

# Jaws of the Dragon Rulebook

Powered By Evan's Wargaming Operational Campaign System (EWOKS) v2.3

Written by Evan D'Alessandro © 2023

## Assumptions

1 turn = 1 day

1 hex (Operations Map) = 100 miles, which is approximately 150 km (161 km = 100 mi, but 150 is easier to use as a yardstick for players)

1 hex (Taiwan Map) = ~ 1/6<sup>th</sup> of a hex on the Operation map = ~ 17 miles = 30 km

Unit	Constituent Units	Missiles <sup>1</sup>	Notes
CSG	1 carrier + 4-5 ships <sup>2</sup>	3 Atk., 5 Def.	Roughly 400 VLS cells.
ESG	2 amphib + 4-5 ships	3 Atk., 5 Def.	Assumed to have embarked 1 marine battalion unless explicitly disembarked. Roughly 400 VLS cells.
SAG	4-5 ships	3 Atk., 5 Def.	Roughly 400 VLS cells.
Missile Boats	6 Missile Boats <sup>3</sup>	1 Atk.	Any sort of ships using hit and run tactics (incl. corvettes, frigates)
Submarine	1 submarine	1 Atk. (SSGN 6)	US subs (LA, Virginia) tend to have 12 LACM, Seawolfs carry 50 torpedoes/LACM
Land Units	Brigade Size		Logistics, air defense, etc. abstracted. While frontages are quite wide here 4 units per hex would allow for a "continuous line" to be formed. <sup>4</sup>
US MLR	N/A	1 Atk.	
Air Units	Squadron		Tankers, AWAC's, BACN, EW, SEAD (generally), drones, etc. abstracted, <b>but assumed to happen as/be a part of operations</b> . 12 5 <sup>th</sup> gen aircraft, 16-18 all other gens.
Bombers	US 6, Chi. Regiment		# based around 100 missiles, B-1's can carry 24, B52's 20, B2's 16, HK-6's can carry 6 YJ-12

## Movement

Unit	Movement	Notes
CSG, ESG, SAG	6 hexes/day	25 knots
Submarines	3/6 hexes/day	Can sprint 6, but more detectable. Normal slow speed + need to get coms limits stealthy movement.
Land Units (Rotating)*	0 [1] hexes/day	
Land Units (Cross Country)*	1 [5] hexes/day	
Land Units (Road)*	2 [11] hexes/day	TRADOC Pamphlet 350-14, September 1994, Heavy Opposing Force (OPFOR) Operation Art Handbook <sup>5</sup>
Land Units (Rail)*	5 [27] hexes/day	TRADOC Pamphlet 350-14, September 1994, Heavy Opposing Force (OPFOR) Operation Art Handbook <sup>6</sup>
Embark Units on Ships	1/day/per port	Gross abstraction
Squadron Changing Air Sectors	1 day	Gross abstraction

\* Numbers in [#], are the numbers for use on the Taiwan map with its smaller hexes.

## Detection / Tracking<sup>7</sup>

Approximate locations of units in hexes are always known, sea units can only be engaged however if they are tracked.

*Surface Ships* (single units or a task force):

- If inside the First Island Chain, on a d10 roll the # of hexes or higher to the nearest friendly country or carrier to track.
- If outside the First Island Chain, roll a d10. On a 1 or 2 they are tracked. +1 if the target is a carrier conducting flight operations.<sup>8</sup>
- If ships are in the same hex, roll a d10, on a 2+ they are tracked.
- Ships in port are always tracked.

*Submarines*

- See the detection section of Undersea Combat.

*Land Units* and *Air Units* are always tracked.

## Weather<sup>9</sup>

Represents predominate weather conditions for each Air Theater.

### Clear

- No Effects.

### Cloudy

- Tracking rolls have -1, all Air Strikes have a 10% chance to fail.

### Rain

- Tracking rolls have -2, all Air Strikes have a 30% chance to fail.

### Storms

- Tracking rolls have -4, all Air Strikes have a 50% chance to fail.

