NATO.

Further detailed information on the Bundeswehr conducting the Jobas North wargame is available in files stored in the Federal Archives' military department in Freiburg.

1.3.4 The Scope of Wargaming – Overlaps

The Bundeswehr mainly distinguishes between analytical and educational wargames. Nevertheless, there are shifting overlaps across the different forms of wargaming, and drawing a crystal clear distinction between them is hardly possible in practice. Take the various applications of wargaming, for example – analytical wargames also lead to learning effects among participants, and educational wargames may just as well lead to new insights on military strategies.

It is possible to distinguish wargames not only by their application, the level of war and the time period, but also by other criteria such as their *mode of representation* and *method of adjudication (rigidity)*.[9]

1.4. Arriving at a Definition of Wargaming

Given that wargaming can be used in so many diverse areas, it is easily confused with other methods, such as *military exercises* and *computer-assisted simulations*. These are similar methods, yet fundamentally different from wargaming.

1.4.1 Military Exercises

During exercises, decision-making is done manually by the *forces actually deployed* and not in a safe-to-fail environment as simulated in a wargame. Exercises are conducted in different forms, some of which are similar to wargames. Although most exercises are designed to test the participants' understanding of learning and training content, there are also experimental approaches that serve to try out new ideas. In terms of methodology, exercises without a predefined script where two parties compete are particularly similar to wargames.[10]

1.4.2 Computer-Assisted Simulations

Computer-assisted simulations use *algorithms* to analyse specific questions and provide results. Complex questions are broken down into several parts and processed systematically. This scientific approach creates a clear basis for evaluation. Algorithms, however, are only able to predict human behaviour to a *limited extent*. People often react unpredictably due to stress, irrational thought patterns or cultural influences.[11] For this reason, classical algorithms are increasingly complemented by the use of *artificial intelligence* (AI).[12]

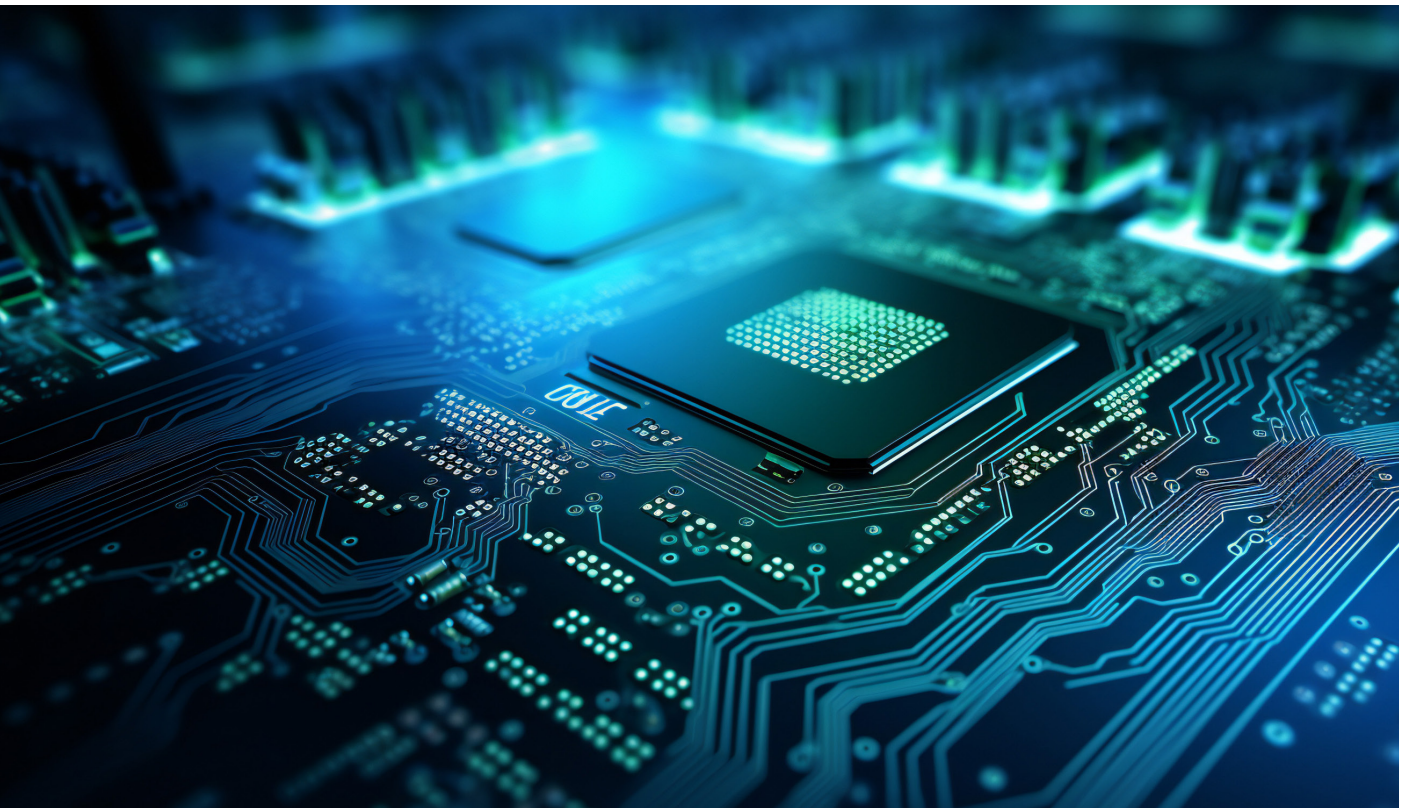
Open computer-assisted simulations are often confused with wargames. While in wargames there are at least two opponents characterised by human behaviour and with *similar room for manoeuvre*, in open computer-assisted simulations decision-making is almost *completely automated*. Examples for the latter include strategy computer games where users play against an *AI opponent*.

1.4.3 Synergistic Effects Between Wargaming and Computer-Assisted Simulations

While computer-assisted simulations provide quantitative answers to specific questions, wargaming provides qualitative indicators of correlations that – when carefully applied to reality – help to better understand specific processes and questions.

Even though wargaming and computer-assisted simulations differ in their methodological approaches, they complement each other when it comes to studying complex issues. In fact, simulation systems – a combination of computer-assisted simulations – are used as the basis for computer-assisted wargaming. The advantage is that both methods have their own strengths, which can be combined when used together. It all depends on the question to be answered.

Computer-assisted simulations are particularly well suited when studying technical processes, such as the use of certain weapons against a specific target. Wargaming, on the other hand, is particularly suitable for the study of issues that are characterised by poorly quantifiable factors, such as possible political implications of a military decision.



1.4.4 Definition of Wargaming

A working definition of wargaming is the basis for establishing it as a uniform method in the Bundeswehr. At the same time, this definition must be compatible with those used by our allies. In order to address this challenge, we have adopted a definition of wargaming that is very closely modelled on NATO's:

