

Introduction

This special supplement to Andy Doty's *FG&DN* Forms CD provides official changes to the gun modifiers and damage rules for *Fear God and Dread Nought*, first edition. They upgrade the rules to *FG&DN* version 1.1.

These simple changes incorporate the most important parts of the *Admiralty Trilogy* harmonization, designed to bring the three game systems into complete compatibility.

Page 6-4 can be photocopied and three-hole punched and placed in the rules instead of the existing Pages 6-4 and 6-5. It combines Gunnery Standards 1 and 2 on a single table.

The seven sheets (14 pages) that make up the damage rules can be three-hole punched and replace the existing six sheets of damage rules. The index will be off, but a substitute table of contents is provided on the right. It is shorter than the original section, and can be taped over the old chapter 8 table of contents.

Thanks to Andy Doty, Steve Thorne, and Jay Wissmann for their sharp eyes.

Change Note:

- 21 Feb 11: A change to the example in the left column of page 8-7 and a correction to "Controlling Fires and Flooding" was made so that damage from fires and flooding was applied consistently.

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Fear God And Dread Nought is Larry Bond's, Chris Carlson's, and Michael Harris' registered Trademark for their WW I tactical naval wargame.

The designers of *Fear God And Dread Nought* are prepared to answer questions about play of the game system. They can be reached in care of Clash of Arms Games, 1804 Hoffmansville Road, PO Box 212, Sassamansville, PA 19472-0212 or at sales@clashofarms.com.

GUNFIRE HIT CHANCE MODIFIERS TABLE
GUNNERY STANDARDS 1 & 2 - Pre-Dreadnought Era / World War I

Base Chance of a Hit	GS1	GS2
Short	40%	50%
Medium	20%	30%
Long	10%	10%
Extreme	5%	5%

VISIBILITY/ENVIRONMENTAL MODIFIERS

• Visibility ≤25% (Ignore when target illuminated or silhouetted).	-4		
• Visibility ≤40% (Ignore when target illuminated or silhouetted).	-2		
• Target in line with sun - Target obscured. Must be ±10° of line from ship to sun.	-2		
• Target in line with twilight sun - Target silhouetted. Must be ±30° of line from ship to sun.	+1		
• Target silhouetted by a starshell or fire.	-1		
• Target illuminated by a starshell fire or if ship is using a searchlight.	+0		
• Target illuminated by a searchlight.	+1		
• Dead Reckoning Fire - First turn of fire after a loss of visual contact on a target.	-4		
• Blind Fire - Firing at muzzle flashes (Ignore visibility modifiers).	-6		
• Sea State (Heavy seas make it very difficult to aim the guns properly.)	A&B	C&D	E-G
SS 3	NA	NA	-2
SS 4	NA	-2	4
SS 5	-2	-4	-6
SS 6	-4	-6	NFP
SS 7 (No Fire Possible (NFP) above Sea State 6.)	NFP	NFP	NFP

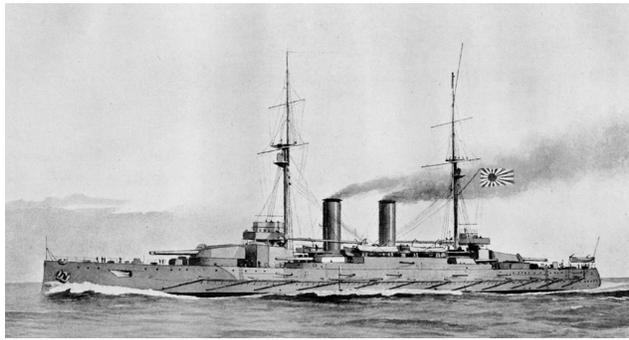
FIRE CONTROL/GUN MODIFIERS

• Firing Ship is not being fired on	+1		
• First salvo on target. (Long and Extreme range bands only).			
First salvo if new target is more than 15° in azimuth and 1 nm off of old target.	-2		
• Third or later salvo on target - (All range bands.)	+1		
• Overconcentration (Long and Extreme range bands only).	-1 per ship		
Too many ships firing at same target.	above limit		
• Firing beyond range finder capability.			
Up to +3,000 yds	-1		
3,001 to 6,000 yds	-2		
more than 6,000 yds	-3		
• Coincidence range finders in poor visibility (≤40%) - Long and Extreme range bands only.	-1		
• Firing ship at speeds over 15 knots	-1		
• Local Control (GS2 guns only)	-2		
• Firing ship changes course by 45° or more.	-3		
• Firing ship steering evasively. Takes precedence over course change modifier.	-4		
• Number of barrels firing.			
1 - 2	+0		
3 - 4	+1		
5 - 6	+2		
7 - 8	+3		
9 - 10	+4		
11 +	+5		

TARGET MODIFIERS

• Target speed.			
Speed 25 knots or more	-3		
Speed 20 - 24 knots	-2		
Speed 10 knots or less	+1		
• Stationary ("Dead in the Water")	+2		
• Target steering evasively. (Requires min ship speed of 20 knots.)			
Size Class B (Pre-Dreadnoughts cannot steer evasively)	-2		
Size Classes C & D	-3		
Size Classes E - G	-4		
• Target Aspect		Broad/Quarter/Narrow	
Size Class A	+2 / +1 / +0		
Size Class B	+1 / +0 / -1		
Size Class C & D	+0 / -1 / -2		
Size Class E - G	-2 / -3 / -4		

Multiply the final modifier by 3% for Short or Medium range targets, and 2% for Long and Extreme range targets, and add it to the base chance to hit.



Kashima-class dreadnought

Chapter Eight - Damage

Weapons hurt a ship in several ways. First, the explosive effects damage the ship's structure, including its shell plating. If this is close enough to the waterline, flooding will occur. If enough of the framing and longitudinal members that make up the ship's structure are broken or damaged, the stresses on the remaining ribs could break it in half. This is almost certain if the keel is broken.

Second, an explosion will send a shock wave through the ship. This may break electronic components, knock heavy machinery off its mountings, or stress previously damaged components to the point where they fail.

Third, the explosion's pressure wave will damage exposed items such as radar antennas or aircraft.

Finally, warheads create fragments that will fly off on their own, causing more damage.

FG&DN measures damage in two ways: damage points and critical hits. Hits by enemy fire reduce a ship's damage point level until it reaches zero, sinking it. Those same hits will also knock out weapons and other vital

equipment, start fires, or cause flooding. These may cripple the ship or sink it indirectly long before the ship's structure is destroyed. Procedures for each type of hit are provided below.

8.1. Applying Damage. Whenever a Size Class A - D ship is hit by a weapon, subtract the damage points inflicted by the weapon from the ship's damage point total. When the ship's total reaches zero the ship sinks.

Small craft are tougher, ton for ton, and cannot be sunk by successive turns of fire that add up to their total damage point rating. If the damage they receive in a single turn is twice their damage point rating, they are sunk. They have to roll for critical hits for damage effects, but their point total is not reduced after each hit like larger craft.

When a weapon inflicts damage on a target, the weapon must penetrate any armor in the location of the hit before it can do internal damage. Non-penetrating hits will cause less damage (see 8.1.6).

The effects of damage, including critical hits, are applied simultaneously to both sides at the end of the phase.

Damage from fire or flooding critical hits is applied in the Resolution Phase of the third turn after the critical hit is inflicted, with two exceptions: Flooding from torpedo and mine hits is applied immediately, in the Movement Phase the torpedo hits. Flooding and Fire criticals are inflicted on Small Craft (Size class E - G) immediately.

Secondary effects from criticals, like explosions, are applied immediately, in the phase in which the damage is resolved.

- *Movement Phase.* Resolve torpedo and mine attacks.
- *Planned Fire Phase.* Gunfire and depth charge attacks made in this phase are resolved in this phase, including damage effects.
- *Detection Phase.* No combat resolution occurs.

Critical Hit Table

<i>D20 Roll</i>	<i>Major Surf Combatant (Size A&B)</i>	<i>Minor Surf Combatant (Size C,D)</i>	<i>Aviation Ship</i>	<i>Merchant/ Auxiliary</i>	<i>Torp & Mine Attacks</i>	<i>Submarine Lethal Dam.</i>	<i>Submarine Major Dam.</i>	<i>Submarine Minor Dam.</i>
1 - 3	Main Btry*	Main Btry*	Flight Deck*	Cargo	Weapon	Hull Pen	Weapon	Weapon
4 - 5	Casemate*	Other Wpn	Other Wpn	Cargo	Flooding	Hull Pen	Hull Deform	Switchboard
6 - 7	Other Wpn*	Other Wpn	Ammo/Fuel*	Cargo	Flooding	Hull Pen	Hull Deform	Switchboard
8 - 9	Other Wpn*	Other Wpn	Aircraft	Weapon	Flooding	Hull Pen	Battery	Battery
10 - 11	Engineering*	Engineering*	Engineering*	Engineering	Engineering	Hull Deform	Engineering	Engineering
12 - 14	Flooding*	Flooding*	Flooding	Flooding	Engineering	2 x Flooding	Flooding	1/2 Flooding
15 - 17	Fire*	Fire*	Fire*	Fire	Fire	2 x Flooding	Fire	1/2 Fire
18	Snsr/Comms	Snsr/Comms	Snsr/Comms*	Snsr/Comms	Weapon	Hull Pen	Sensor	Sensor
19	Bridge*	Bridge*	Bridge*	Bridge	Rudder	Hull Pen	Comms	Comms
20	Rudder*	Rudder*	Rudder*	Rudder	Rudder	Hull Pen	Rudder	Rudder

<i>D20 Roll</i>	<i>Small Craft Combatant (Size E,F,G)</i>	<i>Small Cargo Craft (Size E,F,G)</i>
1 - 3	Weapon	Weapon†
4 - 5	Weapon	Cargo
6 - 7	Personnel	Cargo
8 - 9	Fuel Tank	Fuel Tank
10 - 11	Engineering	Engineering
12 - 14	Flotation	Flotation
15 - 17	Fire	Fire
18	Snsr/Comms	Snsr/Comms
19	Bridge	Bridge
20	Personnel	Personnel

Notes:

Locations with (*) require armor penetration before the critical hit is inflicted. Small Cargo Craft Weapon†: Treat as Cargo if the craft is unarmed. For Sensor/Comms critical hits, roll D6. On a 1 - 3 it is Communications. On a 4 - 6 it is a Sensor. Surfaced subs are treated as minor surface combatants. Substitute their torpedo tubes for the Main Battery critical. Submarine Minor Damage Sensor, Rudder, Weapon, and Engineering criticals are automatically cleared in D6 Tactical Turns. There is no fire with the Engineering critical.