## **Rigid Game Turn Sequence**

1. Detection / Tracking
2. Cyber / Space / SOF
3. Salvo Missile Fire
4. Air
5. Sea
6. Land

# Sea Movement

Unit	Movement	Notes
CSG, ESG, SAG	6 hexes/day	25 knots
Submarines	3/6 hexes/day	Can sprint 6, but more detectable. Normal slow speed + need to get coms limits stealthy movement.

# Sea Combat (d10)<sup>10</sup>

Missile Ranges (**MUST HAVE DETECTED ENEMY TO SHOOT**)

Important Info		Unimportant Info	
Missile Type	Range	Missiles/Salvo	Notes
<b>Chinese AShM</b>	2 hexes	95	Assumed to be either YJ-12 (supersonic) or YJ-91 (sea skimming, supersonic), average range is about 200mi (2 hexes).
<b>US AShM</b>	1 hex	115	Assumed to be Tomahawks II or II+ (sea skimming)
Sub AShM	1 hex	By Nation	Have to have better targeting so must be in same hex.
<b>C Carrier J15</b>	3 hexes	<b>1 Atk. Missile</b> <sup>11</sup>	J-15 combat radius is 647 nautical miles, though at full combat load launching from a carrier it's going to be shorter due to the weight restrictions of the STOBAR system of Chinese Carriers <sup>12</sup>
<b>US Carrier F-18</b>	5 hexes	<b>1 Atk. Missile</b>	F-18 combat radius w/ drop tanks is ~450 nautical miles <sup>13</sup>
<b>US Carrier F-35</b>	6 hexes	<b>1 Atk. Missile</b>	F-35 combat radius is 1000km <sup>14</sup> (600mi)
<b>Chinese LACM</b>	18 hexes	?	Based on CJ-10 Range <sup>15</sup>
<b>US LACM</b>	10 hexes	30(ish)	Based on Block IV/V Tomahawk (900 nm range) <sup>16</sup>

Roll type = Offensive missiles – ½ Defensive missiles\*<sup>17</sup>

\*When Subs shoot, they resolve as if **Defense is equal too** at a minimum on the table below<sup>18</sup>

D10 Roll <sup>19</sup>	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	- 8 -	- 9 -	- 10 -
<b>If Defense greater</b>	1 Damage	1 Damage	-	-	-	-	-	-	-	-
<b>If Defense is equal</b>	2 Damage	2 Damage	1 Damage	1 Damage	1 Damage	1 Damage	-	-	-	-
<b>If Defense less than</b>	3 Damage	3 Damage	3 Damage	3 Damage	3 Damage	3 Damage	2 Damage	2 Damage	1 Damage	1 Damage

Excess damage carries over to other units in the same task force

Type	1st Damage	2nd Damage	3rd Damage <sup>20</sup>
<b>SAG</b>	<ul style="list-style-type: none"> <li>Loose half (1/2) missiles</li> <li>Speed half (1/2)</li> </ul>	Sunk	-
<b>CSG (Carrier)</b>	<ul style="list-style-type: none"> <li>Loose half (1/2) missiles</li> <li>Speed half (1/2)</li> <li>Half (1/2) sortie generation</li> </ul>	<ul style="list-style-type: none"> <li>Lose remaining missiles</li> <li>Speed one-quarter (1/4)</li> <li>No sorties</li> </ul>	Sunk <sup>21</sup>
<b>ESG (Amphib)</b>	<ul style="list-style-type: none"> <li>Loose half (1/2) missiles</li> <li>Speed half (1/2)</li> <li>Carried units damaged</li> </ul>	<ul style="list-style-type: none"> <li>Lose remaining missiles</li> <li>Speed one-quarter (1/4)</li> <li>Carried units destroyed</li> </ul>	Sunk
<b>Missile Boat Squadron</b>	<ul style="list-style-type: none"> <li>None</li> </ul>	Sunk	-

# Submarine Combat (d20)<sup>22</sup>

## Detection Table

Roll if:

- The sub attempts to attack, cuing for a strike by long range fires, or shadow a unit.
  - Use below table
- For each enemy unit with detection capabilities (Sub, CSG, ESG, SAG) the sub is in the same hex as.
  - Roll a d20: on a 1 the sub has been detected.
- The sub is inside an Air Sector that the enemy have superiority or supremacy in<sup>1</sup>
  - Use table below for *ASW Fixed Wing*<sup>23</sup>
- The Sub is in a hex with an unfriendly city
  - Use table for *ASW Rotary*

Water Depth (modifies the number rolled on the die)<sup>24</sup>

- Shallow Water = +3
- Medium Water = +0
- Deep Water = -6

Roll higher than or equal to the number on D20 to detect the target. Roll twice and take better result if sub is sprinting:

ASW Table (d20)<sup>25</sup>

	US/Allies				CN*					Platforms				
Hunter ► Hunted ▼	*US Sub	SAG	CSG	ESG	CN Nuke Sub	CN Diesel Sub	SAG	CSG	ESG	Civilian	Counter fire	ASW Fixed Wing	ASW Rotary	ASW Surface
<i>Seawolf</i>	-	-	-	-	18	16	18	18	18	20	17	19	19	19
<i>Virginia</i>	-	-	-	-	17	15	18	18	18	20	16	19	19	19
<i>Los Ange</i>	-	-	-	-	15	14	17	17	17	20	12	18	18	18
<i>C Type93</i>	4	9	8	9	-	-	-	-	-	19	5	10	8	15
<i>C Diesel</i>	3	14	11	15	-	-	-	-	-	20	5	10	8	14
<i>Japan</i>	-	-	-	-	16	15	18	18	18	20	10	14	12	16
<i>Vietnam</i>	-	-	-	-	10	8	13	12	15	19	9	5	7	4

\* If inside Chinese SOSUS line add +1

\* US SOSUS line detects as US sub

## Attack Table (only use if sub is detected)<sup>26</sup>

For Subs vs. Subs and ASW vs. Subs. If sub shoots at another sub, use Counterfire to see if shooting sub is detected, and the attacked sub can fire in response.

D20 Roll	1 to 9	10	11 to 20
Effect	<i>Sub Sunk</i>	<i>Half (1/2) movement +10 on rolls to be detected</i>	<i>Sub Escapes, may not attack again this turn.</i>

<sup>1</sup> Superiority or supremacy (or the lack of) is the judgment of the players or air umpire.

## Air Movement

Unit	Movement	Notes
Squadron Switching Sectors	1 day	Gross abstraction <sup>27</sup>

## Air Combat (d10, d20)<sup>28</sup>

Carrier Air uses a range system rather than sector system, see Sea Combat for details.

Squadrons<sup>29</sup> can either be at full strength, damaged,<sup>30</sup> or destroyed (if a Squadron is damaged and suffers a second damaged it is destroyed). When damaged they roll two d10 and use the worse result.

Squadrons can be used to conduct one of the following missions per turn in their or an adjacent Air Sector:<sup>31</sup>

- Fight for Air Supremacy<sup>32</sup> - All squadrons dedicated to fighting for air supremacy are paired up at random with Enemies and then roll on the Air-to-Air Table for resolution.
  - Squadrons that are unpaired 1:1 can be reassigned or can gang up in other fights (max 3:1)
- Conduct Strike<sup>33</sup> - A squadron may conduct a strike on any unit in its sector.
  - Maritime Strike - Pass the attack information to Naval Control for them to resolve it. Air strikes carry ½ of an attacking missile per squadron (exception: bombers count as carrying 2 attacking missiles)
  - Air Support - if Strike makes it through, notify Land control.
    - Ground Support - deal 1d2 attrition to a targeted ground unit.
    - Interdiction - The squadron inflicts 1 attrition<sup>34</sup> on an enemy unit moving and reduces their movement by half.
- Escort Strikes - Select a strike to Escort. If strike is attacked, squadron battles intercepting fighters as if Fighting for Air Supremacy.
- SEAD - A squadron equipped to conduct a SEAD missions degrades IADS by 1 for one strike.
- Intercept Strikes - Can attack one strike and its escorts. Battles any escorting fighters as if Fighting for Air Supremacy. A maximum of 3 squadrons can engage each enemy squadron.
  - vs. Escorted - If the Interceptors inflict a Damaged or Destroyed result on the escorting Squadron, roll on the Escorted Strike row.
  - vs. Unescorted - roll on the Unescorted Strike row.