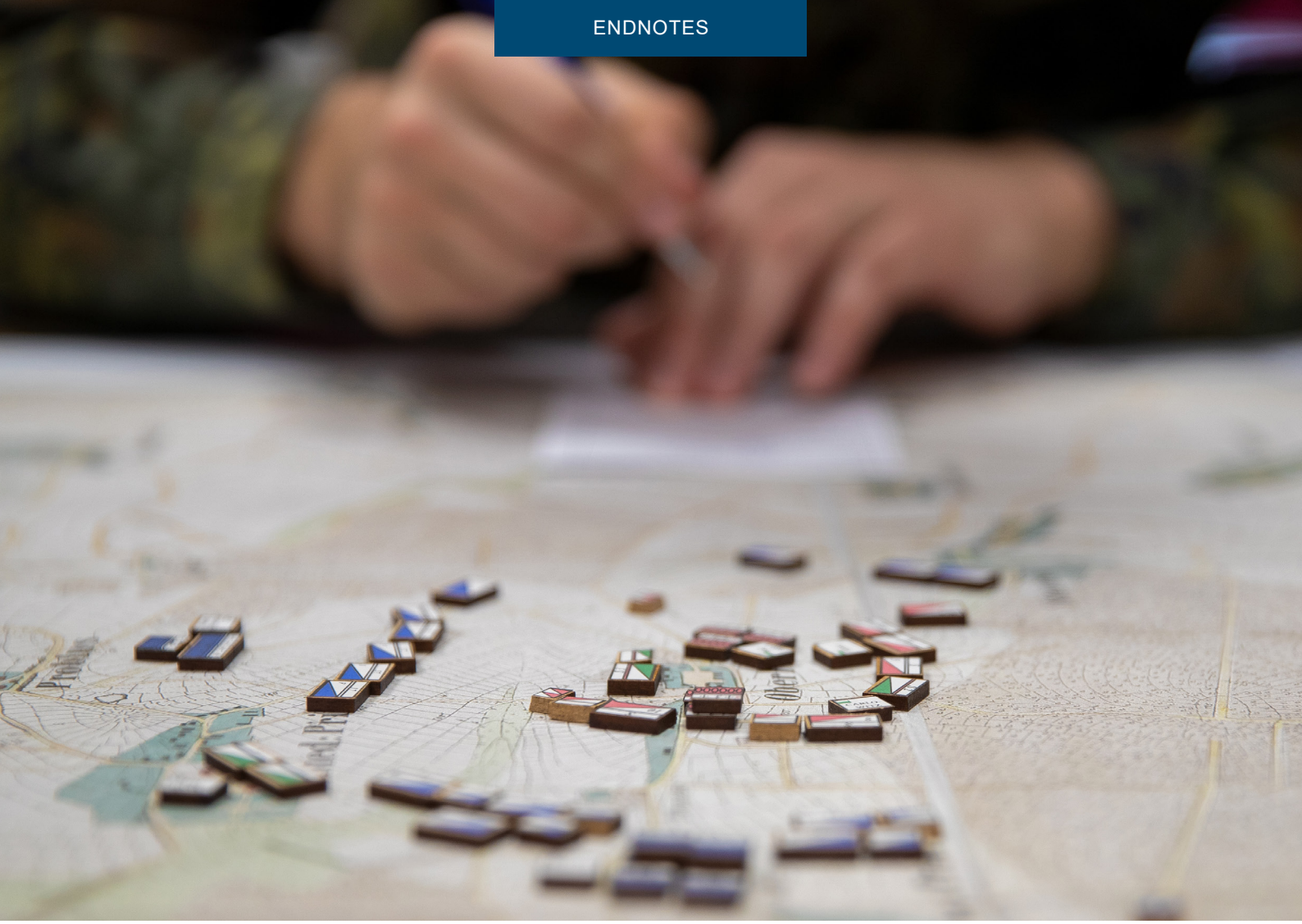
Wargaming is a method that uses scenario-based models to represent conflict or competition in a safe-to-fail environment, in which events, human decisions and resulting outcomes mutually influence one another.[13]

Wargaming in a Wider Context

In general, wargaming can be seen as a form of gamification. Gamification is the use of playful elements in non-playful contexts.

With regard to the *methods applied for the future and further development of the Bundeswehr*, analytical wargaming is used in both Concept Development and Experimentation (CD&E) and Operations Research (OR). CD&E uses analytical wargaming to develop and conduct experiments in order to further advance conceptual ideas and to test their feasibility. In Operations Research, analytical wargaming is used as a method to answer analytical questions.

Wargaming is not synonymous with game theory. Game theory provides mathematical analyses of strategic situations where decisions must be taken and the results depend on the decisions of several agents. Nevertheless, game theory approaches can be applied to wargames.



ENDNOTES

Chapter 1

1 Cf. Caffrey (2019): On Wargaming; Vego (2012): German War Gaming; Wintjes (2019): Das preußische Kriegsspiel. The origins of wargaming date back to antiquity, but the Prussians were the first to embrace wargaming in its modern form by developing the Kriegsspiel – the first application of the method as we understand it today.

2 Peter Perla is considered one of the world's leading experts in wargaming.

3 Perla (1990): The Art of Wargaming, p. 70.

4 While 'wargaming' refers to the method as such, a 'wargame' represents the application of this method to a specific case.

5 This also includes the fact that players do not need to fear a negative assessment due to the decisions they take in the safe-to-fail environment.

6 In this handbook, the term 'conflict' is used in a broad sense. It may not only include armed conflicts and competitive behaviour, but may also relate to contradictory and non-cooperative approaches to finding solutions.

7 Cf. Caffrey (2019): On Wargaming, p. 271 ff.

8 It is controversial as to where exactly the dividing lines between the tactical, operational and strategic levels are to be drawn. For details on this discussion see Gray (1999): Modern Strategy, p. 17; Till (2017): Seapower, p. 80.

9 Cf. NATO (2023): Wargaming Handbook, pp. 12–13.

10 So far, there is no universally agreed distinction between exercises and wargames. This handbook follows NATO's explicit understanding that exercises are not wargames.

11 In general, one can distinguish between open simulations (human-in-the-loop simulations) and closed simulations (closed-loop simulations). While it is humans who take vital decisions in open simulations, the decision-making process in closed simulations is fully automated. In complex agent-based simulations, each element of the simulation is handled by agents.

12 With artificial intelligence progressing at a rapid pace, it can be expected that simulations will continue to improve in predicting human behaviour. Cf. Goodman/Risi/Lucas (2020): AI and Wargaming.

13 Cf. NATO (2023): Wargaming Handbook.

2. WHY WARGAMING?

Following the explanation in the previous chapter of what wargaming is, the question arises as to its benefits to the military, the limitations of the method and any associated costs.

2.1. Benefits of Wargaming

The benefits of wargaming are directly related to the reasons for its application. Differentiating between analytical and educational wargaming opens up a broad spectrum of benefits. Notwithstanding the above, human (inter)action is the central element in wargaming. Specifically, this includes:

- 'the players;
- the decisions they take;
- the narrative they create;
- their shared experiences; and
- the lessons they take away.'[1]

While the players' decisions and their consequences are fundamental to analytical wargames, which provide decision-making *information*, educational wargames focus on the players themselves in order to provide decision-making *experience*. The difference in focus allows wargames to be geared to achieve a specific goal – whether to *increase mental resilience*, to *support decision-making* in a specific case, or to *generate new approaches and ideas*.

2.2. Increasing Mental Resilience

Educational wargaming increases the mental resilience of players – in the safe-to-fail environment that wargames provide, no one has to fear the consequences of their actions, even though they must still face them. The increase in resilience can be achieved by *affective* and *cognitive learning*.[2]

Factors such as fear of failure, a poor organisational culture[3], or social desirability have a negative impact on the actions a person takes. A safe-to-fail environment helps players to *shape their mindset*: it improves their conflict handling skills, increases their problem awareness, imparts an understanding of failure, and contributes to fostering a culture in the Bundeswehr that allows for questions and mistakes.

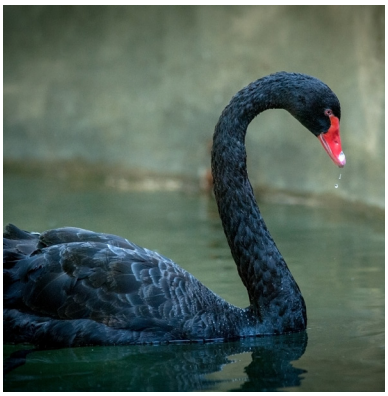
Guiding Principle: A Culture Allowing for Questions and Mistakes

In an organisation, a *culture that allows for questions* represents both the way in which ambiguities, malpractices and inefficiencies *are questioned and the resulting consequences that arise for the questioner* – irrespective of that person's position. In large hierarchical organisations, obvious problems often remain unsolved or they are, at best, only partially solved. This is because these organisations have failed to embrace a culture that allows for questions, which prevents people from speaking out.

Wargames are able to reduce these barriers and teach participants that asking critical questions is essential to the success of any project. The same applies to dealing with failure: the safe-to-fail environment of wargames encourages the development of a *culture that allows for mistakes* and *destigmatises* failure, thereby increasing the players' willingness to take decisions.

Cf. Chott (2004): Ansätze zur Entwicklung einer Fehlerkultur.

In addition, wargaming allows players to gain *synthetic experiences*[4]. Instead of gaining military experience through actually participating in a conflict, they can do so in a simulated, low-risk environment. Synthetic experiences accelerate decision-making processes, increase adaptability and prepare for *emergencies*.



2.2.1 Supporting Decision-Making

From an analytical point of view, wargaming is a method that can be very useful at all levels of command when it comes to investigating specific issues. Analysts use *methods* in order to structure and refine situation pictures. These enable decision-makers to take better informed decisions.[5] Wargaming is a *decision-making* tool that is suitable for investigating issues where other methods can hardly be applied, if at all.

Unlike most methods, wargaming is well suited to depict human behaviour and to teach participants how to deal with uncertainties and *high-impact low-probability events* through the synthesis of existing information. In addition, wargames combined with quantitative methods can be used for the comprehensive study of complex questions to increase the granularity of situation pictures. Wargaming offers the opportunity to examine different courses of action (COA Wargaming), making it an important decision-making tool.

Uncertainty: A Challenge in Decision-Making

Uncertainties leading to an incomplete situation picture are a major challenge for decision-making and risk management. Decision-makers are often not even aware of the existence of unknown factors called 'unknown unknowns' that influence their decisions.

We often underestimate the relevance of rare events with major effects known as 'high-impact low-probability events'. The use of nuclear weapons in a conflict may be unlikely, but its effects would be so devastating that it still has to be considered.

