

TONNAGE WAR

1. Tonnage War is a card game for two players simulating the great North Atlantic convoy battles of 1940-43. One player controls U-boats attacking a convoy, while the other controls the convoy's anti-submarine escorts.
2. Card Decks. Each player in Tonnage War uses two card decks: an Order Of Battle ("OOB") deck, which contains the players units and blank cards, and a tactical deck, which contain cards permitting the player to take certain actions.
 - 2.1. The U-boat player's OOB deck contains various types of U-boats while his tactical deck contains Contact, U-boat Attack, Evade and various special cards.
 - 2.2. The Escort player's OOB deck contains ship and air escort units while his tactical deck contains Evasive Routing, Escort Attack, Air Patrol and HF/DF cards.
3. Preparing for Play. First, players agree on the scenario to be played. Second, referring to the scenario description, the players make up OOB and tactical decks. Third, each player deals 13 cards from his tactical deck and 10 cards from his OOB deck.
4. Game Length. Play of a single game consists of 4 rounds. Each round continues until the players have played or discarded all of the cards in their tactical decks. (A round can also end with the mutual agreement of the players, even if cards remain to be played or discarded.) At the end of a round, the players deal another 13 cards from their tactical decks and another 10 cards from their OOB deck. Tactical cards are never reused, although OOB cards may be. Once a game is complete, the players switch roles and play again. By comparing their scores, the players determine which of them has won the game.
5. Turns. Players alternate turns within a round. During a turn, a player plays or discards 1 card from his tactical deck. The player may also conduct attacks, as described below.
6. Object of the Game. For the U-boat player, the object of the game is to get points by sinking ships in the convoy, damaging or sinking escort ships, and damaging or shooting down aircraft – all while avoiding U-boat losses. For the escort player, the game is won by preserving the convoy and his forces and by sinking or damaging U-boats.
7. Card Play. The game consists of a series of actions taken by either player playing cards from their tactical card hands.
 - 7.1. The U-boat player plays first in each round, with actions then alternating until both players' tactical hands are exhausted.
 - 7.2. The U-boat player can take any 1 of the following actions:
 - 7.2.1. Discard a tactical card face down.
 - 7.2.2. Play a U-boat card face-down and a contact card face-up.
 - 7.2.3. If there is a contact card in effect, play either a blank card or a U-boat card face-down and a U-boat attack card face-up.
 - 7.2.4. If the escort player played an escort attack card HF/DF or air patrol card on a U-boat in the immediately prior turn, play an evade card face-up.
 - 7.2.5. If the escort player played an air patrol card on a U-boat in the immediately prior turn, play a flak card face-up.
 - 7.2.6. If the escort player played a HF/DF or escort attack card on a U-boat, play a U-boat attack card face-up.
 - 7.2.7. If the escort player played an evasive routing card in his immediately preceding turn, play a B-dienst card face-up negating the evasive routing card.
 - 7.3. The escort player can take any 1 of the following actions.
 - 7.3.1. Discard a tactical card face down.
 - 7.3.2. Play a combination of 1 to 3 air escort or blank cards face-down and an air patrol card face-up on 1 card pulled at random from the U-boat player's OOB deck.
 - 7.3.3. If there is a contact card in effect, play a combination of 1 to 3 air escort cards or blank cards face-down and an air patrol card face-up on the contact card.
 - 7.3.4. If there is a contact card in effect, play an evasive routing card on the contact card.
 - 7.3.5. If there is a contact card in effect, play a combination of 1 to 3 surface escort cards or blank cards face-down and a HF/DF card face-up on the contact card.
 - 7.3.6. If the U-boat player played a U-boat attack card in his immediately preceding turn, play 1 to 3 escort or blank cards face-down and an escort attack card face-up.