### Surge

A force may instead of fighting normally may conduct a surge with its air assets. It battles half of the enemies' squadrons tasked for Fight for Air Supremacy and all squadrons tasked for Intercept Strikes. It then resolves all strikes. No other aircraft of that force may then conduct any further missions that turn in that air sector. The Chinese may surge with up to 21 squadrons in an air sector and the US any number.<sup>35</sup>

### IADS<sup>36</sup>

For any enemy squadron operating in a sector with an IADS value, roll a d20. If the number is less than or equal to the IADS value, the squadron is damaged. Exceptions:

Plane	B1	B2	5 <sup>th</sup> Gen
Chance to Ignore IADS	50%	100%	50%

Ground Attack: When ground attack aircraft conduct a strike, add 1 to the IADS value (even if IADS value is 0).<sup>37</sup>

### Air-to-Air Table<sup>38</sup>

Air-to-Air = d10 roll + Attackers attack modifier, + Defender defense modifier

Strikes = straight d10 roll

D10 Roll <sup>39</sup>	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	- 8 -	- 9 -	- 10 -	- 11+ -
Air-to-Air	-	-	-	-	-	-	Sqn. damaged	Sqn. damaged	Sqn. damaged	Sqn. damaged	Sqn. destroyed
Escorted Strike	Strike aborts, destroyed	Strike aborts, damaged	Strike aborts	Strike damaged	Strike damaged	-	-	-	-	-	-
Unescorted Strike	Strike aborts, destroyed	Strike aborts, destroyed	Strike aborts, destroyed	Strike aborts, destroyed	Strike aborts, damaged	Strike aborts, damaged	Strike aborts, damaged	Strike damaged	Strike damaged	-	-

### Modifiers<sup>40</sup>

	5 <sup>th</sup> Gen	4 <sup>th</sup> Gen	3 <sup>rd</sup> Gen	2 <sup>nd</sup> Gen	5 <sup>th</sup> Gen Support	No AWACS
Attack Modifier	+2	+0	-1	-3	+1 to another friendly squadron attacking the same target in the air engagement 1/turn. <sup>41</sup>	-3
Defense Modifier	-2	+0	+1	+3		

Multirole: If multirole aircraft conducting a strike are intercepted, when rolling to the damage for the strike on the Air-to-Air table, roll twice and select the higher result.

# Land Movement

Unit	Movement (Op Map) <sup>42</sup>	Movement (Taiwan Map)	Notes
Land Units (Rotating)	0 hexes/day	1 hexes/day	
Land Units (Cross Country)	1 hexes/day	5 hexes/day	
Land Units (Road)	2 hexes/day	11 hexes/day	TRADOC Pamphlet 350-14, September 1994, Heavy Opposing Force (OPFOR) Operation Art Handbook
Land Units (Rail)	5 hexes/day	27 hexes/day	TRADOC Pamphlet 350-14, September 1994, Heavy Opposing Force (OPFOR) Operation Art Handbook
Embark Units on Ships	1/day/per port		Gross abstraction

Stacking limit is 16 in Urban areas, 6 in Mountains. Reduce coastal hexes stacking limit in proportion to the area taken up by water.

## Land Combat (d6)

Land units can take points of damage up to their combat power.<sup>43</sup> Every 5 attrition<sup>44</sup> = 1 point of damage. 1 point of attrition can be removed each day by rotating the unit off the front line.<sup>45</sup> Each point of damage subtracts 1 from the unit's combat power. A unit with no combat power remaining is destroyed.<sup>46</sup>

Procedure:

- Pick units to attack, each unit only engages 1 unit in the hex.
- Determine Combat
  - Ratio Column = Sum Attacker Power vs. Sum Defender Power
    - Unsupplied units halve combat power
  - Note any column shifts from other factors
  - Then roll 1d6<sup>47</sup> for each side and shift that number of columns in each side's favor
- If a unit forces a retreat on the enemy, it can attack another enemy in the sector at 1 unfavorable column shift.