- *Reaction Fire Phase.* Resolve gunfire and depth charge attacks made in this phase.
- *Resolution Phase.* Fire and flooding criticals are resolved.

Example: In Turn 1200, a cruiser is hit by a torpedo in the Movement Phase, and suffers 35 damage points. As a result, the ship suffers several flooding criticals. In the Planned Fire Phase it is hit by enemy gunfire, which results in more damage and a fire critical. The secondary damage from the fire and flooding will be applied to the cruiser in the Resolution Phase of Turn 1209.

If one of the shell hits in turn 1200 had hit the main battery magazine, the cruiser would have been immediately destroyed by an explosion at the end of the Planned Fire Phase.

Weapons hitting aircraft destroy the aircraft, rendering it unflyable (if on the ground), or damage it so severely (if airborne) that it aborts its mission. It is removed from play. See 8.7 for aircraft damage procedures.

8.1.1 Speed Reduction. As a ship or sub's damage point total is reduced, its speed goes down as well. Loss of structural strength may force a ship to slow down. Drag on the hull will slow it as its smooth lines are broken by holes and other damage, and general damage to the propulsion plant will affect its efficiency.

A ship's speed is reduced by one quarter each time it takes one quarter of its original damage point level, and is reduced to zero at the 90% damage level.

The break points for damage are 0%, 25%, 50%, 75%, 90%, and 100%. The speed percentages are 100%, 75%, 50%, 25%, 0%, and sunk.

Each ship class has a different table which is included with its other characteristics in Annex A. The top line represents the damage point levels where the speed is reduced, while the bottom line shows the new maximum speed at that level of damage.

Example: A British *Tiger*-class battlecruiser takes 501 points of damage. Its damage and speed breakdown table is shown below:

Damage and Speed Breakdown:

Dam Pts:	0	125	251	376	451	501
Surf Speed:	28	21	14	7	0	Sinks

With no damage (0), *Tiger* is capable of 28 knots. At 124 points of accumulated damage, it can still do 28 knots, assuming no propulsion criticals or other restrictions. At 125 points though, its maximum speed is 21 knots. From 125-250 points of damage, it can make 21 knots. The 251st point reduces its speed to 14 knots, and so on.

Acceleration/Deceleration rules (section 3.1.1) apply here, so the ship slows, coasting to a slower speed at half the deceleration rate, so its speed next turn would be 28 - (8/2) = 24 knots. The following turn it would slow to its new maximum speed, 21 knots.

If a ship has taken propulsion criticals or other damage that also reduces its speed, these are applied to the ship's maximum speed as it changes.

8.1.2 Ship & Sub Critical Hits. A ship can be destroyed by sinking it, but it can also be rendered useless by destroying the equipment that makes it a warship. This is called a "mission kill."

Damage to a vital component of the ship is called a critical hit. These include not only weapons and sensors, but engineering (propulsion), the rudder, and flight decks.

In each phase that a ship takes damage, divide the damage points taken by the points the ship has remaining after that phase's damage points are applied. This is the damage ratio used to figure out how many critical hits a ship may have suffered.

Example: A British W-class destroyer has 39 damage points. If it takes 8 points of damage from gunfire in the Planned Fire Phase, the critical hit ratio is 8/(39-8) or 8/31 = .26. The players use the .20 line (always round down).

Small Craft (size class E - G) are tougher, ton for ton, than larger vessels. The damage points inflicted in a phase are always divided by the craft's total damage points to find the damage ratio and find out if the craft suffers any critical hits.

Minimum Damage: Ships must suffer some measurable damage before they must roll for critical hits. If the critical hit ratio is less than 1% of the ship's original damage points, then no criticals are inflicted. This prevents anomalous results such as a submachine gun sinking a destroyer.

Roll D6 and cross-index the result with the damage ratio on the Damage Ratio Table. The result is the number of critical hits inflicted on the ship.

Damage Ratio Table

Critical Hit Ratio	D6 Die Roll					
	1	2	3	4	5	6
<.10						1
0.10					1	2
0.20				1	2	3
0.30			1	2	3	4
0.40		1	2	3	4	5
0.50	1	2	3	4	5	6
0.60	2	3	4	5	6	7
0.70	3	4	5	6	7	8
0.80	4	5	6	7	8	9
0.90	5	6	7	8	9	10
1.00	6	7	8	9	10	11

Note: Higher ratios may be extrapolated by adding one to the number of criticals for each .2 that the damage ratio exceeds 1.00. Ratios of 3.0 or greater should be treated as reducing the ship to 10% DP remaining (see 8.1.10 massive damage).

Once the players know how many critical hits have been inflicted, find the nature of each on the Critical Hit Table. Each type of ship has its own column. Roll D20 for each critical hit on that column to see what its effect on the ship is. The critical hit types with asterisks (*) are protected by the ship's armor, if it has any. If the armor was not penetrated that turn, the critical is ignored.

Some weapons will automatically inflict some types of critical hits, in addition to any generated by damage points:

- Each contact-fused torpedo that hits a ship or sub will automatically inflict a flooding critical, in addition to any other critical hits. A ship's torpedo protection system (see section 8.1.7.2) must be penetrated before the automatic flooding critical hit occurs.
- If a submarine is hit by a torpedo, or any other contact-fused weapon, the pressure hull is automatically breached.

- Any ship that takes 75% or more damage from a single bomb, torpedo or mine hit must roll D10. For torpedoes or mines, on a 1 - 8, and for bombs on a 1 - 4, the keel has been broken and the ship will sink per section 8.1.8.

- Each bomb of 100 lb/50 kg or larger that hits a carrier automatically inflicts a flight deck critical hit (penetration allowing) in addition to any other criticals caused by its damage points.

- Each turn of 120mm or larger shell fire from Long or Extreme range that hits a carrier may inflict a flight deck critical hit (penetration allowing) in addition to any other criticals caused by its damage points. The chance is 30% from Long range and 60% from Extreme range.

8.1.3 Light Weapon Critical Hits. Light weapons (65mm and less) do not have the explosive force to inflict all the critical hits listed on the Critical Hit Table on larger ships (size class D and larger). When checking for Critical hits from light weapons fire, roll normally on the appropriate column of the Critical Hit Table for the target type. Then check the type of critical against the following table:

Light Weapons Critical Hit Table

<i>Largest gun fired</i>	<i>Criticals allowed against Size class D and larger</i>
7.62 - 9mm	Bridge, AA, Light Battery
12.7 - 15mm	Aircraft, Bridge, AA, Light Battery, Sensor/Comms (not sonar), Cargo
20 - 25mm	Aircraft, Bridge, Fire Control, AA, Other Weapon, Sensor/Comms (not sonar), Cargo, Light Battery
37 - 45mm	Aircraft, Bridge, Fire (-2 severity), AA, Other Weapon, Light Battery, Sensor/Comms (not sonar), Cargo
57 - 65mm	Aircraft, AA, Bridge, Fire, (-2 Severity), Flooding, (-2 severity), Light Battery, Other Weapon, Cargo, Sensor/Comms (not sonar)

If the critical rolled is not listed above, or the area's armor protection is not penetrated, the critical hit is ignored.

8.1.4 Submarine Critical Hits. While on the surface, submarines are treated as surface ships, and use the Minor surface combatant column for figuring critical hits. Treat main battery result as hits on the torpedo tubes.

When submerged, subs use the Lethal/Major/Minor damage columns, as determined by the severity of the underwater attack that they suffer.

8.1.5 Firing at Beached or Grounded Craft. Vessels of all sizes were often beached if they were in danger of sinking. Small craft and amphibious vessels were often beached to offload cargo. Ships that strayed too close to shore sometimes ran aground.

Destroying a beached vessel requires twice as many damage points as it does to sink it. Flooding/flotation criticals are still applicable, since the boat is not completely out of the water, but subtract two from the severity roll of all flooding critical hits.

Vessels that have taken more than their listed damage point rating cannot be refloated, but they are not "destroyed."

8.1.6 Effects of Armor. Armor reduces the amount of damage a ship takes and provides special protection to critical areas of a ship. In World War I, ships larger than a destroyer carried armor covering the magazines and engineering spaces (belt), major weapons (turret top and faces), and the deck. Other critical items, such as the conning station, could also be armored. The armor belt provided protection against close-range shell fire and shallow torpedoes. The deck provided protection from bombs and plunging fire at long ranges.

Larger warships also had special protection against torpedoes. Below the waterline, most ships had a large empty compartment called a void. These were designed to absorb the force of a torpedo's warhead, and prevent the true inner hull from being ruptured. While a torpedo would destroy the void, no real harm would be done to the ship.

Each weapon has a **penetration rating** as part of its statistics. These values are precalculated for each gun at each range bracket, and are listed in Annex C. To find a gun's penetration, measure the range and find the appropriate range band in the Annex for that gun and shell type. The most common shell types are Armor-Piercing (AP), Semi-Armor Piercing (SAP) Common (CP) and High Explosive (HE). Most of the AP, SAP and some CP shells had a special cap added to improve the armor penetrating capability of the shell against face hardened armor. A shell with a cap on it has a "C" after its designator. Thus, a capped armor-piercing round would be APC.