- 7.3.7. If in the immediately preceding escort player turn the escort player had detected and attacked a U-boat with an escort attack card or a HF/DF card, play another card of the same type on the U-boat and escorts, and add additional surface escorts to the attack as permitted by the card.
- 7.3.8. If in the immediately preceding escort player turn the escort player had detected and attacked a U-boat with an air patrol card and the U-boat player had responded with a flak card, play another air patrol card on the U-boat and air escorts, and add additional air escorts to the attack as permitted by the card.
- 7.4. A contact card is "in effect" until:
 - 7.4.1. The escort player plays an evasive routing card without the U-boat player immediately countering with a B-dienst card; or
 - 7.4.2. The U-boat card played with the contact card has an evade card played for it or is detected and attacked.
- 7.5. Contact cards (and their accompanying U-boats) are the only cards that remain "in effect" from hand to hand.
- 8. **Combat.** Combat occurs under the following circumstances.
 - 8.1. **U-boat attacks.** A U-boat played with a U-boat attack card can roll to attack the convoy in the following circumstances:
 - 8.1.1. The escort player does not play an escort attack card on the U-boat player's attack card in the next turn. Resolve the attack as soon as the escort player declares an action other than playing an attack card.
 - 8.1.2. The escort player does play an attack card, the U-boat player does not respond with an evade card, and the U-boat is not detected. Resolve the attack as soon as the escort player fails to detect the U-boat.
 - 8.1.3. The U-boat player plays an attack card on an escort player's attack or HF/DF card. Note that in these circumstances, the U-boat can make only 1 attack. Resolve the attack as soon as the U-boat attack card is played.
 - 8.1.4. The U-boat player plays a flak card in response to an air patrol card. Resolve the flak attack and the air attack simultaneously, if the U-boat is detected.
 - 8.2. **Resolving the U-boat Attack – Against Convoys.** The U-boat player rolls 1D10 against the U-boat's attack value, modified as directed by the U-boat attack card. Depending on the attack card, the U-boat player may roll from 1 to 4 times. Each successful roll sinks a ship in the convoy. For surface escorts, hit numbers are halved, with fractions dropped and no attack card modifiers applied (unless a special card says otherwise). Roll only once for attacks against escorts.
 - 8.3. **Resolving the U-boat Attack – Against Escorts.** Check first to see if any escort detects the U-boat.
 - 8.3.1. If the U-boat is detected, it rolls 1 D20 to attack 1 attacking surface escort of its choice, requiring a 2 or less to hit.
 - 8.3.2. If the U-boat is not detected, it attacks 1 attacking surface escort of its choice with 1 D20 roll, rolling half or less of the normal hit number to hit.
 - 8.3.3. The U-boat is automatically detected by all attacking escorts immediately after it attacks.
 - 8.3.4. A damaged or sunk escort takes no part in further attacks against the U-boat.
 - 8.4. **Escort Unit Attacks.** Escort units attack U-boats under the following circumstances.
 - 8.4.1. The escort player plays an escort attack card or HF/DF card on a U-boat or blank card, and the U-boat player does not respond with an evade or U-boat attack card in the next turn. Resolve the attack as soon as the U-boat player declares an action other than playing an evade or U-boat attack card.
 - 8.4.2. The escort player plays an escort attack card or HF/DF card on a U-boat card and the U-boat player does respond with an evade or U-boat attack card. Resolve the attack as soon as the evade or U-boat attack card is played.
 - 8.4.3. The escort player plays an air patrol card on a U-boat or blank card, and the U-boat player does not respond with an evade or flak card in the next turn. Resolve the attack as soon as the U-boat player declares an action other than playing an evade or flak card.