Cf. Taleb (2008): The Black Swan.

2.2.2 Wargaming as a Driver of Innovation

A frequently neglected aspect of wargaming is the part it plays in innovation. Large hierarchical organisations are characterised by structures that facilitate the formation of information silos. At the same time, these structures are necessary for the overall functioning of the system – this represents a dilemma for which wargaming can be an effective solution:

Bringing together stakeholders from across all echelons in a closed safe-to-fail environment, it enables them to examine issues in a creative way and with maximum confidentiality. This combines different perspectives, paving the way for *new approaches* – and thus for new developments, strategies, plans, etc.

World War II: Development of Anti-Submarine Warfare Approaches

By wargaming, the British Royal Navy's Western Approaches Tactical Unit (WATU) developed innovative tactics for coping with attacks on Allied convoys by German submarines. WATU operated from 1942 to 1945, developing a basic set of rules for wargames that included *decision-making processes*, *doctrine* and *communication conditions*.

The players representing commanding officers of the escorting warships were only given such information as would be available to them in a real battle. The first game sessions indicated that the best time for submarines to attack a convoy would be *at night and from within the convoy*, which is exactly what happened. WATU also predicted the German use of *wolf-pack tactics*, i.e. coordinated attacks performed by several submarines.

As a result, the British Navy began to prepare for possible future tactics at an early stage. It improved the coordination of aircraft and escorts during anti-submarine warfare, accelerated the development of new sonar technology for detecting submarines and encouraged the development of more effective water bombs.

Cf. UK Ministry of Defence (2017): Wargaming Handbook, p. 19 f.

2.3. Limitations of Wargaming

The special characteristics of wargaming should not obscure the fact that its use – as with any other method – has its limitations. There is *no one-size-fits-all* method that provides useful results regardless of the question.

2.3.1 Wargames Can Only Partially Replace Real Experiences

When wargaming, players are able to gain experiences that they can later apply to a real military context. Nevertheless, these synthetic experiences can only replace real-life experiences up to a certain point. While command and control principles such as decision-making, conflict handling skills and a culture allowing for mistakes can be experienced and internalised very well in wargaming, it cannot fully reflect the *psychological and physical challenges* posed by exercises or battles.

In a simulated environment, real-life factors such as lack of sleep, exhaustion and injuries can only be represented to *a limited extent*. Therefore, wargames should not be considered a cost-effective substitute for military exercises. On the contrary, they *complement* them with specific facets. In combination with exercises, these facets then increase the participants' level of training and their wealth of experience.

2.3.2 Wargames Have Different Outcomes When Repeated

Even when a wargame is executed several times with the same players, the outcome will never be the same. If players are already familiar with the given situation, the element of surprise is lost and they will take decisions based on the experience gained during the first game session. However, when replaying an educational wargame, players can demonstrate that they have actually learned something and make *better* decisions this time. By replaying a wargame, you can also collect data on rare and poorly documented hypothetical scenarios. Unlike data gained from case studies and survey experiments, wargaming data can be generalised.

2.3.3 Wargaming: A Qualitative Method

Decisions in wargames are based on players' assessments, analyses and actions that lead, as a whole, to a continually updated situation picture. This means that wargames provide useful and meaningful results, except for issues that are characterised by mathematical contexts and require replicable research. In such cases – e.g. when investigating the effects of using a particular weapon – it is recommendable to use computer-assisted simulations over a wargame.

2.3.4 Wargaming: Not the Sole Basis for Decision-Making

Interpreting wargame results is not without risk. If, for example, the outcomes of analytical wargames are falsely thought to predict the future, it is ignored that they are never the *only solution*. Therefore, wargame findings must always be contextualised with the rest of the available information.[6] In military operational planning, we often decide what the course of action will be before using COA wargaming. This turns wargames into games with predetermined outcomes that merely serve to legitimise a decision already made.[7] Similarly, conclusions from historical wargames cannot simply be applied to current issues, since today's conditions are different from those of the past.[8]

2.3.5 Wargames: Only as Good as Their Participants

A method shaped by its users is particularly dependent on their understanding of the method, on their expertise and their *motivation*. While educational wargaming relies on the players' acceptance and methodical understanding, analytical wargaming relies on their expertise in the scenario under consideration. A high level of motivation is a prerequisite for effectively conducting wargames and gaining useful insights. The working groups involved in running a wargame must prepare and supervise the game *in a competent manner as regards technical, methodical and subject matter expertise*.

In addition to *early methodical training* in the Bundeswehr to provide information on the benefits, limitations and costs of the method and to generate a positive perception of wargaming, it is above all the design of wargames that must be *tailored to the participants*. This is crucial for the method's success.

2.4. The Costs of Wargaming

Depending on their form and scope, conducting wargames leads not only to *material and personnel costs*, but also to *opportunity costs*. The decision to conduct a wargame should, therefore, be considered carefully and weighed against other options. In principle, the value for money is excellent, if the method is used correctly, because simulating the use of material and personnel is less expensive than actually using them.

2.4.1 Material Costs

The material costs of wargames vary greatly *depending on their structure and scope*, but can generally be broken down into two groups:

- costs for simulation systems used in wargaming;
- costs for infrastructure and technical requirements.

The in-house development of simulation systems is costly and takes a lot of time. This holds especially true for the development of algorithm-based models, which can make computer-assisted wargames very expensive. It is, therefore, recommended to use existing models and simulation systems and to adapt them, if necessary.[9] Commercially available simulation systems are sophisticated, inexpensive and flexible in use.[10] In the case of manual tabletop wargames[11] that do not require computers it is usually sufficient to procure a game board, game pieces and a set of rules.

For many wargames, the infrastructural and technical requirements are manageable. Even complex wargames can be conducted in normal classrooms or seminar rooms equipped with a basic IT system. Leading wargaming countries also have established their own *wargaming centres* offering facilities and simulation systems with appropriate security standards. The main cost factor is the coupling between software and hardware, e.g. simulation systems and technical command posts.

2.4.2 Personnel Costs

To use wargaming effectively, there must be sufficient qualified personnel available to ensure that wargames are developed, executed and analysed appropriately. In wargaming, personnel costs are incurred due to the involvement of different groups of persons, who can be roughly summarised as follows:[12]

- methodology experts whose core task is wargaming;
- supporting personnel;
- players.

At the working level, methodology experts are responsible for putting educational and analytical wargaming into practice and developing these approaches further. These experts supervise the planning, development, execution and analysis of complex wargames and coordinate the supporting personnel. In addition, they advise military leaders on the purposeful use of wargaming and its results, ensure the exchange with the academic world, work on the further development of the method and maintain international contacts.

The supporting personnel have different roles and responsibilities in putting wargames into practice. The planning, development, execution and analysis of complex wargames is taken care of by working groups consisting mainly of supporting personnel: in addition to the actual wargaming team, these working groups usually include an *analysis team*, a *management team*, and groups of *different subject matter experts*.

Of course, with any wargame it is particularly important to find suitable players. The degree to which a wargame achieves its objectives is directly related to the *players' abilities and motivation*.

2.4.3 Opportunity Costs

Overall, the value for money of wargaming is very promising: many wargames can be conducted with little effort. An experienced facilitator and a simple tabletop wargame already on the market can be enough to pose a major challenge to players.

In any case, those responsible should consider carefully when and under what circumstances they plan to use wargames. Seeking advice from methodology experts on the advantages and disadvantages of conducting a wargame is strongly recommended.

ENDNOTES

Chapter 2

1 UK Ministry of Defence (2017): Wargaming Handbook, p. 5.
2 For a detailed explanation of affective and cognitive learning, cf. Bloom (1956): Taxonomy of Educational Objectives.
3 'Poor organisational culture' means that specific value systems have become so ingrained in an organisation that they negativly impact the achievement of the organisation's goals.
4 In wargaming, the term 'synthetic experiences' refers to experiences gained in a safe-to-fail environment.
5 Cf. Pherson/Pherson (2016): Critical Thinking for Strategic Intelligence.
6 This also applies to COA wargaming, e.g. in the context of NATO's Comprehensive Operational Planning Directive (COPD). Here, too, the findings are not deterministic. Instead they are a decision-making tool helping to identify problems, factors that have not been considered, etc.
7 Cf. Millet (2022): Wargaming. The Ugly, the Good, the Better.
8 Cf. Chapter 1.3.2.
9 Developers of a new wargame (wargaming working group, in particular: methodology experts) should check whether existing models can be used.
10 Commercially available simulation systems can often be obtained not only as a civilian version but also as a military version that contains classified data and models. The 'Command: Modern Operations' simulation system by Matrix Games, for example, is used by both the Bundeswehr and NATO.
11 Tabletop wargames are manual wargames that resemble board games.
12 Please see Chapter 3 for a description of the different roles and responsibilities.