Short and Medium-range gunfire has a relatively flat trajectory, and will strike the side of a ship on its armor belt. Long and Extreme-range fire must arc much higher and is called plunging fire. At Long range, there is a 70%/30% chance the shellfire will strike the belt or deck armor, and the firing player must roll to see which armor value must be penetrated. Extreme-range shellfire has a 40%/60% chance of striking the belt or deck armor.

Bombs are classed as demolition or general-purpose (GP), fragmentation or incendiary. Armor-Piercing and Semi-Armor Piercing bombs with thicker casings and smaller explosive charges weren't developed until long after WW I. Demolition bombs have relatively thin-walled casings and a large explosive charge. Fragmentation bombs were small antipersonnel weapons, while incendiary bombs were designed to cause large scale fire damage. The latter two types were designed specifically for use against land targets and were largely ineffective against ships. The amount of damage inflicted by GP, fragmentation and incendiary bombs and other weapons is shown in Annex H1.

Bombs and rockets always strike the deck armor, except skip bombs, which strike the belt. Bombs will have armor penetration ratings listed in Annex H1. Penetration ratings are given for dive bombing attacks from Low and Medium altitude and Level bombing attacks from Low, Medium, and High altitude. Pressed home attacks are always delivered from Low altitude. Early release attacks are made from Medium altitude.

Players may want to attack from higher altitudes, even though the chance of a hit is reduced. Much of a bomb's penetration ability comes from kinetic energy, not explosive force. AP bombs do not detonate until after they have penetrated a ship's armor. This means that for AP bombs to get the best possible penetration, they must be dropped from High altitude.

Shells and Armor

Until the late 1880s, warships relied largely on mild steel, or a combination of mild steel and wrought iron (Compound or composite armor) for protection against gunfire. Both the mild steel and Compound armor were considerably stronger than wrought iron armor and were able to defeat the chilled cast-iron "Palliser" projectiles by breaking them up on impact. It became quite clear that a harder and stronger material was needed for projectiles, and steel was adopted for this purpose by the mid-1870s. By the end of the 1880s, all shells were made with steel. With the new steel projectiles, the gun once again had the upper hand in the seesaw struggle for supremacy between guns and armor; but not for long.

In 1889, the French company Schneider & Co. at Creusot, found that by adding small quantities of nickel to steel alloy, the strength of the armor plate could be increased without any loss in hardness. Hardness was a crucial factor in armor performance, because this was what caused the projectiles to break up on impact. Although nickel steel was only slightly stronger than Compound armor, it had the advantage of being easier to manufacture and was found to resist the cracking that tended to shatter Compound armor after a few hits. Nickel steel might have become the armor of choice for warships, had it not been for an American by the name of H.A. Harvey.

Mr. Harvey liked the concept of Compound armor, with its very hard face and the tough resistant back, but the transition between the two materials was too sudden and the joint between them was incapable of holding up to the attack of the new steel shells. So Harvey experimented with the idea of "soaking," or diffusing carbon into homogeneous nickel steel by placing a red-hot plate in contact with bone-charcoal for several days. After quenching the plate in water, the face of the plate was "supercarbonized" or "cemented" to a depth of a little over an inch. This process resulted in the first face-hardened armor, with an extremely hard face bound together (*i.e.*, no physical joint) with and supported by, a tough back that provided excellent resistance to cracking. This revolutionary new armor was about 30% better than nickel steel and about 40% better than Compound armor in stopping power. Even many of the new steel shells had considerable difficulty penetrating the superhard face of Harvey armor.

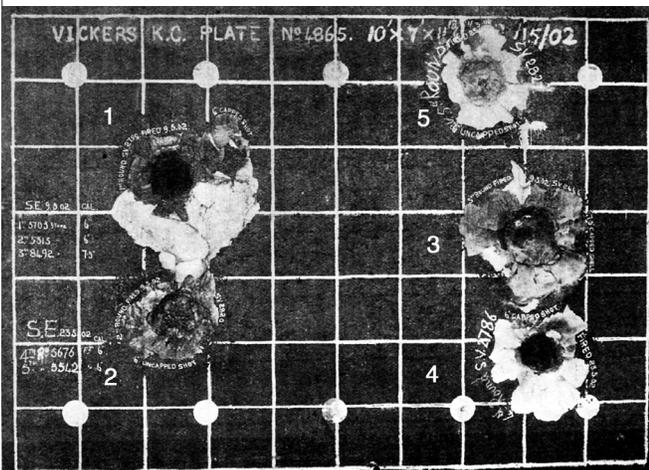
While the Harvey process was a great leap forward in the manufacture of armor, it was soon found that the back of a Harvey plate was still not tough enough to withstand attacks by the newer forged chromium steel alloy shells. Onto the scene now steps Friedrich Krupp of Essen, Germany with a cementing process that becomes the standard for all future face-hardened armor. Krupp's process began with the addition of small amounts of chromium to the steel alloy. The chromium made it easier to harden a plate of armor and the depth of the hardened layer could be much thicker than with the Harvey process. Krupp also kept the steel plates in an oven for three weeks, not days as in the Harvey process, resulting in the hardened layer being about 30% of the thickness of the plate. The back of the plate, however, had low carbon content and was very tough. The major problem with Krupp cemented armor, hereafter known as KC armor, was its cost - Krupp armor was expensive and many navies didn't view the 10-15% increase in protection over Harvey armor as being cost effective. Thus by the mid-1890s, armor had once again eclipsed the gun, as even the new forged shells could not penetrate Krupp's armor. But gunmakers would not let this situation last for very long.

Armor-piercing caps had been experimented with as far back as 1878, and even though the results were encouraging, no one adopted the cap right away. However, in 1894 the Russians began putting the cap on their large caliber naval shells. By 1908, every navy had caps on their armor piercing and semi-armor piercing shells. The cap's primary purpose is to prevent the shell from shattering on impact with face-hardened armor by absorbing the shock and protecting the head of the shell from damage (see the photo of the 12-inch shell above). Initially, caps increased the penetration power of shells by 15%; provided the striking velocity and angle of impact were within certain limits. Ultimately, later cap designs would boost the penetration capability by 30%. With armor-piercing caps, a gun could once again penetrate even the thickest KC armor, but usually only from short to medium range.

The picture on the left of a Vickers test armor plate helps to drive home the benefits of armor-piercing caps. Shot numbers 1 and 4 are 6-inch capped armor-piercing shells that completely penetrated the 11.8 inch KC armor plate. Shot numbers 2 and 5 are 6-inch uncapped armor-piercing shells that broke up on impact with the armor plate. Shot number 3 is a 7.5-inch capped armor-piercing shell that penetrated 11.5 inches before being stopped. The larger round had a significantly lower striking velocity than the 6-inch shells.



Twelve-inch AP shell with cap.
(Naval Annual 1911)



Vickers Krupp Cemented armor test plate.
(Naval Annual 1903)

Strafing attacks must penetrate the ships deck armor.

Deck and belt **armor ratings** are provided for each ship. For example, the *Tiger*-class battlecruisers have a rating of 18/6, meaning a belt thickness equivalent to 18 centimeters, and a deck armor equivalent to 6 cm. The deck is much thinner than the belt, but shells at Long range do not penetrate as much armor and the chance of getting a hit is much less as well. Demolition or GP bombs also lack penetrating power and will not penetrate even this much deck armor.

In the diagram of HMS *Tiger* below, you will note that many of the locations have armor thicknesses greater than the associated belt or deck armor rating. This is due to the fact that all armor is not alike and that a quality modifier has been applied to the weighted average used in determining the ratings. See Annex Z for more information.

Compare the penetration ability of a weapon with the armor rating where it struck (Deck or Belt). If the weapon's penetration is greater than the armor rating, it inflicts full damage. Note: Weapons with and armor penetration of zero will inflict full damage on a target with an armor rating of zero.

If a shell or bomb does not penetrate, halve the damage. Also, certain critical hits will not happen. These are marked with an asterisk (*) on the critical hit table. For example, to knock out a ship's main battery, a bomb must penetrate the ship's deck armor.

8.1.6.1 Faulty shells (optional rule). The game's gun system assumes shells are 100% reliable and the damage model reflects this assumption. The one thing that was 100% certain in WW I was that nothing worked perfectly - particularly British shells. As early as 1910, the Royal Navy's armor-piercing shells filled with Lyddite were known to have very poor performance when they struck armor at high angles of obliquity. These shells had a tendency to detonate or break up before they had penetrated the armor, significantly reducing their effectiveness.

If a warship is fitted with British guns, and fires British APC shells, they will have their damage reduced by 40% when firing at targets at Long or Extreme range, provided the target has a belt armor rating greater than, or equal to 1/3 of the shell's diameter. In other words, all gunfire attacks by British APC rounds are resolved normally, with the exception that the final damage is multiplied by 0.60 if the above condition is met. If the shells would normally not penetrate the target's armor, then the damage is calculated normally (according to 8.1.6).

Example: HMS *Tiger* engages SMS *Moltke* at long range with 1,400 lb. 13.5in (343mm) APC shells. The *Tiger* successfully attacks *Moltke* and scores two hits from her eight guns. Normally, the 1,400 lb. APC shell (penetration

of 26) would easily defeat *Moltke*'s belt armor (rating of 21) at this range, but since the German battlecruiser's armor is greater than 11 ($34.3/3 = 11.4$ or 11), the British shell does not perform properly and the damage is reduced from 34 to 20 DPs ($34 \times 0.6 = 20.4$ or 20).

Note: If players intend to use this rule, they should make up a table before the game for each British gun, listing the required armor thickness and the reduced damage.