- 8.4.4. The escort player plays an air patrol card on a U-boat card and the U-boat player does respond with an evade or flak card. Resolve the attack as soon as the evade or flak card is played.
- 8.5. Resolving the Escort Attack. The U-boat player rolls 1D20 against the U-boat's evasion value, as modified by the escort's detection modifier and any evade card modifier. If the U-boat is detected, the escort player rolls 1D20 against each escort's attack value: a roll equal to or less than the number damages the U-boat; a roll equal to or less than ½ of the number sinks the U-boat.
- 8.5.1. Where multiple escort units are involved in an attack, the U-boat player must roll separately to evade each escort.
- 8.5.2. If any escort detects the U-boat, all attack it.
- 8.5.3. A roll of 2 for a surface escort in the first attack on a U-boat sinks the U-boat (by gunfire) while a roll of 1 sinks the U-boat and damages the escort (by ramming).
- 8.5.4. A roll equal to or higher than the escort's depletion number means that the escort can no longer attack during the game – other than as described in 8.5.3.
- 8.6. Continuation Escort Attacks. Continuation attacks occur when escorts play additional escort attack, air patrol or HF/DF cards on the same U-boat, as described in 7.3.7 and 7.3.8. Air escorts cannot make continuation attacks unless the U-boat target responded to the immediately preceding attack with a flak card.
- 8.7. Damage. Any escort or U-boat that is damaged twice is sunk (or, for air escorts, shot down). Damaged escorts and U-boats may not attack or detect.
9. Cards Returned to OOB Hands. Cards are returned to a player's OOB hand in the following circumstances.
- 9.1. Any escort that attempts to detect a blank card is returned to the escort player's OOB hand *at the end of the U-boat turn following the detection attempt/immediately*.
- 9.2. Any escort that is part of an attacking group of escorts that fails to detect a U-boat is returned to the escort player's OOB hand *at the end of the U-boat turn following the detection attempt/immediately*.
- 9.3. *Any escort that participated in an attack is returned to the escort player's OOB hand at the end of the U-boat turn [following the turn of attack/immediately], unless it [participates in/the escort player wishes to have it available to conduct a] continuation attack.*
- 9.4. Any U-boat that is not detected despite having an HF/DF or air patrol card played on it is returned to the U-boat player's OOB hand.
10. Cards Returned to OOB Decks.
- 10.1. Escort cards are returned to the escort player's OOB deck (at the escort player's option) after failing in an initial attempt to detect a U-boat or after attacking a U-boat.
- 10.2. U-boat cards are returned to the U-boat player's OOB deck after being detected but unsuccessfully attacked, unless the escorts elect to continue attacking and succeed in detecting the U-boat again.
11. Cards Discarded from the OOB Decks.
- 11.1. *[Escorts that make continuation attacks are discarded from play permanently. [possible alternative to 9.3]]*
- 11.2. *[U-boats that are successfully detected in continuation attacks are removed from play permanently.][Use only if 11.1 is used]]*
- 11.3. Blanks played by the U-boat player are discarded from play as soon as they are revealed as blanks.
- 11.4. U-boats that attack are discarded from play immediately.
- 11.5. Any escort or U-boat that is damaged is discarded from play once all attacks against the escort or U-boat are over.
- 11.6. Destroyed escorts or U-boats are discarded from play immediately.
12. Winning. The U-boat player receives 1 point for each convoy ship sunk, one point for every escort damaged, and 2 points for every escort destroyed (shot down or sunk). The escort player receives 1 point for every U-boat with a novice or average crew damaged, 2 points for every U-boat with a novice or average crew sunk, 2 points for every U-boat with an ace crew damaged, and 4 points for every U-boat with an ace crew sunk. Players not do receive

points for damage to escorts. Players play a scenario once, then play again reversing roles. A player wins by scoring more points than his opponent as the U-boat player while also scoring more points in total for both games; any other result is a draw,

13. Special Cards. The following cards have special characteristics.

13.1. Special Contact Card. If the escort player is receiving support from carrier-based aircraft, this card permits the U-boat player to contact the carrier as if it were a convoy. Otherwise, the card functions as a normal contact card. Consult the scenario rules for the composition of the carrier's escorts. The carrier is attacked like an escort, except that multiple attacks can be made against the carrier if permitted by an attack card. A damaged carrier that is damaged again is sunk.

13.2. Support Group Card. If the escort player pulls this card from his OOB deck, he immediately pulls additional cards from the deck as directed by the support group card. He may discard blanks or escort cards equal to the number of cards pulled, so as to keep his OOB card total at 10.

13.3. U-Tanker. This is a special card that the U-boat player may have to insert in his OOB deck by scenario special rule. It represents the special support U-boats that the Germans had to employ to permit their boats to operate in the western reaches of the North Atlantic. The Allied player receives 3 victory points for damaging a U-Tanker and 6 victory points for sinking it.

14. Special Rules.

14.1. Storms. For scenarios set in stormy weather, add 3 to all basic evasion values and subtract 2 from all attack values.

14.2. Bad Sonar Conditions. For scenarios set in bad sonar conditions, add 3 to all surface escort evasion modifiers after the first attack.

14.3. Rescue Ships. Any U-boat attack rolling a 1 in a convoy attack sinks the convoy rescue ship. The escort player must immediately designate a surface escort in his OOB hand as a new rescue ship. This escort cannot engage in detection attempts or attacks. It is sunk on a 1 in any subsequent attack on the convoy (and the process is repeated). The effect of a sunk rescue ship persists from round to round.

14.4. Shooting Contact Boats. A U-boat played with the contact card for a convoy or support group may attack that convoy or support group by having a U-boat attack card played on it. Once the attack card is played, the contact card ceases to be "in effect."