3. OPERATIONALISING WARGAMING – THE PROCESS

Great Britain, the United States and NATO have acquired a *wealth of experience in wargaming* to draw on. Their findings have been made available to the public in detailed handbooks.[1] The Bundeswehr, too, has already made use of various forms of wargaming.

For the purpose of this handbook, we have examined existing approaches and integrated them into a four-phased process structure consisting of *a planning phase, a development phase, an execution phase* and an *analysis phase*.

3.1. The Planning Phase

The wargaming process starts with the planning phase. This phase serves to identify the problem or question that is to be addressed by the wargame, to determine its scope and to assign personnel. Moreover, the wargaming working group conducts research in order to determine the details of the wargame to be delivered and then proceeds to prepare an initial design concept. Upon completion of the planning phase, *all conditions are in place* to start the development of a prototype.

3.1.1 Formulating the Problem

The planning phase begins with the sponsor formulating the problem or question that is to be addressed by the wargame. The problem must be formulated in a clear and unambiguous manner in order to obtain workable results. As a general rule, one should ask open questions such as: *What for? Who, what, when, where, how?*

It often happens that the sponsor has not yet formulated a problem statement or question but still wants to conduct a wargame on a specific topic. In such cases, it is important for the wargaming working group to cooperate closely with the sponsor and clearly identify the problem before starting to develop the wargame.[2]

If the problem is very complex, it may not be possible to solve all aspects with one single wargame. Instead of reducing the wargame's level of detail, it is then better to break the problem down into its key points and conduct a *series of wargames*.

3.1.2 Defining the Scope – What are the Framework Conditions?

Using the aforementioned questions, the sponsor determines the scope of the wargame in close consultation with the various stakeholders. Specifically, they must agree on the following parameters:

- purpose (what for?)
- objectives (what for?)
- desired results (what for?)
- timeline (when?)
- concept of analysis (how?)
- constraints (who? how?)
- assumptions (what?)
- modelling (how?)

The best way to do this is to hold a *scoping event* where *all stakeholders* are present.

a. Purpose – The purpose is a *concise statement* of the aim of the wargame.[3] All contents of the wargame must be geared towards this aim. If the purpose is too unspecific, there is a risk of including unnecessary elements in the wargame. The purpose is derived from a valid answer to the question *'What for'?* There are *no predetermined outcomes* to wargames.

b. Objectives – To achieve the defined purpose, specific objectives must be formulated. They cover *different aspects of the problem* and do not have to be directly related to each other. However, they are *the basis for the game design, analysis and scenario*. Specifying too many objectives will result in a situation where none of them can be given the necessary attention.[4] Therefore, *objectives must be stated clearly*. This can be achieved using the S.M.A.R.T. approach, according to which an objective must be specific, measurable, achievable, relevant and time-bound. Taken together, the objectives must support the game's purpose. Vice versa, the ob-

jectives can be derived from the purpose. In this context, the question is: What exactly needs to be achieved to accomplish the purpose of the wargame?

c. Workable Results – It is essential to *manage expectations* prior to developing a wargame. First, it must be clarified which products a wargame is supposed to generate. Reports will make the results available to the sponsor and other stakeholders. Questions must be answered in an unbiased manner so as not to undermine the wargaming effort.

Second, it is important to determine how these products are to be used. Wargaming is *only one element* in a complex analysis or training process in which other methods are used as well. If the results of a wargame are intended to be used, for example, for computer-aided simulations or vice versa, the players' actions must be documented with a sufficient level of detail. Therefore, all reports must provide information that is *relevant to the game's purpose*.

d. Timeline – During the scoping event, sponsors and stakeholders agree on a rough schedule for developing and executing the wargame. At this point, the timeline is still subject to changes, as many challenges will only become apparent during the development phase. A timeline with *milestones* helps to measure development progress, and possible delays can be noticed earlier. Frameworks and methods of agile project management such as *Scrum* or *design thinking* can be used for the development, preparation and execution of wargames.

e. Concept of Analysis – During the scoping event, a *concept of analysis* needs to be developed. It shall include essential assumptions that must be reviewed to achieve the wargame's purpose and objectives. The resulting questions are comparable to theses covering different aspects of the overall problem. A senior analyst is responsible for the concept of analysis. On this basis, they should initiate the development of a data collection and analysis plan (DCAP) at an early stage.

f. Constraints – Typically, the sponsor will limit the scope and design of a wargame by introducing specific requirements providing the framework for its development. Examples are *geographical boundaries, rules of engagement* or *operational readiness levels*. At the same time, the wargaming working group must advise the sponsor as to which ideas *can be realistically implemented*, because the sponsor will likely not have the requisite methodological expertise. It is essential that the sponsor and all stakeholders *clearly communicate* any constraints from the very beginning.

g. Assumptions – A set of assumptions relating to the development and execution of the wargame is *indispensable for its success*. During the development process, the wargaming working group should try to verify assumptions as quickly as possible in order to resolve potential problems together with the sponsor at an early stage. Typical assumptions include the availability of data, experts, models and infrastructure.

h. Modelling – Often, sponsors can draw on existing models or simulation systems that only need to be adapted to the respective application. In this respect, it is important to note that the game's purpose and objectives and the validity of results are *essential criteria for the selection of a model.*

3.1.3 Assigning Personnel

Delivering a wargame requires the collaboration of *methodology experts* and *supporting personnel*. They form working groups to attend to different aspects of the wargame. Continuous *exchange of information* between the individual groups is indispensable. As a minimum requirement, there must be the following working groups:

a. Wargaming Working Group – The wargaming working group is the core element of any wargame. It consists of *wargaming methodology experts* and supporting personnel. In consultation with the sponsor, it is responsible for planning and developing a prototype, which will be repeatedly tested and adapted. In addition, it *coordinates the execution of the wargame and appoints adjudicators*. The wargaming working group is headed by a director, who is *responsible for the entire project*, *monitors the analysis process* and *integrates other stakeholders in the wargaming process*. Apart from sound methodological expertise, the director must have leadership skills and knowledge of the organisation's internal processes. Furthermore, a broad network of contacts is essential.

b. Analysis Working Group – This working group is made up of analysis personnel and is responsible for developing a *purposeful data collection and analysis plan (DCAP)*. In educational wargaming, too, the

analysis of results plays an important role. The working group is headed by a senior analyst.

c. Management Working Group – The main task of this working group is *event management*: Conducting a wargame requires great organisational effort in a variety of areas. Aside from providing the necessary infrastructure and ensuring security, this also includes the provision of food, transport and IT support. The management working group is headed by a *project manager*.

d. Expert Groups – To ensure the wargame's authenticity, the scenario, game mechanics and game components must depict reality as closely as possible. Wargames are multidisciplinary, meaning that a wide variety of subject areas need to be included in the planning and development process. When developing a comprehensive wargame it is common practice to draw on subject matter experts and have them work together in subject-specific groups.

During the planning phase, the wargaming working group coordinates with the sponsor to decide about the staffing of the other working groups and whether additional support from other actors is required:

a. Design Working Group – Ensuring a *clear layout of all game components* must be a top priority. Although the overall responsibility for the wargame's design lies with the wargaming working group, it is advisable to outsource the design work to a design working group if the wargame is a complex one.

b. Simulation Support Working Group – Many wargames require simulation support. This support is usually provided by specially trained personnel. A simulation support working group ensures the *targeted and professional use of simulation systems in wargames by involving personnel with the requisite methodological expertise.*

3.1.4 Conducting Research – What Information is Needed?

Once the scope of the wargame has been defined, the wargaming working group will decide how to obtain the necessary information for the production of a game prototype. As a rule, its research covers the following three aspects:

a. Information on the Wargame's Topic – It is important that wargames are credible. This means that scenarios must be designed precisely and realistically. Future-focused wargames may require *speculative assumptions* based on current findings. In many cases, the topics of modern wargames are so complex that methodology experts often do not have sufficient knowledge of every detail.

b. Information on Game Mechanics – Existing wargames that have been conducted before can be an inspiration for designing one's own wargame. Depending on the requirements and objectives specified for the wargame, proven game mechanics can be adopted or adapted. Wargaming working groups with little experience are advised to use existing approaches instead of venturing into uncharted territory and trying to develop a new game from scratch.

c. Information on Game Components – The level of abstraction of simulated forces and other game components depends on the defined scope of the wargame. Please note that too many details will overwhelm the players, especially in an operational or strategic wargame.