The Royal Navy wasn't the only one with defective shells. On average, the failure rate of WW I shells of all types for all nations was about 20%. If players desire, all gunfire damage can be multiplied by 0.85 to reflect this historical deficiency

8.1.7 Armor and Torpedoes. Torpedoes can be set to run shallow or deep. Torpedoes must run shallow to hit size C-class (destroyer) and smaller ships. A shallow torpedo will strike a larger ship's belt armor, however. Deep torpedoes will run under small ships and will strike larger ships below the belt armor, on their torpedo bulges if they have any. While some large ships carried torpedo protection systems many did not.

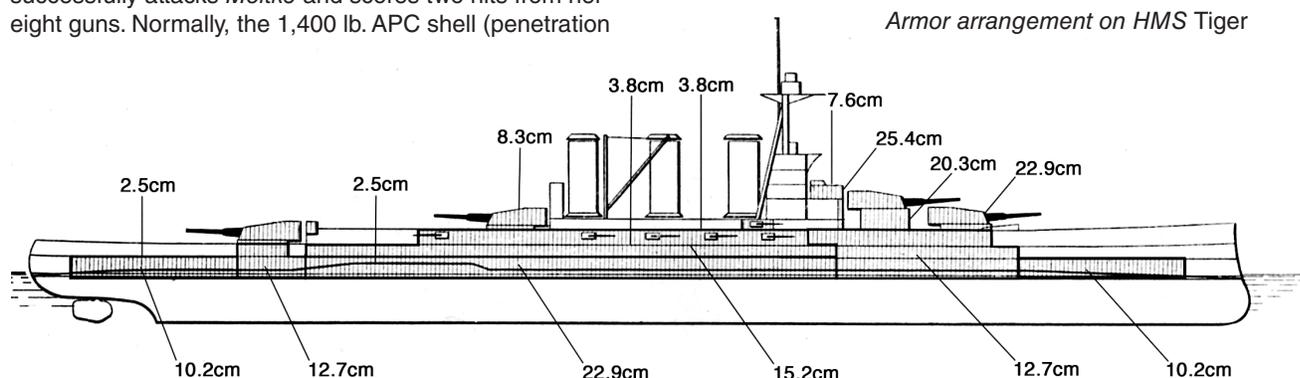
Whatever their depth, torpedoes that strike a ship from the narrow aspect (see the diagrams on 2-6 or 6-15) strike outside the armor belt or the torpedo protection system. Divide the torpedo's damage by two. An extreme bow or stern hit wasted a lot of its energy moving water and not damaging the ship.

If the narrow aspect hit is in the stern, the first two critical hits (beside the automatic flooding, which doesn't count against the critical hit number) are automatically engineering and rudder hits. Roll the remaining critical hits as per sections 8.1.2.

8.1.7.1 Shallow-Running Torpedoes. If a shallow-running torpedo strikes the armor belt, its damage is reduced according to the following table.

<u>Target's Belt Armor</u>	<u>Damage Point Reduction</u>
0-5	None
5-10	10%
11-20	25%
21-30	40%
31-40	50%

8.1.7.2 Deep-Running Torpedoes. These will strike below the armor belt, but if the target has a torpedo protection system, the weapon will strike it.



Underwater protection ratings are given for those ships that have them. A German *Kaiser*-class battleship's armor rating, for example, is 26/7/105. The first two numbers are belt and deck ratings, as before. The third number is the underwater protection rating. Unlike the first two numbers, the third number is not an armor thickness but the number of damage points the protection system will absorb on each side of the ship before it fails. However, the system can absorb only one-third the total damage points (35 in this case) from a single torpedo. Any damage points over this inflicted by a single hit are applied to the ship's total.

Example: A *Kaiser*-class battleship is hit by two different torpedoes, one with a 40-damage point warhead and one with 70 damage points. Both torpedoes will overwhelm the system, inflicting 5 and 35 damage points respectively on the interior of the ship.

If a ship takes several torpedo hits on the same side, the protection system will be destroyed. The system itself consists of empty compartments, called voids, just inside the skin of the ship. By lining the ship's side with them, the torpedo will hit one of them and expend its explosive force. The more voids, the better the protection. The compartments will only absorb one torpedo hit in a given area of the ship though. After that, a hit in the same area will reach the ship's vitals. Also, the area around the actual hole is weakened, and is less able to resist a hit.

A ship can absorb torpedo damage on each side equal to the strength of the protection system. Thus, a *Kaiser*-class battleship can absorb 105 points of torpedo damage on the port side and another 105 on the starboard side as well. Damage done to one side will not carry over to the other. Torpedo damage points inflicted on the protection system, even if they do not penetrate, still reduces its total resistance.

Example: A *Kaiser*-class battleship is attacked on the port side by a salvo of four 40-point ship-launched torpedoes. Two torpedoes hit and penetrate, but the port side protection system is only reduced by 70 points, 35 for each weapon. The system on the port side has only 35 points left (105 - 70 = 35). The next torpedo that hits the port side is only reduced by the protection system's remaining 35 points. The torpedo protection system on *Kaiser's* port side is now totally eliminated. Any other torpedoes which hit the port side will inflict full damage.

8.1.8 Sinking. A ship or surfaced sub that has received enough damage to sink it rolls D10 x 10 for the number of minutes it will take to sink. The final disappearance happens in the Movement Phase. Submerged subs and ships that have magazine explosions sink immediately. Until the hulk sinks, it is a menace to navigation and will still cause damage if another ship collides with it.

8.1.9 Transferring Crew from One Small Craft to Another. Crew can be transferred from a sinking or immobilized boat to another one, or can be sent over to assist a boat that has casualties. It can also be used for transferring boarding parties from one ship to another, or from a boat to a pier.

If one vessel is stationary, and the other moves alongside and stops, the transfers happen automatically.

If both craft are moving, they must be moving at the same speed and on the same course. Transfers between two moving small craft are:

- 1 - 5 kts: 50% chance of success
- 6 - 10 kts: 5% chance of success
- 11+ kts: Prohibited

A failure means the crew factor(s) attempting the transfer go in the water, and there is a 50% chance of a collision between the two units involved.

A player can move within 50 yards of the boat, slow to 10 knots or less and roll a D6. It takes that many Impulses to maneuver the boat alongside and bring it to a stop.

In the Impulse that the boat is stopped alongside the stationary vessel, any number of uninjured crew factors can move from one boat to the other. Transferring crew factors that have been injured (Personnel Critical hits) takes one Impulse each, and can only be transferred one at a time.

A boat can carry a total of 12 crew factors, injured or uninjured (twice its normal complement).

Once the transfer is complete, boats can maneuver normally.

8.1.10 Massive Damage. Even though some of a ship's weapons may still be intact, there is a time where overall damage to a ship will prevent their operation.

When a ship has only 25% of its original damage points left, all main, secondary, and tertiary (if fitted) battery weapons are out of action. Subs must surface. Aircraft carriers cannot launch or land aircraft on the flight deck.

When a ship has only 10% of its original damage points left, all of its weapons are out of action.

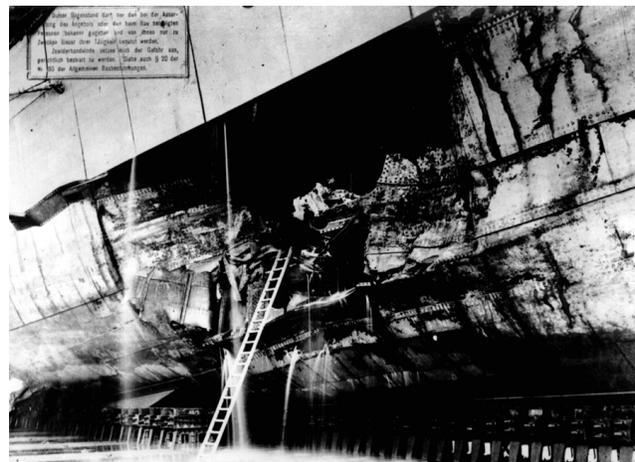
8.2 Fire & Flooding Critical Hits. Either a fire has started, or the ship's watertight integrity has been violated (that sounds better than, "there's a hole in the hull").

For each flooding or fire critical, roll to see how severe the casualty is:

<i>Ship's in service date</i>	<i>Fire & Flooding Severity</i>
1907 and earlier	2D6+2
1908 - 1924	D6+2
1925 and on	D6

Modifiers:

- 1) Halve the result if the hit is non-penetrating.
- 2) Halve the result if it is caused by guns of 76mm or less.



Torpedo damage to SMS Seydlitz

(US Navy)

The result is a percentage of the ship's original (undamaged) DP. These damage points are inflicted on the third Tactical Turn after the critical hit and on each Intermediate Turn after that, until the critical is removed (*exception*: flooding critical hit damage caused by mines or torpedoes is applied immediately).

Example: On turn 1506 of a gun battle, the battleship *Valiant* succeeds in hitting the dreadnought *Deutschland* (commissioned in 1906). The German player rolls for the type of critical hits, and one of them is a fire. Using the first line of the table, the British player rolls a 5 and a 2, meaning the fire inflicts 9% of *Deutschland's* undamaged rating each Intermediate Turn. However, because the hit didn't penetrate *Deutschland's* armor, the damage is reduced to 4% (4.5% rounded down). *Deutschland's* undamaged DP rating is 298, so she suffers 11 damage points in the Resolution Phase of turn 1512 and rolls in the same Resolution Phase to see if the fire damage causes any new criticals. The German player should also roll during the Resolution Phase to see if he can reduce the severity of the fire.

Record the time the critical was inflicted and its severity as a percentage.

When figuring out what line of the table to use, look at the ship's in service date in Annex A. Also check the remarks to see if the ships has been reconstructed. For instance, the Japanese battlecruiser *Kongo* entered service in 1913, but was rebuilt in 1937, improving her resistance to fire and flooding. She should use the third line, covering 1925 and on.