### Attritional vs. Maneuver Combat<sup>48</sup>

When attacking decide if the attack is an attritional attack or maneuver attack. Attritional attacks resolve as normal on the table below. If the attack is a maneuver attack however, when a result states that the unit was attritted, it takes d6 attrition instead of just one. Artillery and Helicopter units take 3 x normal attrition.<sup>49</sup>

Ratio = Sum Attacker Power vs. Sum Defender Power

Then roll 1d6 for each side and shift that number of columns in each side's favor

Atk vs. Def Ratio: <sup>50</sup>	1:4	1:3	1:2	1:1	2:1	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1
Meeting Engagement	▲ ♣	▲	☠	☠	☠	♥	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣
Prepared Atk. vs. Prepared Defense	▲ ♣	▲ ♣	▲	▲	☠	☠	♥	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣	♥ ♣
Prepared Atk. vs. Breaching	▲▲ ♣	▲▲ ♣	▲▲ ♣	▲▲ ♣	▲ ♣	▲	☠	☠	♥	♥	♥ ♣	♥ ♣	♥ ♣	♥ ♣

▲ = Attacker attritted, ♥ = Defender attritted, ☠ = Attacker and Defender attritted

♣ = Number of hexes damaged unit must retreat (cannot be mitigated). If unit cannot retreat to friendly hex it is destroyed.

♣ = Number of hexes damaged unit must retreat. A unit can choose not to retreat (or to retreat some) and is attritted for each ♣ it chooses to ignore.<sup>51</sup> If unit must retreat and cannot retreat to friendly hex it is destroyed.

Factors	Column Shift	Other Effects
Light Inf vs. Armor	1 favorable shift for tanks	
Air Support (per strike) <sup>52</sup>	1 favorable shift	
Mountains/Heavy Urban	4 favorable shifts for Defender <sup>53</sup>	May ignore 1 ♣
Light Urban	2 favorable shifts for Defender	
Fortification (per level)	1 favorable shift for Defender	May ignore 1 ♣
Amphibious Assault	2 favorable shifts for Defender <sup>54</sup>	For each ♣ Attacker is damaged
Naval Gunfire Support	1 favorable shift	

## Tactical Nuke Rules

If naval task force (CSG, ESG, SAG) or air unit (squadron), the unit is destroyed. If unit is a Battalion the unit's dispersion determines damage:<sup>55</sup>

Dispersion	Example	Damage <sup>56</sup>
Highly Dispersed	Defending an area after dispersing due to nuclear threat.	10%
Dispersed	Defending an area.	30%
Concentrated	Conducting an attack.	40%
Highly Concentrated	Defending a key point (airfield, port), fighting in urban terrain. <sup>57</sup>	80%