INTRODUCTORY SCENARIO – Convoy Halifax 228

U-boats

OOB deck: 18 boats, 22 blanks

Tactical deck: 13 contact, 2 U-boat attack x4, 2 U-boat attack x3, 3 U-boat attack x2, 3 U-boat attack x1, 3 U-boat attack x1 +4, 1 evade +8, 2 evade +6, 3 evade +4, 7 evade +2, 8 B-dienst, 5 flak

Escorts

OOB deck: 9 escorts, 11 blanks

Tactical deck: 13 evasive routing, 2 escort attack (3), 4 escort attack (2), 7 escort attack (1), 2 HF/DF (3), 4 HF/DF (2), 7 HF/DF (1), 2 air patrol (3), 4 air patrol (2), 7 air patrol (1)

CARD DECK VALUES – Spring 1943

ESCORT

| Any ♥ | Evasive Routing | |
|---------------|-----------------|-------------------------|
| A, K ♠ | Attack | Up to 3 Escorts |
| Q, J, 10, 9 ♠ | Attack | Up to 2 Escorts |
| 2-8 ♠ | Attack | 1 Escort Only |
| A, K ♣ | HF/DF | Up to 3 Surface Escorts |
| Q, J, 10, 9 ♣ | HF/DF | Up to 2 Surface Escorts |
| 2-8 ♣ | HF/DF | 1 Surface Escort |
| A, K ♦ | Air Patrol | Up to 3 Air Escorts |
| Q, J, 10, 9 ♦ | Air Patrol | Up to 2 Air Escorts |
| 2-8 ♦ | Air Patrol | 1 Air Escort |

U-BOAT

| | | |
|---------------------------|-----------------|-------------------------------------|
| A, K ♥ | Special Contact | Contact carrier or convoy |
| 2-Q ♥ | Contact | Contact convoy |
| A, K ♠ | Attack | Beam attack, 4 rolls |
| Q ♠ | Attack | Bow attack, 3 rolls |
| J ♠ | Attack | Bow attack, 3 rolls, FAT, +2 |
| 10, 9, 8 ♠ | Attack | Quarter attack, 2 rolls |
| 7, 6, 5 ♠ | Attack | Stern attack, 1 roll |
| 4, 3, 2 ♠ | Attack | Straggler attack, 1 roll at +4 |
| A ♣ | Evade | +8 modifier |
| K, Q ♣ | Evade | +6 modifier |
| J, 10, 9 ♣ | Evade | +4 modifier |
| 2-8 ♣ | Evade | +2 modifier |
| A, K, Q, J, 10, 9, 8, 7 ♦ | B-dienst | Nullifies all evasive routing cards |
| 6 ♦ | Flak | +2 modifier |
| 5, 4 ♦ | Flak | +1 modifier |
| 3, 2 ♦ | Flak | 0 modifier |

Unit Values (Basic)

| U-Boats | Attack | Evade |
|--------------------------------------|--------|--------|
| Novice (N) | 6 | 8 |
| Regular (R) | 10 | 10 |
| Ace (A) | 14 | 12 |
| Air Escorts | Detect | Attack |
| Novice (AN) | -4 | 2 |
| Regular (AR) | -6 | 4 |
| Ace (AA) | -8 | 6 |
| Surface Escorts | Detect | Attack |
| Novice (SN) (+3 to HF/DF detection) | 0 | 2 |
| Regular (SR) (+2 to HF/DF detection) | -2 | 4 |
| Ace (SA) (+1 to HF/DF detection) | -4 | 5 |

Designer's Notes

In World War II, German submarines – U-boats – and Allied anti-submarine forces fought a series of great naval battles in the North Atlantic, battles unlike any fought before. These battles were fought in slow motion over days instead of hours. They were fought by very different opponents with different capabilities and different goals. They seesawed back and forth as they were fought, with the hunters becoming the hunted in a heartbeat.

They were fought under staggeringly bad conditions. In the past, darkness and low visibility had usually made naval battles less likely. For the submarine war in the North Atlantic, the Germans sought these conditions. That meant that the most active times for the submarine wars were the stormiest seasons of an inhospitable ocean: fall, winter and spring. The prospects for the crew of a torpedoed ship in the wintry North Atlantic were grim. But then, they were not grimmer than the likely fate of a U-boat brought to bay by Allied escort forces. “Lost with all hands” was the common refrain when the escorts scored a kill.