- **Fire & Flooding Severity Levels.** Total up the percentage of the fire and flooding critical hits from either existing or newly inflicted hits. For example, a ship with two fires at 4% and 9% and a 3% flooding critical has a total percentage of 16%. This is the severity level. It affects how well the damage control teams will be able to fight the casualties, and if it's bad enough, will affect the ship's ability to move and fight.

The ship's damage control ability is affected by its size:

Size Class	Severity Level			
	Minor	Major	Severe	Overwhelmed
A - B	1 - 10%	11 - 15%	16 - 17%	18%+
C - D	1 - 8%	9 - 12%	13 - 14%	15%+
E - G	1 - 6%	7 - 10%	11 - 12%	13%+

These levels are modified by the age of the ship. Over time, designers have made ships more resistant to damage.

Ship In Service Date	% Reduction
≤1907	-2%
1908 - 1924	-1%
1925 - 1941	0%
1942 - 1959	+1%
1960+	+2%

Example: HMS *Hood* was built in 1920, so her severity levels would be 9%/14%/16%/17%

- If the severity of the fire criticals adds up to:
 - Minor*: Submarines must surface to ventilate the boat.
 - Major or worse*: Ships must cease flight operations, maneuver to put the wind 30° on either bow and slow to 15 knots or less. If they do not maneuver and reduce speed, add +2 to the die roll for reducing the fire. Submarines must surface.

When applying gunfire and visual detection modifiers at night, treat the ship as illuminated. It will also illuminate or silhouette other ships similarly to a flare or starshell.

Overwhelmed: The ship is suffering a "conflagration." There is a 25% chance, cumulative per Intermediate Turn, of the fire reaching the ship's magazines and causing an earth-shattering kaboom. A ship's player can prevent this by ordering the magazines to be flooded in the Plotting Phase. The ship loses all main battery, secondary battery, and aircraft ordnance. Only Light AA ammunition is unaffected.

- If the severity of the flooding criticals adds up to:
 - Major or worse*: Ships must slow to 15 knots or less. Submarines must come to shallow depth.

Submarines: If submarine flooding reaches the severe level, it has one chance to reduce the percentage, or it must surface.

Overwhelmed: The extensive flooding may cause the ship to capsize. There is a 25% chance per Intermediate Turn of the ship capsizing. The only way to prevent this is to reduce the level of the flooding to severe or less.

If the die roll fails, the ship will capsize.

- **Controlling Fires and Flooding:** Players can try to reduce/control fire and flooding critical hits in the Resolution Phase of the third Tactical Turn after the casualty is inflicted and the Plotting Phase of each Intermediate Turn that follows.

The ability of a ship's damage control parties to effectively fight casualties depends on how much stress they are under. On a large ship, one or two small fires are relatively easy to deal with. On the other hand, several large fires and flooding will be harder to manage. Therefore, the severity condition (the total of all fires and flooding on the ship) affects how well the damage control parties deal with the casualties.

Fire and Flooding Reduction Table

D10	Minor	Major	Severe	Overwhelmed
1	-2D6%	-2D6%	-2D6%	-D6%
2	-2D6%	-2D6%	-D6%	-D6%
3	-2D6%	-D6%	-D6%	-D6%
4	-D6%	-D6%	-D6%	NC
5	-D6%	-D6%	NC	NC
6	-D6%	NC	NC	+D6%
7	NC	NC	+D6%	+D6%
8	NC	+D6%	+D6%	+D6%
9	+D6%	+D6%	+D6%	+2D6%
10	+D6%	+D6%	+2D6%	+2D6%

"NC" means "No Change"

Players try to reduce fires and flooding by rolling a D10 once for all fires and once for all flooding (or roll red and blue D10s at the same time). This happens in the Resolution Phase of the third turn after the critical is inflicted and in each Intermediate Turn after that.

Compare the D10 rolls with the ship's severity level. This is how many dice must be added or subtracted from the fire and flooding criticals.

Example: A Royal Navy *Devonshire*-class armored cruiser has suffered two fire critical hits (5% total) and one flooding critical hit (4% total). The cruiser has a total secondary damage of 9%, which for a 1905-built Size Class B ship puts it in the Major severity condition. Rolling D10 for the fire casualties results in a "4" and the two fires will be reduced by D6%. Rolling another D10 for the flooding casualties results in a disappointing "9" and the flooding will increase by D6%.

- Assigning more men to fight the casualties: A ship can increase its damage control capability by taking crew from the weapons. A player can choose to draw people from the main or casemate batteries, which prevents the ship from firing those guns, or from the Light Battery crews, reducing the Light battery value to zero.

This will modify the effective total percentage of the casualties by half of the minor severity level. For example, a size class A or B ship has a minor rating of 10%. This means that he can reduce the total of the fire and flooding casualties by an additional 5%, which may be enough to reduce the severity level and improve his chances of controlling the casualties.

A ship can only do this once. There is not enough room to send more men, so the player can only increase the percentage once, by half the minor rating.

- Assistance from other ships. If another ship maneuvers within 100 yards of the damaged ship and matches its course and speed, it can assist in battling fires. Up to two ships may assist, one per side. As long as the ships' speed is below 10 knots, there is no risk of collision.

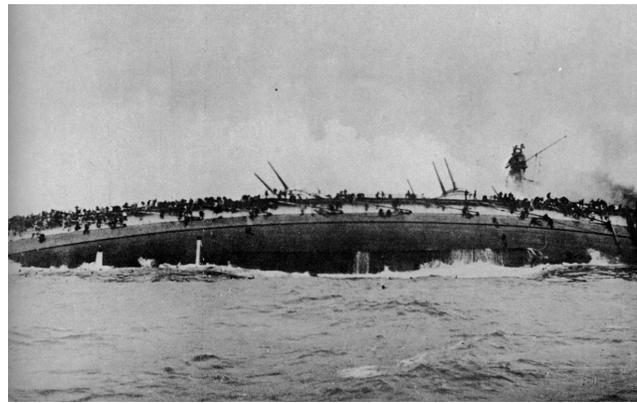
Each ship assisting in firefighting lends one-half of its minor rating to the other vessel.

Ships which themselves have any fires, including minor ones, or which have more than 50% damage, cannot assist in fighting fires on another ship.

Example: A British *Queen Elizabeth*-class battleship has suffered a number of fire and flooding critical hits. The



*HMS Queen Mary explodes at the Battle of Jutland
(The Fighting at Jutland)*



*SMS Blücher capsizing at the Battle of Dogger Bank
(US Navy)*

combined fire percentage is 16% and the flooding damage is 8%. The total of the two is 24%, which puts the vessel well over the 17+% level. The ship's damage control teams are overwhelmed.

The CO orders all light battery crewmen to fight the casualties. More attacks are likely so he cannot abandon the main or casemate batteries. Two escorting destroyers also approach to lend assistance.

By augmenting his damage control teams, the battleship's CO reduces (for purposes of the damage control rolls) his combined fire and flooding total to 19% (24% - 5%: half of the battleship's Minor capacity). Unfortunately, this is not enough, and the teams are still overwhelmed.

The two DDs assist the battleship. Each destroyer lends 3% (half of the DDs' Minor capacity value) to her and this drops the battleship's percentage (19% - 6%) to Major with an effective percentage of 13%. The battleship's crew now has a good chance to reduce both the fire and flooding critical hits and save the ship.

Note: Fleet tugs and similar vessels can lend their entire minor capacity to another vessel.

- National Effectiveness (*optional rule*). Different navies were more or less effective in training their crews in how to control flooding. These represent average values, and individual leadership or circumstances could change a crew's performance dramatically. Modify the D10 roll as follows:

German, Russian crews	-1
All other navies	0
A die roll of zero (10) is always treated as a 10, regardless of modifiers.	

8.3 Effects of Other Critical Hits. Critical hits take systems out of action, affecting the fighting capability of the target.

- *Aircraft.* An aircraft aboard the ship has been destroyed. There is also a chance that a fire has started. Roll D6-2% for the severity of the fire. A result of less than one means there is no fire.

Armed or Fueled Aircraft (optional rule) Hits on armed or fueled aircraft ready for launch roll on the fire critical with a +2 modifier instead of -2. If the D6+2% roll is a six or more, the ordnance on the plane explodes, inflicting 2/3 normal damage points on the ship (part of the damage to a ship comes from the kinetic energy of a weapon, not just its explosive power). If the ship is armored, the damage will not penetrate.

CARGO DAMAGE TABLE

<u>Contents</u>	<u>Roll</u>	<u>Result</u>
Ammo	1-2	D100% of the ammo is lost
	3-7	D100% ammo lost. Fire, add one to the fire severity and reduction die rolls. There is a 25% risk of explosion each following Intermediate Turn.
	8-10	Earth-shattering kaboom. Nearby ships take damage points according to the amount of ammo, in tons, in the hold. 500 yds away tons/5 dp 1000 yds away tons/25 dp 2000 yds away tons/200 dp If the ammo in one hold explodes, there is a 70% chance ammo in each other hold will explode. Fires or the chance of explosion can be stopped by flooding the hold, but all the cargo in that hold is lost.
Petroleum Products		Fire. Add one to the severity die roll for crude oil. If it is a refined product, add two. If it is avgas, add three. Add the same number to the reduction die roll.
Troops	1-3	DP casualties
	4-6	2 x DP casualties
	7-9	3 x DP casualties
	10	4 x DP casualties
General Supplies		DP/2 tons destroyed
Vehicles		DP/2 Destroyed
Aircraft		DP/5 Damaged

Closely Parked Aircraft (optional rule). Massed parked aircraft were especially vulnerable to attack. Normally, planes are parked in dispersed locations, or in revetments, with earth walls separating them. Sometimes, though, they are parked close together, such as at Hickam Field during Pearl Harbor, or on the flight deck of an aircraft carrier.