3.1.5 Developing the Initial Design Concept – How to Proceed with the Project?

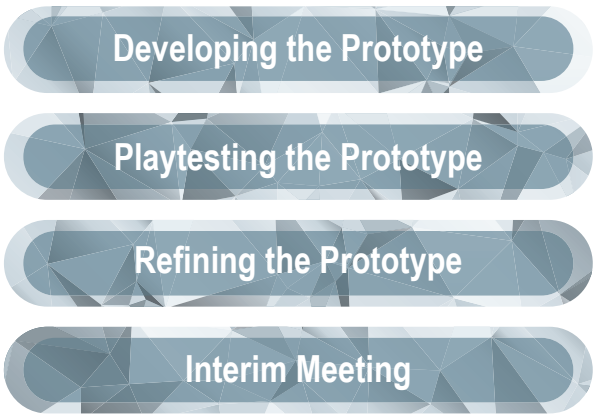
Having completed their research work, the wargaming working group informs the sponsor about its findings and their *significance for the scope of the wargame* (design brief). The briefing includes a discussion leading to the preparation of the *initial design concept*. This is a binding document that contains a realistic timeline for

implementing the project. The design brief must *at least provide information on the following topics*:

- sponsor's problem
- purpose and objectives
- desired results
- concept of analysis (including recommendations for possible methods)
- rough scenario outline (including ideas for the context and setting)
- type of wargame (including a proposal regarding the scope of the wargame)
- structure of the wargame (including suggestions regarding the duration and parties involved)
- timeline with milestones for development, execution and analysis

3.2. The Development Phase

Once the planning phase is complete, the wargame development phase begins. The first step is to develop a prototype that contains *all essential game components* and serves as a foundation for the further design work. In a second step, the prototype is extensively playtested by subject matter experts and representatives from the intended target groups, who will identify and address any need for improvement. The result of the revision process is the final version of the wargame. Finally, a meeting is held with all participants to ensure that everyone is aware of their tasks during the wargame's execution.



3.2.1 Developing the Prototype

As soon as the sponsor has approved the initial design concept, the actual development process begins. The first step is to develop a draft design and a prototype. The draft contains only the most relevant details, since many aspects will only come up during development. Developing and executing a wargame is a complex endeavour involving different processes that run in parallel and concern different stakeholders:

a. Event Management – The success of the project depends largely on comprehensive and timely event management. It is handled by the management working group and comprises different aspects:

- finding an adequate venue
- security (both information and physical security)
- ensuring IT support
- providing accommodation and transport
- providing food and refreshments
- setting up a registration system for participants
- sending out invitations
- communication
- providing break rooms

All event planning measures must be closely coordinated with the wargaming working group and also with the sponsor, who may have to pay for the costs incurred.

b. Data Collection and Analysis Plan (DCAP) – The analysis working group must be involved both in the development and execution of the wargame. In parallel with the wargame, it develops a suitable DCAP, which will serve as a *basis for collecting data* needed to solve the problem that is to be examined by the game.[5] Often, disagreements may arise between developers and analysts, since scenarios, rules and game mechanics do not always produce relevant or usable data. *The personnel responsible for the analysis must specify* which types of data are needed in what form in order to address the sponsor's problem, and *the personnel responsible for the development must ensure* that this data is generated.

c. Establishing Rules and Game Mechanics – The wargaming working group is responsible for creating the game mechanics and the rules of the wargame. This comprises the following aspects:

- **Assigned Roles, Goals and Victory Conditions** – In order to provide the players of the wargame with a firm framework for their decision-making, it is necessary to provide them with clearly stated goals in due time.
- **Available Resources** – Wargames often require a variety of assets and resources that are used in the course of the game. The participants must understand how to use them and what effects they have.[6]
- **Duration of the Wargame** – The more detailed a wargame is, the longer it will take to play. The timespan may range from a few minutes to several days. For certain reasons, such as the simulation of pressure to act or existing constraints, time limits can be implemented. Repeated playtesting of the game prototype in the further development process will help to determine the *optimum number and length of game turns*. Depending on the wargame, the turn length may vary considerably (in a strategic wargame, for instance, one turn can represent an entire year, which would not make sense in a tactical wargame).
- **Decisions[7] –** Any amount of leeway for players to take decisions must be clearly defined. This may include simple things such as moving a single unit or complex issues such as an operational manoeuvre scheme. The players should have to make no more – and no fewer – decisions than *necessary* to achieve the objectives. *Turn sheets* are a useful reference for the players, indicating the number and type of decisions they are allowed to make during one game turn and how these decisions are to be implemented. In order to gain insights, it is vital that players are prompted to prioritise their courses of action by the wargame mechanics.
- **Evaluation of Player Turns (Adjudication)** – Decisions on the consequences of a player's turn can be made in different ways. There is no ideal solution – the choice of adjudication method may depend on factors such as time, players, wargame objectives and the type of data to be generated. The more adjudication is guided by rigid and formal rules, the more extensive the playtesting of the game prototype will have to be. For most wargames, a mixture of several approaches is recommendable:

- **Expert Assessment –** Experts decide about the consequences of a player's turn
- **Consensual Assessment** – The parti cipants agree on the consequences of a player's turn
- **Analytical Assessment** – Tables, algo rithms or simulations are used to determi ne the consequences of a player's turn
- **Rule-Based Assessment** – Formal if-then conditions are used to determine the consequences of a player's turn

- **Feedback Mechanisms** – An essential part of any wargame are mechanisms that provide players with feedback on their actions. The methodology and *feedback parameters* are determined during the development phase. Feedback must be communicated in a clear and comprehensible manner.

d. Deciding on the Scenario and Game Components – The scenario provides the context and background story for the wargame and is determined by the wargaming working group. It typically contains information on the time and location(s), narratives regarding the current situation and key factors influenced by the different parties represented by the players. For many scenarios, the use of *vignettes* is common practice. While the scenario provides the broader storyline, vignettes are individual, selected *parts of this storyline*.

The amount of information available to the players must be sufficient for them to make reasonable decisions without distracting them from the actual purpose of the wargame by providing too many details.[8] However, depending on the overall problem to be solved, an information overload can also be part of the game mechanics.

In computer-based wargames, scenarios and game components are embedded in a simulation and stored in the *simulation system database*. The functionality of the simulation system needs to be ensured by repeated tests as it will be almost impossible to make any spontaneous adjustments during the execution phase.

e. Prototype Game Components – Before the wargame can be playtested, it is necessary to create its components and make them compatible with each other. A starting point may be a commercial-off-the-shelf wargame (COTS wargame), which can be purchased on the market and adapted to one's aim with the help of experts. In board wargames, the game components include playing cards, game boards, game pieces, adjudication tools and turn sheets. In computer-based wargames, these may be visualisation and simulation tools. At this point, the design of the individual game components does not have to be final, as experience has shown that usually a number of adaptations will become necessary during the development phase.

3.2.2 Playtesting the Prototype

Enough time, personnel and material must be allocated for playtesting the game design. In complex wargames, the individual parts, such as vignettes, can be tested separately, but there should be *at least two extensive test runs* involving all elements of the wargame. The following components need to be tested:

a. Products with Geospatial Data – Topographic maps and the game board must include all information needed for the execution of the wargame. Furthermore, the design must be checked as to its comprehensibility and functionality: A common problem are *oversized game boards*, as they make it difficult for players to focus on what is essential.[9] The game board should be easily accessible to all players and facilitators and ideally also include a legend.

b. Game Components – For both manual and digital wargames, the game components designed for the prototype must be adapted, refined and tested. This includes, but is not limited to, playing cards, game pieces, adjudication tools, instructions and turn sheets. The aim is to keep all game components *simple* and *comprehensible*. If there is a design working group, it should be tasked to design the game components, since a professional-looking, easy-to-understand game will establish greater credibility with everyone involved.

c. Game Mechanics – All wargame mechanics must be checked for their functionality. The set of game rules, for instance, contains all options for players' moves. Also, the rules describe how the consequences of the players' actions are to be assessed and how this is represented in the game. In order to improve the game flow, it is recommendable to have *streamlined processes* allowing for simplifications of reality.[10] If a high level of complexity is required, it is necessary to include methodology experts as an 'interface' between the players and the game mechanics. They will 'trans-

late' the players' intended actions and decisions into a format that complies with the game mechanics.

d. Timing – The overall timing depends on a range of factors including preparation/introduction times, the length of a game turn, the time allocated for making decisions and evaluating the players' turns as well as other elements of the game mechanics. Depending on the wargame and its adjudication procedures, the players may have idle time, which should be used for other activities such as discussion rounds.

e. Data Collection and Analysis Plan (DCAP) – The analysis working group also participates in the test runs, because the DCAP must be tested to ensure that the analysts are able to collect or generate the required data using the selected analysis methods. The analysis working group may find that the wargame generates *not enough or the wrong type of data* or that there are not enough qualified analysts/technical tools to collect the data. In such cases, adjustments must be made to the DCAP or to the wargame prototype itself.

f. Venue – Depending on the wargame, the positioning of the players may have an influence on the course of the game (e.g. if two (teams of) players are not allowed to witness each other's discussions and decisions). This influence must be analysed in view of the overall problem addressed by the wargame. In many cases there are requirements providing that the different parties be *kept separate* for parts of the game. In other situations, it might be necessary to have them all together in one room.

g. IT and Communication – If digital tools are part of the wargame, they must also be tested. This may refer to aspects such as audio-visual equipment, network support, knowledge management, communication means, simulation support, and workplace management. Even if the wargame does not include any digital elements, it is important that the participants can communicate effectively with each other. In addition, the possibility of conducting the wargame in a *hybrid or fully distributed* manner should be examined in order to determine whether participants might be able to join in remotely.