The Campaign. The principal goal of Hitler's U-boat war was very simple. In 1940, Britain and the Commonwealth nations stood alone against Germany. Britain was an island, dependent on ships to feed her people and stoke her industries. Sink the ships, and the island would die. The war in the Atlantic was a tonnage war: a war by the Germans against Allied merchant ship tonnage, and a war by the Allies to preserve it.

The Germans had, in a halting way, tried a similar strategy in the First World War. While it had ultimately been defeated by Allied countermeasures, and had played a major role in bringing the United States into the war, none of this was to stop Adolph Hitler from trying the same thing again. This time there would be no halfway measures, no nice regard for the rights of neutrals, and little compunction about the deaths of merchant seamen and the passengers in their charge. The Germans would fight as ruthless a submarine war as their resources would allow.

The start of the campaign saw both the Germans and the British struggling to build up their forces. Submarines had been forbidden to Germany after her defeat in World War I; only in 1934 had she begun to build again. By the start of the Second World War the Germans had less than 60 submarines in commission – a clearly inadequate number to cripple a British merchant marine of more than 4,000 ships. But the British also had building to do, as the Royal Navy had spent scarce inter-war defense funds on larger ships and not on building the massive numbers of small escort vessels needed to safeguard those 4,000 merchantmen.

From the start of the war, the Germans sent their submarines out into the Atlantic in search of prey. The principal British response was to sail more and more of their merchant shipping in convoys – groups of ships sailing together from port to port. Convoys had been effective in combating the submarine threat World War I, and they were to be effective again in World War II. Concentrating shipping in this way lessened the odds of the U-boats finding them, and increased the effectiveness of the anti-submarine forces escorting them. So effective were convoys compared to ships sailing alone that gradually, as the war went on, more and more ships were sailed in convoys and fewer and fewer sailed individually.

While U-boats waged war in waters as far away as the Indian Ocean, the focus of their efforts was on the North Atlantic. It was there that the great stream of shipping between the New World and the Old traveled, and it was there that the U-boats could break the back of the Allied merchant marine. Further, the North Atlantic was close by the U-boat bases. Once the Germans had established U-boat bases in France, U-boats could travel to the North Atlantic either north or south around the British Isles. While U-boats could venture further afield than the North Atlantic, this required elaborate refueling plans and resulted in a dilution of strength.

To combat the U-boat menace, the British allocated more and more escort ships and anti-submarine aircraft at more and more bases. At first, there were large gaps in both the escort

protection and the air patrols directed at the U-boats – gaps that the Germans were quick to exploit. These gaps were closed in four ways. First, the British, Canadians and Americans acquired and developed more and more air and sea bases to support their war against the U-boat. Second, the Allies developed the ability to re-fuel and re-provision escorts at sea. This multiplied their effectiveness. Third, the Allies devoted more and more very long range aircraft against the U-boat threat, closing the gaps in their defenses still further. Finally, the Allies built a number of small aircraft carriers, which they used both to protect convoys and to search out U-boats.

Once the Allied defensive gaps were closed and enough Allied escorts were available to guard the convoys, the Germans had lost their tonnage war. Although the winter of 1942-43 was a grim time for the convoys, the tide turned decisively in the spring of 1943. By the end of that year the Germans were forced by the weight and effectiveness of Allied countermeasures to give up wolfpack tactics in favor of individual attacks on targets of opportunity. The Germans could never hope to win the tonnage war by such means.

By the end of the war, the Germans had lost 790 U-boats out of a total of 1,162 built – and more than 30,000 U-boat men had died. U-boats had sunk almost 2,500 ships totaling 13,000,000 tons, but it was not enough. The Allies built 42,000,000 tons of merchant shipping in World War II.

Tactics and Technology. Until the end of 1943, the standard German tactic for attacking Allied convoys was the wolfpack. The wolfpack was a loosely organized group of up to 20 or so U-boats that would patrol along the expected route of a convoy. When one of the wolfpack members spotted the convoy, it would maintain contact while calling in the other boats. These would attack independently, usually by mounting torpedo attacks while on the surface at night.

While the distinguishing characteristic of a submarine is, of course, its ability to submerge, submarines of the Second World War spent most of their time on the surface. Submerged, they were capable of only low speeds and limited endurance. To track down convoys and maneuver to attack, U-boats needed to operate on the surface. At first, their ability to operate on the surface in the face of escort forces was quite good. A submarine presents a small visual target, particularly compared to a mass of ships making up a convoy. As time went on, however, the U-boats found the surface an increasingly perilous place.