### Pre-Generated Damage Reference<sup>58</sup>

Unit Cbt. Power	Damage			
	10%	30%	40%	80%
1	0 Damage, 1 Attrition	0 Damage, 2 Attrition	0 Damage, 2 Attrition	0 Damage, 4 Attrition
1.5	0 Damage, 1 Attrition	0 Damage, 3 Attrition	0 Damage, 3 Attrition	1 Damage, 1 Attrition
2	0 Damage, 1 Attrition	0 Damage, 3 Attrition	0 Damage, 4 Attrition	1 Damage, 3 Attrition
2.5	0 Damage, 2 Attrition	0 Damage, 4 Attrition	1 Damage, 0 Attrition	2 Damage, 0 Attrition
3	0 Damage, 2 Attrition	1 Damage, 0 Attrition	1 Damage, 1 Attrition	2 Damage, 2 Attrition
3.5	0 Damage, 2 Attrition	1 Damage, 1 Attrition	1 Damage, 2 Attrition	2 Damage, 4 Attrition
4	0 Damage, 2 Attrition	1 Damage, 1 Attrition	1 Damage, 3 Attrition	3 Damage, 1 Attrition
4.5	0 Damage, 3 Attrition	1 Damage, 2 Attrition	1 Damage, 4 Attrition	3 Damage, 3 Attrition
5	0 Damage, 3 Attrition	1 Damage, 3 Attrition	2 Damage, 0 Attrition	4 Damage, 0 Attrition
5.5	0 Damage, 3 Attrition	1 Damage, 4 Attrition	2 Damage, 1 Attrition	4 Damage, 2 Attrition
6	0 Damage, 3 Attrition	1 Damage, 4 Attrition	2 Damage, 2 Attrition	4 Damage, 4 Attrition
6.5	0 Damage, 4 Attrition	2 Damage, 0 Attrition	2 Damage, 3 Attrition	5 Damage, 1 Attrition
7	0 Damage, 4 Attrition	2 Damage, 1 Attrition	2 Damage, 4 Attrition	5 Damage, 3 Attrition
7.5	0 Damage, 4 Attrition	2 Damage, 2 Attrition	3 Damage, 0 Attrition	6 Damage, 0 Attrition
8	0 Damage, 4 Attrition	2 Damage, 2 Attrition	3 Damage, 1 Attrition	6 Damage, 2 Attrition
8.5	1 Damage, 0 Attrition	2 Damage, 3 Attrition	3 Damage, 2 Attrition	6 Damage, 4 Attrition
9	1 Damage, 0 Attrition	2 Damage, 4 Attrition	3 Damage, 3 Attrition	7 Damage, 1 Attrition
9.5	1 Damage, 0 Attrition	3 Damage, 0 Attrition	3 Damage, 4 Attrition	7 Damage, 3 Attrition
10	1 Damage, 0 Attrition	3 Damage, 0 Attrition	4 Damage, 0 Attrition	8 Damage, 0 Attrition
10.5	1 Damage, 1 Attrition	3 Damage, 1 Attrition	4 Damage, 1 Attrition	8 Damage, 2 Attrition
11	1 Damage, 1 Attrition	3 Damage, 2 Attrition	4 Damage, 2 Attrition	8 Damage, 4 Attrition

## Strategic Nuke Rules

Facilitator adjudicates as needed.

### Quick Reference

See Nuclear Checklist

## Space Rules

Facilitator adjudicates as needed.

### Quick Reference

See space capabilities

## Missile Rules

Salvos described on the Missile Tracker sheet.

AShM – roll on Sea Combat damage table

### Vs. Airbases<sup>59</sup>

For each THADD battery at the location, reduce the number of salvos by 1.<sup>60</sup>

D10 Roll	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	- 8 -	- 9 -	- 10 -
Single Salvo <sup>61</sup>	–	–	–	–	–	–	–	☠	☠, Airbase Closed (1)	☠, Airbase Closed (d2)
2+ Salvos	–	☠	☠	☠, Airbase Closed (1)	☠, Airbase Closed (1)	☠, Airbase Closed (d2)	☠, Airbase Closed (d2)	☠, Airbase Closed (d3)	☠, Airbase Closed (d3)	☠, Airbase Closed (d4)

☠ = Roll a d10 for all squadrons at the base – on a 4+ they are damaged, on a 10 they are destroyed. (Fast version, each squadron is damaged on a 3+)

Airbase Closed (#) = Airbase runway is inoperable for that number of days. For each salvo over two, add 1 day for the 3<sup>rd</sup> salvo, and 2 days for each subsequent one (4<sup>th</sup> salvo onward)

### Vs. Ports<sup>62</sup>

For each THADD battery at the location, reduce the number of salvos by 1.<sup>63</sup>

D10 Roll	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	- 8 -	- 9 -	- 10 -
Single Salvo	–	–	–	–	–	–	–	☠	☠, Port Closed (d1)	☠, Port Closed (d2)
2+ Salvos	–	☠	☠	☠, Port Closed (d1)	☠, Port Closed (d1)	☠, Port Closed (d2)	☠, Port Closed (d2)	☠, Port Closed (d3)	☠, Port Closed (d3)	☠, Port Closed (d4)

☠ = Roll a d10 for all ships at the base – on a 6+ they are damaged.

Port Closed (#) = Roll the dice in the brackets to determine how many days the port is not functional. On a 5+ each of the following is damaged: drydock, fuel farm, munitions storage. For each additional salvo after the 2<sup>nd</sup>, roll an extra dice.