3.2.3 Refining the Prototype

During the different test runs, the testers may notice that individual components of the wargame do not work or do not contribute to achieving the game's aim. Such issues must be documented so that any adjustments can be checked for effectiveness in further test runs. To complete the final product, the above-mentioned elements must be adapted continuously. If the DCAP

does not generate the required data, it is necessary to consult with the sponsor at an early stage.

3.2.4 Interim Meeting

The interim meeting will serve to ensure that each person involved in the execution of the game has understood their role and tasks. Individual parts of the main event will be presented, coordinated and validated. The meeting will be held by the wargaming working group.

3.3. The Execution Phase

The execution phase comprises all of the following: *establishing the framework conditions, training the players prior to the wargame's execution, preparing the personnel who will run the wargame, the execution of the wargame itself* and *the documentation of its results*. Depending on the complexity and type of the respective wargame, these aspects may vary.

3.3.1 Preparing the Personnel

Even simple and small-scale wargames require a phase of preparatory training so that the participants can familiarise themselves with the game mechanics and rules. For this purpose, it can be helpful to provide preparatory information and/or online seminars/self-learning material prior to the game session. However, this cannot replace a *detailed briefing*. Thus, enough training time must be allocated for this step.

a. Players

Having the players understand the objectives of the wargame and their own roles/tasks is crucial for a successful execution of the game. In fact, an *adequate preparation* of the players depends entirely on their understanding of the aforementioned points. Moreover, it is important to explain the framework (scenario or 'story') behind the wargame's current situation.

The players need to understand how *their roles and tasks* fit into this story. Generic scenarios must be described in a *realistic and credible* manner, and the players must be acquainted with the basic game mechanics. Particularly in the case of complex games, it is not necessary to explain every subtlety in advance. Instead, it is recommendable to give players the opportunity to get to know the details in a dry run or tutorial.

Prior to playing the game, it is important to explain the *rules of communication and relationships*. Players must know how to ask questions and how to interact with other participants when working on their tasks. They need to understand how to get access to reference documents, background material and information. Explanations must be given on how to use the available means of communication and digital infrastructure and on the rules for processing and archiving information.

Time constraints such as the duration of turns, meetings, planning times, breaks, etc. must also be described. Particularly in the case of complex wargames, it may happen that the players, who may have other obligations to attend to, cannot be fully briefed on the game mechanics neither in advance nor during the game session.[11] In such cases, the wargaming working group must ensure that the players' decisions are translated into a format that can be processed by the game mechanics.

b. Personnel Running the Wargame

Facilitators and adjudicators also need preparatory training, which, in contrast to the players' training, is more focused on the game mechanics, the schedule and the rules of communication. Of course, they also need to have a basic understanding of the scenario. *Experience, flexibility and improvisation skills* are key for those running the game and especially for adjudicators.

Complex game mechanics, in particular, may require a very thorough preparation of facilitators and adjudi-

cators as they must know how to handle complex rule issues and need to come up with possible solutions. In contrast to the players, those who run a wargame must have fully understood its rules. Personnel with gaming experience, for instance from playing pen and paper role-plays or commercial board games with complex rules in their leisure time, are often well prepared for complex wargames and will be able to quickly familiarise themselves with their responsibilities.

c. Analysts
Even if they are not directly engaged in the gameplay, the analysts involved in the execution of the wargame must be familiar with the essential elements of the respective scenario and the game mechanics. In particular, this includes a *comprehensive introduction to the DCAP*, including an introduction to the methods used for data collection and the forms of data storage.

3.3.2 Preparing the Material

When setting up the wargame, *sufficient time* should be allocated to deal with possible delays and eliminate potential sources of errors at an early stage. For tabletop wargames, too, this may take some time as all game components must first be sorted and/or set up. This phase also includes the establishment of the *administrative framework conditions*, *which has to be seen to by the management working group* (accommodation, transport arrangements, access regulations, help desk/event office, issue of material, provision of IT equipment, rooms, catering, etc.).

In the case of games that rely heavily on IT, it is especially important to test all equipment in advance and allocate sufficient time for the installation of the systems.

3.3.3 Opening Event

An *icebreaker* or similar event can help all participants to get to know each other and thus contribute to improving cooperation and communication not only among the players but also between the players and the facilitators and adjudicators. Holding an opening event is optional.

3.3.4 Dry Run

A simplified 'warm-up' turn should be an integral part of the overall process. It should be conducted prior to the actual game session with all participants, including the director and the organisation personnel. Its purpose is to introduce the game structure and mechanics to everyone. This provides an opportunity to solve comprehension problems, address any rule-based issues, explain the adjudication procedures and answer any remaining questions regarding the assigned roles and responsibilities. For the personnel running the wargame, this is a good opportunity to eliminate any obstacles in the gameplay and the observation/analysis process.

3.3.5 Coordinating the Game Session

In order for the wargame to run smoothly, the *coordination of the game session must be expertly managed*. The complexity depends on the scope of the wargame. Nevertheless, even in the case of (apparently) simple wargames, certain coordination measures must be implemented.

a. Head of the Wargaming Working Group (Wargame Director) – Responsible for the overall process; he/she should *not perform any other functions* (e.g. adjudicator).[12] In order to maintain an overview in complex wargames, the director may need to appoint a person responsible for ensuring that the game runs on schedule.

b. Supporting Personnel – They monitor the application of the game mechanics and are on standby should the players have questions regarding the game structure. They *must not give any content-related advice, i.e. try to intervene in the game*, even if they wish to protect players from making a wrong decision.[13] In contrast to errors resulting from an incorrect application of the game mechanics, errors of the players regarding their chosen course of action are part of the wargame and will contribute to achieving the envisaged objectives. If players make disastrous decisions due to an obvious misinterpretation of the game mechanics, a facilitator should consider providing some explanation and clarification.

c. Adjudicators – Decisions on the evaluation of player turns have to be *made quickly and consistently and must be communicated transparently* in order to ensure a successful conduct of the game, give players confidence of action and increase their confidence in the game mechanics and the results of the wargame. This, however, does not apply if delays, a certain de-

gree of intransparency or unequal treatment are an intentional part of the wargame. In case of complicated decisions, the adjudicators should work with the director to find a solution.

d. Analysts – All analysis work should be performed *in the background* and without interfering with the gameplay, except when interaction with the players is intended. A *constant exchange with the director* ensures that the data collection can be realised as planned.

3.3.6 Review of Results and Feedback

Wargames are not an end in themselves but serve to achieve certain objectives. The evaluation of results and the generation of *feedback* are indispensable – both in educational and analytical wargames. The following measures must be planned and carried out even for smaller wargames (in an adapted form):

a. After-Action Review – The after-action review varies depending on the wargame and can range from a short hot wash up to a long closing event. It should cover the following aspects in an appropriate form:

- key findings regarding the purpose of the wargame, including *lessons identified and learned* with regard to the content, game mechanics and structure
- need for further analysis and/or training
- possibilities of transferring concrete results of the game to reality


Feedback

b. Concluding Survey – A concluding survey allows for the collection of data for the DCAP and is used to gather feedback. It may vary in length depending on the wargame and the need for information.

3.4. The Analysis Phase

Regardless of the type and scope of the wargame, the post-game analysis phase is as important as the game itself. Wargaming is not an end in itself. It requires *careful following-up* in order to solve the sponsor's problem, verify the achievement of the training objective and identify further need for research, analysis and training as well as potential for improvement with regard to future wargames. To get the best benefit from the wargame and its analysis, it is necessary to document and disseminate the results.