The Allies countered wolfpack tactics with a combination of tactics and technology. Allied anti-submarine tactics at the start of the war called for the escort vessels to patrol around the convoy formation, trying to prevent the U-boats from closing to shoot. Primary emphasis was placed on stopping submerged attacks by detecting U-boats with sonar (or, in British parlance, asdic). Because asdic could not detect surfaced submarines, the Allies changed their tactics over time. They came to place more emphasis on detecting surfaced U-boats, and on attacking U-boats before they could close the convoy.

The Allies had important technological help in developing their tactics. While technology alone did not win the tonnage war, Allied technological dominance gave them an important edge and helped them bankrupt wolfpack tactics. Technology helped the Allies in a number of ways.

First, the Allies developed increasingly effective radar and installed it in more and more escorts. Radar made it much more likely that a surfaced U-boat would be detected before it could attack. Effective radar also made aircraft much more effective U-boat killers. With radar, the aircraft could surprise the U-boats on the surface in bad visibility or at night. While the Germans did develop effective radar detectors over time, which U-boats could use as warning devices, they usually lagged well behind in their ability to detect the most current Allied radars.

Second, the Allies also developed extremely effective high frequency direction finding equipment (called “HF/DF”) that permitted them to home in on U-boat radio transmissions. Because the

Germans never believed that the Allies could develop this ability, they never enforced radio discipline among the U-boats, and the Allies were continually able to run the boats down based on their radio chatter. In particular, the Allies used HF/DF to pin down contact boats broadcasting convoy locations.

Third, the Allies developed increasingly effective ASW weapons as the war went on. Depth charges became more and more effective at deeper and deeper depths. Ahead-throwing weapons, which cut down on the U-boat's ability to escape an attack, were developed and perfected. Aircraft ASW weapons grew immensely in effectiveness. By contrast, German submarine weapons were relatively static. Perhaps the most radical new weapon used by the U-boats was the acoustic homing torpedo, introduced in numbers in 1943. This torpedo homed in on the noise made by the propellers of its target, and proved fairly effective against escorts. Beyond this, the Germans developed some torpedo types that could be programmed to turn in mid-course (in hopes of increasing the chances of a hit when fired into a convoy formation) and armed their U-boats with increasing number of anti-aircraft guns as the Allied air threat grew.

Finally, the Allies got tremendous help from their code-breaking efforts, which were fueled not just with intellectual effort but with some of the first computers. This, combined with other intelligence, often gave the Allies enough hard data to simply steer convoys right around U-boat concentrations. Here though, the Germans had a counter. For while the Allies were reading the German naval codes, the Germans were also reading the Allied convoy codes. This occasionally led to situations in the Allied used their code-breaking information to alter a convoy's course around a wolfpack while the Germans used theirs to find the convoy again, with neither side suspecting that the other was reading its mail. By mid-1943, however, Allied code-breaking efforts had permanently outstripped those of the Germans.

Both Allied technology and Allied production combined to make Allied ASW efforts more and more effective. At first, too few Allied escorts were using inadequate means to detect U-boats and lacked the time, techniques and technology to have a good chance of killing the U-boats that they did detect. By mid-1943, larger number of escorts were able, through the use of HF/DF and excellent radar, to attack U-boats before they could close the convoys. These escorts could take the time to hunt down the U-boats they detected, and had the weapons and training needed to make them effective U-boat killers. Similarly, ASW aircraft grew immensely in effectiveness as the war went on. By mid-1943, there was no place in the North Atlantic where at least the longest-ranged of the Allied aircraft could not reach, and these aircraft had the radar and weapons needed to kill U-boats.

The Game. Two aspects of the convoy battles make them hard to simulate. First, obviously, are the aspects of limited intelligence. Even with efficient code-breaking and radio direction-finding, the Allied escorts could never be quite sure what they were facing or when the enemy would strike. On the German side, individual U-boat commanders would have only sketchy information on the convoys they were attacking, and could not even be sure of where their compatriots were. All of this limited knowledge made for a cat and mouse game in which the roles of cat and mouse could be reversed at any time.

The second aspect is less obvious. Submarine and ASW warfare both involved short periods of frenetic activity interspersed with long intervals of little obvious action. This makes the use of a turn of fixed duration difficult; most turns would involve little action.