## Cyber Rules

Facilitator adjudicates as needed.

### Quick Reference

See each team's cyber sheets for what capabilities they have. When these capabilities are used they may be lost: generally the bigger/more visible the problem made, the more likely it is to be lost. Usually Big capabilities are lost 95% of time on use, small ones 80% of time on use.

All existing cyber capabilities have a chance to be attrited when *any* attacks happen as people take defensive measures preemptively (attrit what you see fit, use your discretion on what capabilities wont/can't be attrited).

Use	Big Capability	Small Capability
1 <sup>st</sup> Use	10% chance of capability loss.	3% chance of capability loss.
2 <sup>nd</sup> Use	5% chance of capability loss.	2% chance of capability loss.
3 <sup>rd</sup> + Use	3% chance of capability loss.	1% chance of capability loss.

- At the outbreak of a crisis there is a 5% chance of capability loss.

- At the start of war there is a 10% chance of capability loss.

Regenerating capabilities:

Attack	Example	Time
Small	Defacing website	1d2 weeks
Medium	Attack a selected node in a network	1d4+1 weeks
Large	Major attack against protected infrastructure	3d4 weeks

**Attacks:**



Chance of success of the attack = chance of preexisting vulnerability \* chance of vulnerability still working \* chance of major effect

Impact = chance of major damage \* time it takes to repair the damage

## SOF Rules

Facilitator adjudicates as needed. As a general rule, limit them to conduct as many missions as they have Tier 1 units. Tier 2 SF, Psychological Warfare units, et. al. can be employed in addition as desired.

Country	Tier 1 Units
Australia	SASR
Canada	JTF 2 – Canadian Special Operations Regiment
China <sup>64</sup>	<i>ETC</i> – Sharks, Thunderbolts, Dragons of the East Sea, <i>STC</i> – Sword of the South, Unidentified Brigade, <i>NTC</i> – Falcons, <i>CTC</i> – Sacred Sword of the East, Whistling Arrows, Ferocious Tigers, <i>PLANMC</i> – Sea Dragons, <i>PLAAF</i> – Thunder Gods
France	1er RPIMa – 13e RDP – Commandos Marine – CPA 10
Japan	Special Forces Group
New Zealand	NZSAS
Philippines	Light Reaction Regiment – NAVSOCOM
Taiwan	Airborne Special Service Company – 101st Amphibious Reconnaissance Battalion
UK	SAS – SBS
US	Delta (Army) – Regimental Reconnaissance Company (Rangers) – SEALs (Navy) – SOG (CIA) – AFSOC (24th STS) – MARSOC (Marines)

<sup>1</sup> 1/3 of missiles on a US destroyer are offensive missiles in peacetime, thus with 8 missile cubes of 50 missile each this is 3/5. Players could of course opt to change the inventory of their reinforcement units who would have the time to change their loadouts as they see fit. Ships at sea are stuck with their loadouts, though depending on the scenario the side with the initiative may opt to change their loadouts, while the side lacking initiative would not be able to. For the 1/3 number see *Commanding The Seas - The U.S. Navy And The Future Of Surface Warfare* by Brian Clark from the Center for Strategic and Budgetary Assessment (2017) [https://csbaonline.org/uploads/documents/CSBA6292-Surface\\_Warfare\\_REPRINT\\_WEB.pdf](https://csbaonline.org/uploads/documents/CSBA6292-Surface_Warfare_REPRINT_WEB.pdf) pg. 16

<sup>2</sup> While CSG's do not always deploy with enough ships to provide 400 VLS cells of capacity, I make the assumption for two reasons: First: I suspect that in a war there would be a tendency to want to provide more magazine depth and sensor coverage than can be provided by a 3 ship configuration (1 Ticonderoga, and 2 60-cell variant Arleigh Burke for example) to defend more vulnerable assets (see *Carrier Killer: China's Anti-Ship Ballistic Missiles and Theater of Operations in the Early 21<sup>st</sup> Century* by Gerry Doyle and Blake Herzinger, pg. 33), without leading to over centralization making targeting easier (the current game system allows such stacking at the player's discretion which would make detection easier for the enemy). This makes it a player choice, not a designer choice on the value of concentration vs. dispersion of forces. Second: it limits the number of pieces on the board, making the game easier to play. Thus, all naval units (CSG, ESG, SAG) use the 400 VLS cell number as their benchmark. Note that this generally means 4-5 escorts, it may include more/less depending on the available number of VLS cells of ships and could be conceived to include additional elements like coast guard ships, USV's, or maritime militia ships.