Post-Game Analysis Formats

Following up on the Results

3.4.1 Post-Game Analysis Formats

Depending on the wargame, the analysis requirements and the amount of data collected may vary. This chapter provides ideas for possible analysis formats. However, no assessment of these formats is given and the list is by no means exhaustive. In addition to the hot wash up described above, the following formats might also be an option:

a. After-Action Review (AAR) – If required, the wargaming working group can develop a *schedule and formal structure* to evaluate the wargame. Supporting measures such as the involvement of experts make it necessary to plan sufficient time for questions and discussions.

b. Short Report – In cases where it is planned to develop a comprehensive and more formal final report, it is recommended to write a short report soon after the wargame has been conducted to summarise its results (regarding content and execution) in a concise form. Since readers of short reports tend to avoid consulting later products, the report should include a note that it provides only first impressions and is not an actual summary. In case of small-scale wargames, however, a short report may be sufficient for an evaluation of the results.

c. Formal Presentation of Results – Guided by the sponsor's interest in the results, key findings of the wargame will be summarised in a meeting between the sponsor and the wargaming working group. The presentation may coincide with the AAR or take the form of a stand-alone event for the final evaluation.

d. Internal Evaluation – Regardless of the sponsor's interest in the wargame's findings, and also in case of less complex wargames, the wargaming working group should *conduct an internal follow up on the execution of the wargame*. This should cover not only the improvement of game mechanics and rules but also the adaptation of the scenario, game structure, framework conditions and internal/external coordination (particularly with the sponsor).

e. Final Report – In some cases, a *formal final report* is required. It is prepared and coordinated by the wargaming working group. Depending on the sponsor and stakeholders involved, further formal coordination processes (e.g. official review/co-signing procedures) might become necessary. During the development of the report, these coordination measures must be planned for and transparently communicated, particularly if publication deadlines must be met. *Precautions must be taken in order to avoid* any attempts to exert influence on the final report during co-signing procedures; otherwise, this could lead to distorted results.

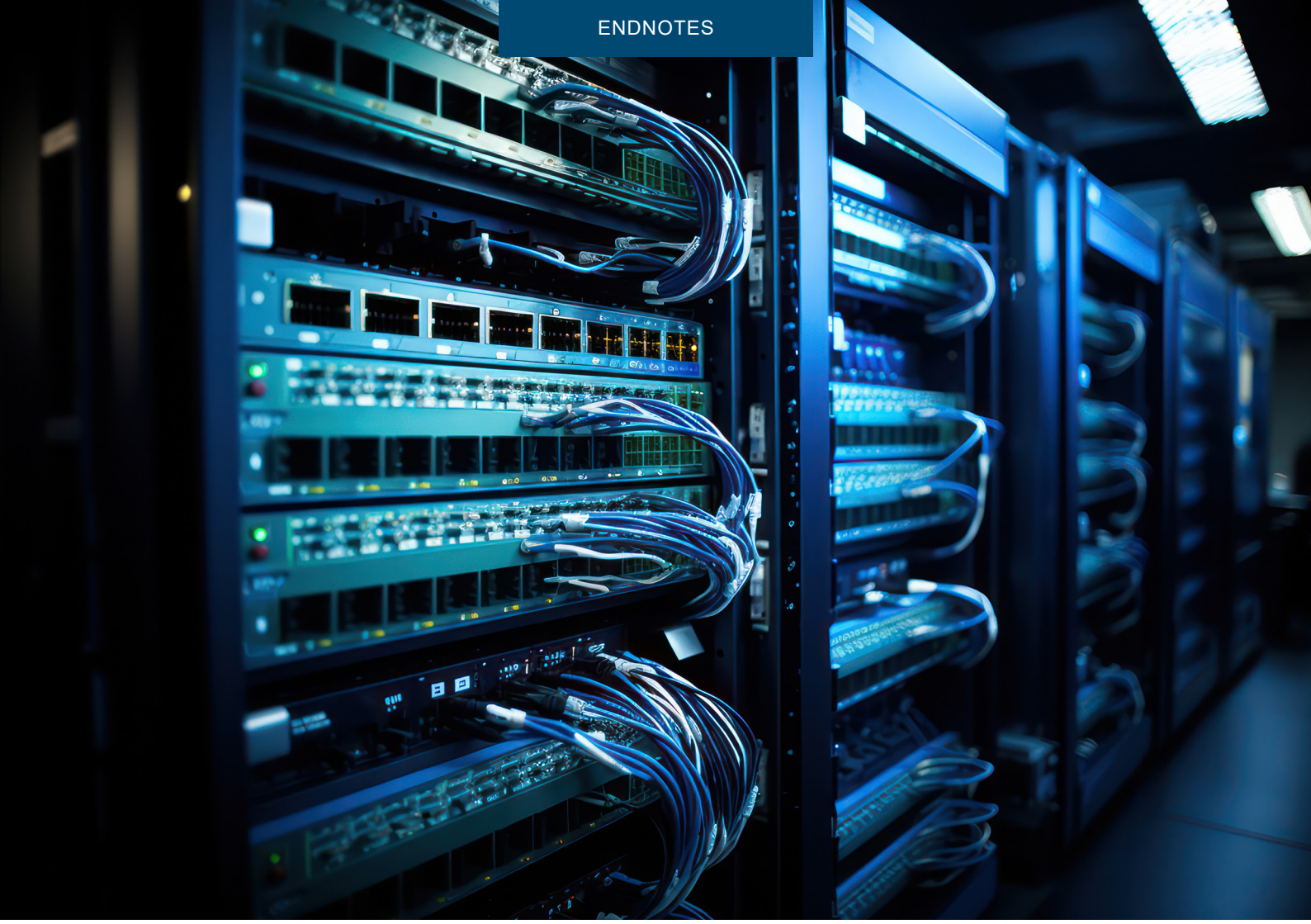
3.4.2 Following up on the Results

Products resulting from a wargame are not only important for decision makers but also serve as a source of experience for wargaming personnel. The accessibility of this information must be ensured in order to allow for follow-on tasks to be accomplished.

a. Information Management/Knowledge Management – Even small-scale wargames might generate extensive amounts of data and their use and storage must be consistently monitored. The head of the analysis working group is responsible for the collection of data during the execution of the wargame and ensures that information is processed and stored in accordance with its respective classification.

Unless explicitly stated otherwise by the sponsor or prevented by technical constraints, findings from the wargame should be processed and made available in an appropriate manner in order to maximise the benefit gained and to facilitate future improvements (need-to-share principle). It is important to avoid the impression that reading about the findings can be a substitute for the execution of a wargame.

b. Generation of Follow-on Tasks – The execution of a wargame will usually lead to follow-on tasks. These may be related to the execution of the wargame (e.g. concerning adjustments in the scenario, changes in the game mechanics, a possible optimisation of the DCAP, etc.) or to its contents (such tasks may involve the identification of further need for training and the planning of corresponding measures, impulses for strategy/capability development, the inclusion of new topics or the development new questions based on the answer to the initial problem).



ENDNOTES

Chapter 3

1 Cf., e.g., NATO (2023): Wargaming Handbook; UK Ministry of Defence (2017): Wargaming Handbook; Center for Army Lessons Learned (2020): How to Master Wargaming.

2 However, wargaming may turn out to be an unsuitable approach after all, which means other methods will have to be used instead.

3 Educational wargames have a training purpose, whereas analytical wargames seek to answer analytical questions.

4 NATO's Wargaming Handbook recommends limiting the number of objectives to three or four.

5 This includes the sponsor's need for information but also data on the game mechanics, which can be used to identify possible adaptation requirements.

6 Depending on the game mechanics, the terms 'assets' and 'resources' can refer to a wide variety of things such as money, raw materials, weapon systems but also influence, action points, energy, artificial currencies, etc.

7 In this context, the term 'decisions' also includes the actions associated with them or, respectively, the players' inputs during the game.

8 If in line with the game mechanics, the employment of a dynamic information system (responsive request for information) might be a good solution: The players are given more detailed information only upon request.

9 Depending on the sponsor's problem, this may be a desired effect. Therefore, it is essential to adapt the size of the game board and maps to the purpose of the game.

10 For example, using a single currency, neglecting aspects such as the weather, simplifying the effects of weapon systems (e.g. attributing the same range and weapon effects to all tanks used in the game).

11 This holds true particularly for VIP wargames with high-ranking civilian and military decision-makers.

12 In less complex wargames, there are few organisational tasks to fulfil, so that the director is only responsible for facilitating the game.

13 In some wargames, the rules may allow facilitators to provide content-related advice to the players. In such cases, this must be announced and explained prior to the start of the game session.

ANNEX
Glossary of Terms

Adjudication – The term essentially means judgment, decision or dispute settlement, but above all it refers to the evaluation of players' actions during a wargame.

Adjudication tools – These are instruments for assessing the outcomes of player turns in wargames, such as calculation aids or guides to the interpretation of the rules.

Affective learning – This is a concept in learning theory developed by Benjamin Bloom that refers to the part of the learning process concerning emotions, values, attitudes and feelings. The concept describes how, at the emotional level, people react to information, how feelings influence their learning process, and how they absorb and process new information going through these emotional experiences. Wargames can contribute to affective learning.

After action review – This is what the final post-wargame meeting is called. It aims to summarise findings and identify further analysis/training needs; it also serves to discuss opportunities for applying the wargame's results to other contexts.