The solution to both of these problems lies in a card game. Because the cards are hidden, each player is left guessing about the strength and capabilities of his opponent. Does he have a few escorts or many? High quality or low? Ace submariners or green boats? Is he primed to attack? To evade? To maintain contact? To use HF/DF or air patrols? All these things become known only as the cards are played.

The use of cards also eases the time scale problem. The time interval represented by the play of a card is abstract. The play of evasive routing cards may represent days going by, while the play of back-to-back escort attack cards represents minutes. The card system takes it all in stride.

Cards bring other advantages. They make it easy to alter orders of battle in an appropriately random way. This keeps each player guessing as to his opponent's strength. Also, the card mix can be varied to reflect different stages in the struggle. No HF/DF early in the war? Pull the HF/DF cards. Operating in the mid-Atlantic air gap? Reduce the number of air patrol card and air escort cards. Ordered by U-boat Control to fight it out on the surface against aircraft? Add flak cards. The Allies change their convoy codes? Fewer B-dienst cards. Finally, cards keep players guessing about their own capabilities. Commanders did not have perfect knowledge of their own forces. The card system keeps them in some suspense about what they will next be dealt.

Here's what the individual cards are meant to represent.

U-boat Player Cards:

Contact (Beta-Beta): In wolfpack tactics, the task of the first boat to spot a convoy was to call in the other boats to attack. It did this by broadcasting "beta-beta" homing signals.

Special Contact (Beta-Beta): While support groups with escort carriers were deadly U-boat hunters, the roles were sometimes reversed.

U-boat Attack (Torpedo Los!): The different U-boat attack cards take into account the varying effectiveness of a U-boat attack based on its position relative to its convoy target and the torpedoes being used. The play of the cards also tends to concentrate escorts around the point of the greatest threat. Zaunkonig torpedoes were acoustic homing torpedoes that were relatively effective against escorts (until Allied countermeasures were introduced). FAT torpedoes were designed to run a set distance and then circle, theoretically increasing the chances of hitting ships in a convoy.

Evade (Alarm!): This card simulates a U-boat abandoning any attack plans and attempting to evade escort attacks. In an initial escort attack round, it simulates a U-boat crash-diving or hauling off to avoid contact with an escort. In subsequent attack rounds, it simulates going deep and evading escort attacks.

Flak: During one period, U-boat doctrine called for the boats to repel Allied air attacks with gunfire, rather than crash-diving away. This was a more effective tactic than one might think, as the Allied bombers used against the U-boats tended to be large targets, and had to fly straight and low to make an effective attack.

B-dienst: The B-dienst was the German codebreaking organization, which succeeded in periodically reading the Allied convoy codes through June of 1943. When Ultra intelligence permitted the Allied to route convoys around U-boat concentrations, B-dienst might let the Germans reposition the U-boats in response.

Escort Player Cards:

Evasive Routing: One powerful Allied convoy defense was simply to sail the convoys where the U-boats weren't. While convoys were large, the North Atlantic was vast by comparison. And the Allies were helped by their abilities to read the German naval code ("Ultra") and to locate U-boats through their telltale radio transmissions.

Escort Attack: In the first round of an escort attack, this card represents a combination of gunfire, ramming and shallow-set depth charge attacks. In the later rounds, it represents attacks by deep-set depth charges and ahead thrown weapons like Hedgehog and Squid. As Allied escorts

became more numerous, more experienced and better trained, their ability to make multiple and persistent attacks grew.

HF/DF: HF/DF (“Huff-Duff” or high frequency direction finding) began the war as a shore-based technique, but HF/DF sets soon found their way on board escorts. Rated by escort commanders as being as crucial as radar, HF/DF permitted escorts to run down U-boats from their radio transmissions. As wolfpack tactics required considerable radio signaling, HF/DF gave escorts many chances to attack U-boats before the U-boats could close a convoy. This was particularly true for the contact boats, which had to broadcast frequently while remaining close to the convoy. The Germans never discovered the Allied use of this technology.

Air Patrol: With time, the aircraft became the most feared U-boat killer. Even at the outset of the war, aircraft were effective at scouting for U-boats and forcing them to submerge. The Germans responded by setting their U-boat operational areas in zones where Allied air cover was lacking or weak. The zones grew fewer and fewer as the war went on, while aircraft became more and more effective against the boats. The weak zones dwindled as the Allies used very long range aircraft and escort carriers to plug the gaps; the aircraft became more effective as they received radar and effective anti-submarine weapons.

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