If there are other aircraft parked near a plane that has been hit (within 10 meters) there is also a chance that they were hit as well. The chance of a hit is one-half the modified chance to hit the first plane. Up to four other planes are also subject to attack.

If the attacked plane explodes because its ordnance detonates, the chance of another aircraft nearby (within 10 meters) being hit is 50%.

If the attacked plane burns, there is a 25% chance of the fire spreading to nearby (within 10 meters) planes.

- *Ammo/Fuel.* Roll D10, with a 1-3 indicating a hit in the aviation ordnance magazine, and a 4-10 is a hit in the fuel storage.

If the magazine was hit, roll another D10. A roll of 9 or 10 means that the magazine has detonated, destroying the ship.

If the aviation fuel storage tanks have been hit, there is a fire, adding two to the D6 roll for the severity of the fire. Also, add 2 when rolling on the Fire and Flooding Reduction Table.

The player has the option of flooding/gas purging the Ammo/Fuel stowage areas. This automatically puts out the fire, but the carrier cannot fuel or arm any aircraft for the

rest of the game.

- *Battery.* Some of the sub's battery cells have been damaged. Essentially, the battery casing has been cracked and the acid is leaking out and into the battery well bilge. This reduces the submarine's submerged endurance because the damaged cells are lost. To figure the percentage of submerged maximum endurance lost, roll D6*5% (max loss of 30% per battery critical). Split the loss proportionately between charged and depleted cells.

- *Bridge.* The main conning station has suffered a catastrophic hit. It takes D6/2 Tactical Turns (one turn on small craft) to correct casualties and re-man the bridge. After the casualty has been corrected, all changes to course and speed take Two Tactical Turns to execute (normal execution on small craft). There is a fire critical hit, subtracting two from the severity roll, in the bridge/control room.

Submarines lose all fire control solutions, and come to periscope depth. Submarines broach (involuntarily surface) for that Tactical Turn on a roll of 1 on D10.

Carriers cease flight operations for D6/2 Tactical Turns.

On small craft, the captain has been hit. If more than one captain is aboard, or if the commodore is embarked, roll randomly to see who is hit.

- *Cargo.* Some of the ship's cargo has been destroyed. If possible, allocate cargo to a hold/tank, then determine which hold or tank was hit. Refer to the cargo damage table to see what the results are.

On small craft, one-quarter of the cargo is destroyed.

- *Casemate.* One of the ship's casemate guns has been knocked out (the armor protection for casemate weapons is 2/3's the belt armor value). Roll D10. On a 1-2, the fire control (if fitted) for the casemate battery has been knocked out (armor penetration not required). On a 3-0, one of the casemate guns is out of action. Roll D10 again. On a roll of 9 or 0 the ready ammunition detonates, inflicting two times the Short range HE damage to the ship. Roll randomly to see which gun has been disabled. (Optional) For the navies of France, Great Britain, Italy and Japan, add one (+1) to the die roll because they used a picric acid-based explosive in some or all of their shells.

Some ships lost their entire casemate batteries on one side during WW I because of chain-reaction explosions.

If a casemate gun's ready ammunition detonates there is a chance the explosion will damage adjacent casemate mounts. Roll 2D6 and consult the table below to see how many guns are affected. For each gun that is affected, roll D10 to see if the ready ammo also detonates (9 or 0). If this happens roll 2D6 again. Continue this procedure until there are no more explosions.

<u>2D6 Die Roll</u>	<u>Additional Guns Damaged</u>
2 - 5	None
6 - 8	1 gun
9 - 11	2 guns
12	3 guns

• **Communications.** One of the communications systems has been hit. Roll D10 on the following table:

- 1-2: Port signal lights destroyed
- 3-4: Starboard signal lights destroyed
- 5-6: Port signal halyards destroyed
- 7-8: Starboard signal halyards destroyed
- 9: Main Wireless (WT)/radio (RT) (if fitted) destroyed
- 10: Auxiliary Wireless (WT) (if fitted) destroyed

• **Engineering.** Roll D10. On a 1-9, the ship's engineering plant has been damaged. Reduce speed to the next lower level on the Damage and Speed Breakdown chart. A fire critical hit, subtracting two from the severity roll, has started in the engineering spaces.

On a roll of 0, there has been a boiler explosion. The ship receives 25% of its original total in damage points, drops one level on the Speed Breakdown chart and has a fire critical hit.

• **Fire Control.** The fire control system has been damaged (main, secondaries or backup). Size class A ships lose one of the directors controlling that gun (roll randomly). Ships with only one director for that gun type lose it, and all guns of that type are forced to operate in local control.

• **Flight Deck.** Roll D6. Hits are either forward (1-2), amidships (3-4) or aft (5-6). Hits forward restrict the ability to launch aircraft. Hits aft will prevent aircraft from landing.

If aircraft are stowed in the location which is hit (forward for landing, aft for launch), roll D6 to see how many are hit. Treat each plane hit as an aircraft critical hit.

Damage to flight decks can also cause damage in the hangar deck. If the carrier has an armored flight deck, only armor piercing bombs may penetrate and cause hangar damage. If the bomb can penetrate, roll D10. On a 1-5 there is no hangar damage, on a 6-10 aircraft in the hangar are hit. Roll D6 to see how many aircraft are hit as well. Treat each plane hit as an aircraft critical hit

• **Flotation.** This reduces a small craft's speed by one level on the Damage/Speed Breakdown Chart. Size class E boats can take six flotation hits, Size class F boats take five, and Size class G boats take four. When a small craft has no flotation hits left, it sinks.

• **Fuel Tank.** A fuel tank has been hit. There is a 30% chance of a fire Critical Hit. Subtract 10% if it is diesel fuel, add 30% if it is gasoline. If there is a fire, roll D6+2 for the fire's severity.

• **Hull Deformation.** Shock has deformed or dished in part of the sub's pressure hull. Because the hull cross-section has lost its circular shape, it can no longer withstand the maximum design depth. The submarine must come to Intermediate Zone I as fast as it can. If a submarine chooses to stay at a depth greater than Intermediate Zone I there is a 25% chance per depth zone below Zone I of the hull failing (treat as a hull penetration). A second hull deformation critical hit restricts the submarine to Shallow. The chance of the hull failing increases to 30% per depth zone below Shallow. A third hull deformation critical hit is treated as a hull penetration critical.

• **Hull Penetration.** The submarine's hull has been ruptured and it experiences uncontrollable flooding. If the submarine is at Shallow or Intermediate Zone I it has a 50% chance of making it to the surface so the crew can abandon ship. The sub will then take D10*2 Tactical Turns to sink. If the submarine is at deeper depths, she sinks with the loss of all hands.

• **Main Battery.** Roll D10. On a 1-2, the fire control for the main gun battery has been knocked out (armor penetration not required). See 8.2.10. On a 3-0, one of the gun mounts/turrets in the main battery is out of action. Roll D10 again. On a roll of 9 or 0 the magazine detonates, destroying the ship. Ships within 300 yards of the exploding ship suffer damage equal to the battery's HE damage at Short range.

If a main battery mount/turret is hit, roll randomly to see which one is destroyed. All mounts/turrets are counted, even if they are already out of action. If the mount has already been destroyed, no further damage is inflicted. If the main battery is also the Area AA battery, see also 8.2.16.

(Optional) Because some navies exercised poor flash protection procedures and/or used a picric acid based explosive in some or all of their shells, one of the following modifiers is applied to the main magazine detonation die roll. This modifier is only applicable to A, B and C size class ships.

<i>Nation and Time Period</i>	<i>Die Roll Modifier</i>
Austria-Hungry:	
1914 to Mid-1915	+1
Late-1915 to 1918	+0
France: 1914 to 1918	+1
Germany:	
1914 to Early 1915	+1
Germany	
Mid-1915 to 1918	+0
Great Britain:	
1914 to Mid-1916	+2
Late 1916 to Mid-1917	+1
Late 1917 to 1918	+0
Italy: 1914 to 1917	+1
Italy: 1918	+0
Japan: 1914 to 1918	+1
Russia: 1914 to 1918	+0
United States: 1914 to 1918	+0

• **Other Weapon.** One of the weapons listed for the ship in Annex A, except a main battery or casemate, has been knocked out. Roll randomly to find out which mounts have been hit. Previously hit mounts can be hit again. If the mount has already been destroyed, no further damage is inflicted. If there are no applicable weapons, ignore the critical.

AA and Light Batteries have their strength reduced by 1/3. There is no chance for a magazine explosion with these light guns.

• **Personnel.** One of the six crew factors is incapacitated. Players should track the number of crew factors lost:

1st Loss: No effect

2nd Loss: One light weapon (20mm or less) must be abandoned and cannot be used for the rest of the battle.

3rd Loss: Two light weapons or one heavy weapon (23mm or larger) must be abandoned. Increase the D6 roll by 2 for the severity of all fires.

4th Loss: The boat must stop all weapons fire and make every possible effort to escape combat at maximum possible speed. Increase the D6 roll by 2 for the severity of all fires. Reduce the chance of correcting fires by 2 on the

D10 roll (add 2 to the die).

5th Loss and higher: Boat leaves the area at current speed. Increase the D6 roll by 2 for the severity of all fires. Reduce the chance of correcting fires by 2 on the D10 roll.

- *Rudder.* The ship's steering or control surfaces have been damaged. Surface ships roll D6:

1 - 3: *Jammed:* The rudder is jammed in whatever direction the ship is currently moving. If the ship is steering evasively or otherwise maneuvering with both left and right rudder, roll randomly for the direction of the jam: 1-2 port, 3-4 straight, 5-6 starboard.

4 - 6: *Disabled:* The ship's steering engine has been hit. Maximum speed is reduced to 1/3 of the ship's undamaged speed. Maximum course changes after moving the required advance are reduced from 45° to 15°.