Analysis phase – VThis is the fourth and final phase in the wargaming process, where data collected during the execution phase is analysed and results are processed.

Analytical wargaming – This refers to a form of wargaming that aims to answer specific questions and helps finding solutions in complex and uncertain contexts. This form of wargaming is primarily used to generate knowledge and support the decision-making process regarding, for example, plans, concepts, strategies and courses of action.

Closed simulations – These are simulations where the decision-making process is fully automated, i.e. determined by algorithms.

Closed-loop simulations – This is another way of referring to closed simulations.

Cognitive learning – This is a concept in learning theory developed by Benjamin Bloom that refers to the part of the learning process that concerns the understanding and processing of information. Cognitive learning refers to the knowledge that people acquire and how they interpret and apply it. Wargames can contribute to cognitive learning in a positive way.

Commercial off-the-shelf (COTS) wargames – These are commercially available wargames that can be purchased on the market.

Complex agent-based simulations – These are simulations where each element is handled by agents.

Computer-assisted simulations – These are simulations that use algorithms to analyse specific questions and provide results.

Computer-assisted wargames – This refers to wargames that use IT systems, among other things, for aspects such as adjudication or visualisation.

Concept Development and Experimentation (CD&E) – Concept Development and Experimentation examines new conceptual ideas for operational benefits and innovation potential for the Bundeswehr using an iterative process of alternating concept development and experimental review. The Bundeswehr describes CD&E as a *method applied for its future and further development* that may also include analytical wargaming.

Courses of Action (COA) wargaming – This is one way of using analytical wargaming. It offers players the opportunity to review different options for action and supports them in selecting the most appropriate one.

Data Collection and Analysis Plan (DCAP) – This plan specifies the framework for collecting data and analysing information to evaluate a wargame's purpose and objectives.

Design brief – This is a presentation towards the end of a wargame's planning phase in which the wargaming working group informs the sponsor of the available information and its significance for the scope of the project. The design brief results in the preparation of an initial design concept, which serves as the basis for developing the game.

Development phase – This is the second phase in the wargaming process. It includes developing a prototype and continuously adapting it until it is finalised into the finished product.

(Wargame) Director – He/she leads the wargaming working group, is responsible for the overall project, supervises the analysis process and involves other stakeholders in order to develop, execute and evaluate the wargame.

Educational wargaming – This is a form of wargaming that imparts knowledge, promotes understanding and enables participants to experience first-hand, among other things, the processes underlying command and control and decision-making. But above all, educational wargaming is used for *education* and *training* purposes, having a positive effect on *decision-making and leadership qualities*.

Execution phase – This is the third phase in the wargaming process, during which the final version of the wargame is executed with the players.

Game mechanics – These include all processes and rules governing a wargame.

Game theory – This theory provides mathematical analyses of strategic situations where decisions must be taken and the outcomes depend on the decisions of several agents. These agents and their actions are simulated by mathematical models.

Gamification – This refers to the use of playful elements in a non-playful context.

High-impact low-probability events – If these rare events do occur, they have a major impact on a given issue.

Human-in-the-loop simulation – This means open simulations.

Kriegsspiel – This is the historical term for wargames that were invented in Prussia at the beginning of the 19th century. Until the end of World War II, wargames were generally referred to as *Kriegsspiel* in the German-speaking world.

Mental resilience – For the purposes of this handbook, this term refers to the ability to withstand psychological stress and other challenges. The affective and cognitive learning outcomes experienced by participants when wargaming are intended to increase their mental resilience.

Milestones – These are major sub-steps in the timeline of the wargaming process.

Military exercise – For the purposes of this handbook, this term refers to the repetitive training of actions involving forces, which primarily aims at consolidating routines by testing the participants' understanding of learning and training content. Nevertheless, there are also innovative approaches that serve to try out new plans, tactics and strategies.

Models – These are representations of objects, systems or processes that have been abstracted and simplified in specific aspects according to specific requirements.

Open simulations – In these simulations, important decisions during the simulation process are made by humans.

Operations Research (OR) – Operations Research means developing and using quantitative and qualitative models and methods to support decision-making. It is characterised by combining applied mathematics, economics and computer science to support decision-making processes when preparing, making and carrying out decisions and when reviewing the implementation of these decisions. The Bundeswehr describes OR as a *method applied for its future and further development* that may also include analytical wargaming.

Participants – This includes all actors present during the execution of a wargame – players, personnel running the wargame and guests.

Personnel running the wargame – These are members of the various working groups who are involved in conducting a wargame.

Planning phase – This is the first phase in the wargaming process, where the wargame's scope is defined. Also, it serves to identify the problem that is to be addressed by the wargame, to allocate personnel and to develop an initial design concept based on research.

Planspiel – This is the historical term for various planning game methods employed to generate knowledge and support decision-making that was used in the Bundeswehr until the 1990s.

Players – These are people who participate in a wargame representing either friendly, enemy or third-party forces and who influence the game in accordance with their roles.

Safe-to-fail environment – In wargaming, this term refers to a framework which stipulates that decisions made within this framework have no direct impact on the outside world. This means that players do not have to fear negative consequences of their actions within this environment, promoting, among other things, their willingness to take decisions.

Scoping event – In this event, which takes place during a wargame's planning phase, the sponsor and the wargaming personnel determine the framework for the wargame to be developed.

Series – These are several wargames that are related to each other and during which the participants examine individual aspects of a setting.

Simulation games – These are simulations in which at least two parties characterised by human behaviour interact in a safe-to-fail environment.

Simulation systems – This refers to a combination of complementary, computer-assisted simulations that are run simultaneously.

Sponsor – This refers to the person, group of persons or organisation under whose authority a wargame is developed and executed. In most cases, the sponsor is also responsible for financing the wargame.

Synthetic experience – In wargaming, the term refers to experiences gained in the safe-to-fail environment of a wargame and resulting in an increase in knowledge. To a limited extent, this concept can be applied to exercises and combat situations, too.

Turn sheets – These are instructions explaining to players the number and type of decisions they are allowed to make during one game turn and how these decisions are to be implemented.

Vignettes – These are selected individual episodes of an overarching wargame scenario.

Wargaming – This is a method that uses scenario-based models to represent conflict or competition in a safe-to-fail environment, in which events, human decisions and resulting outcomes mutually influence one another. For the purposes of this handbook, the term ‘conflict’ is used in a broad sense. It may not only include armed conflicts and competitive behaviour, but may also relate to contradictory and non-cooperative approaches to finding solutions. The use of wargaming in a specific case is called a ‘wargame’.

ANNEX
Bibliography

On the following pages, we have summarised the literature relevant to this handbook. A comprehensive list of wargaming literature is available to Bundeswehr personnel at the *Link and Learn* platform once they have registered for the *Wargaming* group.

Link to register for the group:
https://linkandlearn.auf.bundeswehr.de/group/2046

Link to the literature list:
https://linkandlearn.auf.bundeswehr.de/node/80418

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ANNEX
List of Abbreviations

AAR – After Action Review

AI – Artificial Intelligence

CD&E – Concept Development and Experimentation

COA – Course of Action

COPD – Comprehensive Operational Planning Directive

COTS – Commercial off the Shelf

DCAP – Data Collection and Analysis Plan

HyDRA – Hybrid Warfare Defense, Resilience & Awareness Game

IT – Information Technology

NATO – North Atlantic Treaty Organization

OR – Operations Research

WATU – Royal Navy Western Approaches Tactical Unit

ANNEX
List of Images / Imprint

Figure 1, p. 8: cf. Nitzl/Landsiedel/Borghoff (2023): Lernen von den Erfahrungen militärischer Wargames; Caffrey (2019): On Wargaming, p. 260 ff.

Figure 2, p. 9: cf. Nitzl/Landsiedel/Borghoff (2023): Lernen von den Erfahrungen militärischer Wargames; Caffrey (2019): On Wargaming, p. 272 ff.

Images:

Gelhausen, Christian: p. 6, p. 9, p. 11 (left & centre), p. 12 (centre & right), p. 15, p. 20/21, p. 24, p. 25, p. 31

Jankowski, Norman: p. 5

Weinrich, Anne: p. 10 (centre)

Hähnel, Susanne: p. 10 (left)

Schindler, Andreas: p. 10 (right)

Oed, Günther: p. 11 (right)

Kuhn, Tobias Uwe: p. 12 (left)

Ritter, Katharina: p. 16, p. 33 (centre)

Kellermann, Marie: p. 32, p.34

Adobe Stock:
PHdj: p. 14
Itina, Olga: p. 17 (left)
Joe P: p. 17 (centre)
Chaosamran_Studio: p. 17 (right)
Let's-Get-Creative: p. 28
AA+W: p. 33 (left)
Chorniy, Vlad: p. 33 (right)
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