Submarines lose depth control. A submerged submarine has a 5% chance times its speed to involuntarily change depth. Roll before each Plotting Phase. If the submarine does accidentally change depth, roll D10. 1-5 it goes up one level, 6-10 it goes down one level. The submarine will not exceed crush depth. A submarine which is at periscope depth and goes up one level will broach, but will automatically dive the following turn, unless another 'up' roll occurs.

- *Sensor/Communications.* Roll D6: 1 - 3 Sensor critical hit, 4 - 6: Communications critical hit.

- *Sensors:* One of the ship's sensors is destroyed. Roll randomly to determine which one is affected.

1 - 4: One forward searchlight platform

5 - 8: One after searchlight platform

9 - 0: Sonar

Note: Size class C&D ships only have one forward and one aft searchlight platform.

- *Switchboard.* Fuses blow, causing the submarine to lose most of its electrical equipment. The sub cannot launch torpedoes, change depth or course, and it loses propulsion (decelerates to speed zero). It takes D6/2 Tactical Turns (round up) to replace the fuses.

- *Torpedo or ASW Weapon.* A torpedo mount or depth charge rail. Roll D10. On a 9 or 0, the mount's ammunition explodes, doing half the number of weapons warhead's present worth of damage to the ship. If the mount has fired all of its weapons, there is no danger of explosion.

If a torpedo or ASW weapon does detonate, and the mount is above the waterline, treat the warhead damage as a bomb or gunnery attack for critical hit purposes. In other words, do not roll on the DC or torpedo attack table, since these columns assume underwater impacts. Use the critical hit column that best matches that ship's type.

If a torpedo in the tube detonates, and is below the waterline (either on a sub or a surface ship) it inflicts an automatic flooding critical, and the damage points should be applied as underwater damage. Battleships with submerged torpedo tubes should ignore any torpedo protection system they are fitted with.

- *Weapon.* One of the ship's weapons has been knocked out. Check the total number of mounts carried by the ship and roll randomly to see which one has been hit. Refer to that weapon's critical hit section for its effects.

8.4 Repairs. Damage cannot be repaired during a battle, except to stop fires and flooding. Some damage,

especially to sensors and weapons, may be correctable after battle. Damage to the ship's structure is not repairable, except in port. Some connected with flotation damage from flooding can be removed by pumping the water out.

To find the chance of repairing a system take the ship's remaining damage points and divide them by the ship's original damage points. This is the Repair Roll. Roll D100 for each critical. A D100 roll less than or equal to the Repair Roll means the system has been repaired and is operational. Early attempts to repair, at the 6- or 12-hour points, halve the Repair roll.

For example, a ship with 37 damage points remaining out of 100 original points has a 37% Repair Roll. Attempting to repair a system at 6 and 12 hours after the battle, the player has an 18% chance (37%/2) of fixing the problem. At the 24 and 48-hour points, he has a full 37% chance.

- *Weapon Mount.* Make Repair rolls 6 hours, 12 hours, 24 hours, and 48 hours after the battle is over. If a system is hit or damaged again before the roll is successful, compute the new roll and start over. Failure to successfully roll the 48 hour Repair roll means that the system cannot be repaired at sea.

- *Sensor/Communications.* Make Repair rolls 6 hours, 12 hours, 24 hours, and 48 hours after the battle is over. If a system is hit or damaged again before the roll is successful, compute the new roll and start over. Failure to successfully roll the 48 hour Repair roll means that the system cannot be repaired at sea.

- *Flooding.* Remove one half of the flooding damage points automatically (they pump the water out), but there is a chance of the patch popping. Subs must stay at Periscope depth or the patch pops automatically. The chance for surface ships equals the (sea state x 5%) - (30 - maximum speed that day in knots)%.

A failing patch inflicts a flooding Critical hit.

Example: A ship with a flooding patch spends one Intermediate Turn at 20 knots in sea state 3. The chance of the patch popping is (3 x 5%) - (30 - 20)% = 15% - 10% = 5%, a low chance. If the sea state were 6, though, the chance would be (6 x 5%) - (30 - 20)% = 30% - 10%, or 20%. It pays to reduce speed in rough weather when you have holes in your ship.

- *Fire.* A fire may restart at the 6- (10%), 12- (5%), 24- (2%), and 48-hour (1%) marks. Find out the size of the fire by rolling D6-2 as described in 8.2. Use this procedure for all fires (except planes). Aircraft fires cannot restart.

- *Engineering.* Make repair rolls 6 hours, 12 hours, 24 hours, and 48 hours after the battle is over. If a system is hit or damaged again before the roll is successful, compute the new roll and start over. Failure to successfully roll the 48 hour repair roll means that the system cannot be repaired at sea.

- *Bridge.* Repair rolls are made at the 12 hour, 24 hour, and 48 hour marks. A fire on the bridge is resolved according to 8.3.4. Degraded operations are allowed automatically 1 hour after the critical hit was taken. Two Tactical Turns are needed to change course and the aircraft land/launch rate is halved. Normal operations are allowed after the repair roll is successfully made.

- **Rudder.** During the battle, the player can attempt to unjam the rudder by rolling a D10:

Make the first roll D6 Tactical Turns after the critical hit is inflicted. In the first turn (after D6 Tactical Turns), the chance of unjamming is 20%. The next turn, it is 40%, and the third turn, it is 60%. If the rudder is still jammed after the third roll, it cannot be freed during the battle.

Make Repair Rolls 6, 12, 24, and 48 hours after the battle is over. Failure to successfully roll the 48 hour Repair Roll means that the system cannot be repaired at sea.

- **Flight Deck.** Make a repair roll at the 12-hour, 24-hour and 48-hour marks after the battle for each flight deck critical hit. If a system is hit or damaged again before the roll is successful, compute the new roll and start over. Failure to successfully roll the 48-hour repair roll means that the system cannot be repaired at sea.

- **Aircraft.** Destroyed planes have a 50% chance of being only damaged and repairable under the rules in 8.7 (unless the plane's fuel or ordnance exploded).

- **Cargo.** Cargo cannot be repaired.

8.5 Equipment Serviceability (*optional rule*). Just before beginning the game (or daily in a campaign game) roll D100 for the engineering plant, each sensor, and each weapons system on the ship. First rank navies experience failures at 5%. Second rank navies have failures at 10%.

The failed item cannot be repaired during the tactical game. During non-battle periods it can be repaired as a critical hit of that type using the Breakdown Repair Table. Systems not repaired within 48 hours cannot be repaired at sea.

At a forward base, systems could be repaired alongside a tender (+20% to the roll). At a more established port, or shipyard, add 30% to the Repair Roll.

Damaged aircraft also use the Breakdown Repair Table. If the plane cannot be repaired in 48 hours it cannot be repaired at sea. Land-based aircraft have 10% added to the repair roll, and are not subject to the 48-hour limitation.

BREAKDOWN REPAIR TABLE

Time Since Breakdown (hours)	6	12	24	48
First rank navies:	25%	30%	35%	40%
Second rank navies:	15%	20%	25%	30%

First rank navies: US, Great Britain, Germany, Japan, Russia

Second rank navies: Austria-Hungary, Turkey, France, Italy and all others

8.6 Search and Rescue (*optional rule*). Players who want to realistically play the role of a naval commander should feel compelled to find and recover survivors from sunken ships and aircraft that have been shot down. The effect this can have on a longer game is dramatic.

These rules create a group of survivors which must be rescued. The exact number is not carefully modeled. More important is that fact that they exist and must be found and saved. This takes resources and time.

If an aircraft is destroyed, place a group of survivors near the spot where it goes down. Small aircraft will have crews of one to three, while medium- and large-sized

planes can have up to ten or twelve men inside. If it is a passenger aircraft, it may have as many as thirty or more. Round numbers of survivors above ten to the nearest tens, e.g., twelve becomes ten, twenty-five becomes thirty.

If a ship is sunk, D6*10% of its crew survive. Magazine explosions or other spectacular destructions reduce the number to a D6% roll. If another ship is alongside or within 250 yards of the sinking vessel, and is stationary, increase the number of survivors by 20%.

Place a counter marking the location of the survivors on the spot where the ship is sunk or the plane goes down. In a short game, the counter is stationary, but if the survivors are in the water more than six hours, roll D6 for the speed of the current in knots, and randomly for its direction, consistent with the local geography.

Unless the ship or aircraft is in sight when it is lost (and the survivor marker is placed), the survivors must be searched for. At night or in poor visibility, this will be difficult and even with their general location known it will mean a lot of effort.

When resolving sighting attempts, groups of less than ten men are treated as a size class G. Ten to thirty men are treated as a size class E. Thirty to one hundred men are treated as size class D, and one hundred or more are size class C. Remember to apply the sighting modifier for no wakes (half range).

Survivors in the water may be wounded, suffer from exposure, and may even be subject to shark attack. Even so, unless the environment is extreme (the North Atlantic in the Winter) survivors can last for many days, or weeks if they have a little food or water. In a tactical game, survivor endurance does not need to be modeled.

Once found, a flying boat can land in the water, taxi over, and pick up ten or less survivors in D6 three-minute Tactical Turns. A ship can pick up many more survivors, D6/2 groups of 10 each Tactical Turn. It must be stationary and upwind of the survivors. This creates a lee for the recovery, and also ensures that the ship won't drift downwind from the recovery site.

Recovery is slowed by high waves. Reduce the die roll by one for every sea state level over two. For example, in sea state 4, the die roll would be (D6-2)/2.

A ship can hold as many survivors as its own crew or passenger complement. Practically, this will have a long-term effect on the ship's performance and endurance, but in a tactical game these can be ignored.

If survivor rules are used, rescuing survivors should count as part of the players' victory conditions. Resolving actions and results can be very subjective, but search and rescue is an important factor in real naval battles.

8.7 Aircraft Damage Resolution

 (*optional rule*).

Normally a killed/damaged roll is made after the battle, because historically many of the aircraft that were "shot down" did make it back, even though they took no further part in the battle. This is definitely the best procedure in most games, both for simplicity and to mirror actual doctrine. Pilots who chased down cripples to finish them off abandoned their comrades still in combat, and also ignored other enemy aircraft that could still accomplish their mission.

If players want to finish off the stragglers, they have to know they are not dead, which means the aircraft damage

roll must be made immediately after the hit. Resolving this during the combat will definitely slow play down, and if large numbers of aircraft are involved, it could bring the game to a crashing halt.

Either use the rules in 7.0.4 to generate a simple destroyed/damaged result, or each time an aircraft is hit, roll on the following table:

- 1 - 5: Destroyed.
- 6: Critical damage
- 7 - 8: Heavy damage
- 9 - 0: Light damage

Destroyed: People hear a large untidy noise. Pieces fall off. There is a large fireball, following which it disappears from sight. It immediately ceases to fly and falls to the earth. It's dead, Jim.

Critical: The only thing keeping this plane in the air is the pilot's ignorance of how badly damaged it really is. It cannot use any speed over cruise. All weapons systems, sensors, and defensive countermeasures are down. Its Maneuver Rating is 0.5/0.0, depending on whether it is lightly or fully loaded (hint!).

Heavily damaged: This aircraft's ability to fly is severely impaired. It cannot use any speed over cruise. All weapons and sensors are down. Its Maneuver Rating is halved, minimum 0.5/0.5.

Lightly damaged: This plane can no longer accomplish its mission. Roll D6 on the following table:

1: Pilot wounded. Cannot attack, Maneuver Rating reduced by 1/3.

2-3: Engine damaged. It cannot use any speed over cruise. Maneuver Rating is halved.

4-5: Aircraft structure damaged. It cannot use any speed over cruise. Maneuver Rating is 0.5/0.5.

6: Offensive weapons system damaged. It cannot release any ordnance offensively. There is a 50% chance that it cannot jettison any ordnance, either.

The first hit imposes the listed casualty. Later hits add to the severity of the damage:

- Any hit on a Critically damaged aircraft kills it.
- Heavy Damage to a Heavily damaged aircraft kills it.
- Heavy Damage to a Lightly damaged aircraft makes it Critically Damaged.
- Light Damage to a Heavily damaged aircraft makes it Critically Damaged.
- Light Damage to a Lightly Damaged aircraft, if it is not the same type, makes it Heavily Damaged. If it is the same result, ignore it.

If players use the 50/50 system, treat all damage as Heavy damage, i.e., a second hit kills the aircraft.

Obviously, this ruthlessly oversimplifies the many horrible things that can happen when aircraft and exploding warheads interact, but it will define how an aircraft that has been "hit" behaves after a battle.

After resolving its damage, the players continue their turn with damaged aircraft behaving as indicated. In most cases, damaged aircraft will head in the general direction of away, but a plane with light damage resulting in a sensor or weapons hit might stay in the fight, to help distract or decoy their opponent. This happened historically.

Common sense should apply. If somebody wants to

follow a "kill" to finish him off, then he's out of the dogfight. If a player with a crippled plane wants to stay in the fight ("I'm already dead, so I might as well suck up another attack"), activate the secret autopilot that takes control of the plane and heads it toward home.

8.8 Airship Damage. Because they do not depend on airfoils to remain airborne, and because of their size, a successful hit on an airship does not automatically mean it is shot down, even if it has hydrogen in its cells. Like warships, airships are subject to critical hits.

As described in 7.3.8, the attacker must declare whether he is aiming for the gondola or the envelope. If an aircraft gun or AA gun rolls a "hit" against an airship, it is considered to have inflicted a critical hit (it would normally be enough to bring down a conventional aircraft). Each hit by a plane or AA gun inflicts a critical hit.

Roll for each critical hit on the Airship Critical Hit Table. This table tells exactly what has been hit, and the descriptions below provide their effects:

Airship Critical Hit Table

<i>Die Roll</i>	<i>Gondola</i>	<i>Envelope</i>
1-2	Engine	Gas Cell*
3	Engine*	Gas Cell*
4	Fuel	Gas Cell*
5	Fuel*	Gas Cell*
6-7	Control	Gas Cell*
8	Control	Gas Cell
9	Comm.	Gas Cell
10	Weapons	Gas Cell

Starred (*) items start a fire, in addition to the listed critical. If the envelope is filled with helium, ignore the fire.

• *Control:* Roll D6. On a 1-2 the airship loses elevator control, on a 3-4 it loses rudder control, on a 5 it loses valving control, on a 6 it loses ballast control. Airships without elevator control cannot control their height. Each Tactical Turn the ship must roll to see if it randomly climbs or dives an amount equal to half the maximum rate, or remains level. Airships without rudder control can steer using the engines by halving their speed (to 50% of maximum). Airships without valving control cannot release gas to descend. (The airship commander can always order any number of cells to be "ripped," which involved the crew ripping out special panels to vent all the gas in a cell at once.) Airships without ballast control cannot release ballast to lighten ship, although they can always jettison fuel, ordnance, or mission equipment.

• *Communications:* The airship's wireless or associated equipment is destroyed. It can still communicate by signal lights or message streamer.

• *Engine:* One of the airship's engines is destroyed. Reduce its maximum speed at all altitudes proportionately. If the airship has no rudder control and no other engines on the same side as the damaged one, it will circle in that direction. If it has rudder control, but no other engines on that side, it must throttle back to half remaining speed on that side to maintain control.

• *Fire:* A fire in a hydrogen-filled envelope means the ship is lost immediately. Helium envelopes will not burn.

If the fire is in the gondola, roll D10 in the Plotting Phase of each Tactical Turn. If the airship uses hydrogen, there is a 30% chance the fire spreads to the envelope and the ship is lost (8,9, or 10 on the die). There is a 50% chance it is extinguished (1-5 on the die). If it is not extinguished, roll once on the Airship Critical Hit Table in the Resolution Phase for one additional Critical Hit.

• *Fuel:* One-quarter the airship's maximum fuel is lost. If the airship has used up one-quarter or more of its fuel, see which tanks have been hit by rolling dice. If all fuel is lost, the airship drifts with the wind, losing all elevator and rudder control. It can still valve gas and drop ballast.

• *Gas Cell:* One of the airship's gas cells has been ruptured. Annex B2, Airships will tell how many cells each airship has. Roll randomly to see which cell has been hit, since one cell might sustain several simultaneous hits. The effect of the loss depends on how many cells have been lost:

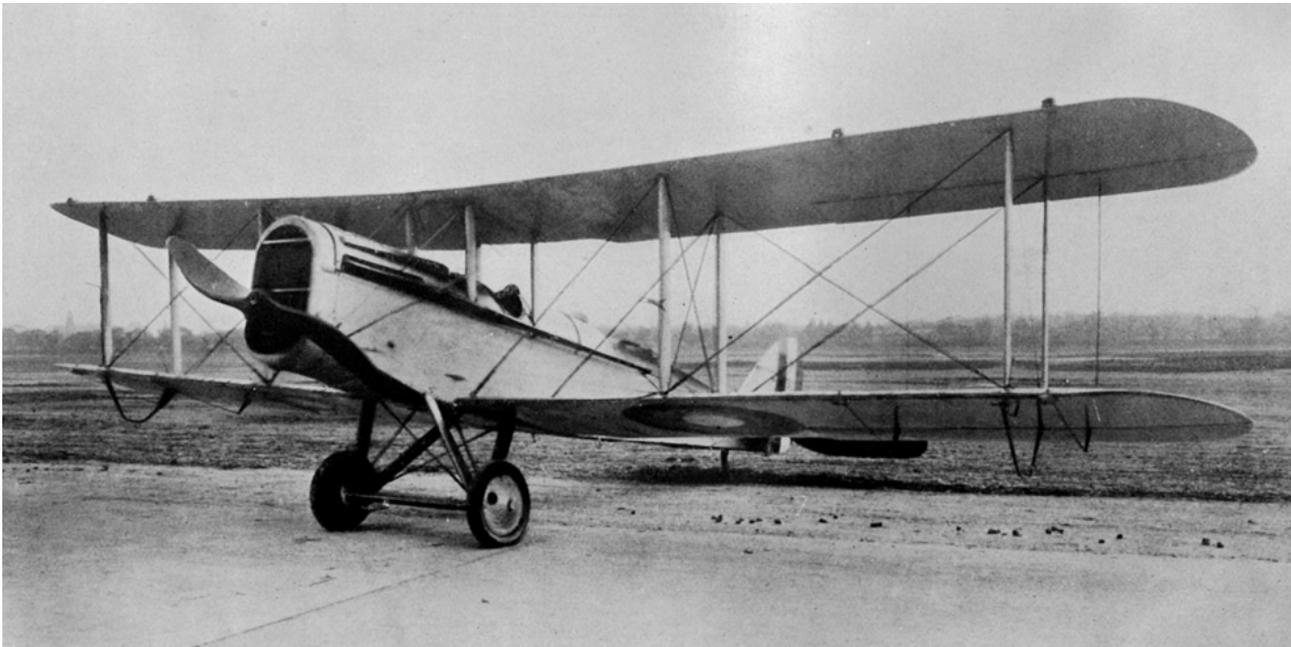
24% or less: No effect

25 - 49%: The airship may not climb.

50%+: The airship must descend at maximum rate of descent.

75%+: The airship is in an uncontrollable dive at three times the maximum rate of descent.

Players may compensate for the loss of one cell by dumping all ballast, all payload and throttling to maximum speed to generate lift over the envelope.



De Havilland-4 Reconnaissance and Day Bomber Aircraft

(US Dept of War)