<sup>3</sup> The number of missile boats making up a squadron is taken from historical numbers of ships involved in Battle of Baltim (6 Israeli, 4 Egyptian), Battle of Latakia (5 Israeli, 4 Syrian), Second Battle of Latakia (various groupings of 2, 3, and 4), Operation Trident (3 Indian missile boats plus other ships). While the average of these historical numbers is 3-5, I choose to use 6 as: 1) missile defenses are better than they were historically necessitating more missiles fired, meaning more boats necessary, 2) historically smaller ships were being engaged by missile boats, necessitating less missiles than the larger combatants of the game, 3) Chinese missile boats operate in larger groups of 8 (see *This is What a Chinese Stealth Warship Looks Like on Radar*, H I Sutton, <https://news.usni.org/2021/09/27/this-is-what-a-chinese-stealth-warship-looks-like-on-radar>, 2021), 4) using 6 reduces the number of pieces on the board, making the game easier to play, 5) using groups of 6 tends to yield ~50 missiles per squadron, which is the number of missiles a missile cube generally represents in this game.

<sup>4</sup> See Ukrainian generals' comments on Brigades holding 40km lines in <https://www.nationaldefensemagazine.org/articles/2022/6/15/ukraine-to-us-defense-industry-we-need-long-range-precision-weapons> (2022), note that this is under the conditions of low force densities on both sides on generally open terrain. This also appears to have been the case as per this source - "the 40th Naval Infantry Brigade's two battalions were stretched over tens of km of the front" (see <https://twitter.com/RALee85/status/1596128978024079360>, archived at <https://archive.ph/r7v8W>, 2022). This works well in the abstract and for larger hexes on the operations map, but on Taiwan 4 brigades per hex is relatively also consistent due to smaller frontages (on the Taiwan map this would mean each brigade holds a frontage of ~5km) due to the more difficult terrain. It is worth noting that in an urban environment the frontage of a brigade becomes 6-12 blocks, where 1 block is ~100m (*ATP 3-06 Urban Operations*, July 2022, section 4-42), but lines can be lengthened the lower the opponents force density is (and I am of the opinion low force densities will feature in a Taiwan invasion due to the lack of PRC units to move across the strait that can be kept supplied, and the low number (and manning) of Taiwanese units (e.g. not having forces for divisions on divisions fights coupled with the massive space of megacity terrain)).

<sup>5</sup> As per [https://upload.wikimedia.org/wikipedia/commons/8/8d/TRADOC\\_Pamphlet\\_350-14\\_-\\_Heavy\\_Opposing\\_Force%2C\\_OPFOR\\_Operational\\_Art\\_Handbook\\_%28September\\_1994%29.pdf](https://upload.wikimedia.org/wikipedia/commons/8/8d/TRADOC_Pamphlet_350-14_-_Heavy_Opposing_Force%2C_OPFOR_Operational_Art_Handbook_%28September_1994%29.pdf), pg. 58 (3-3), this is a high bound (200 miles a day) but is possible. This assumes hard surface roads (reasonable as all countries here are modern countries with well-developed road infrastructure), and the given number is for divisions not brigades, brigades would likely be more efficient due to their smaller size. The source notes to add 10-20% distance for mountainous routes, which while a mild stretch, could fit within the high bound.

<sup>6</sup> As per [https://upload.wikimedia.org/wikipedia/commons/8/8d/TRADOC\\_Pamphlet\\_350-14\\_-\\_Heavy\\_Opposing\\_Force%2C\\_OPFOR\\_Operational\\_Art\\_Handbook\\_%28September\\_1994%29.pdf](https://upload.wikimedia.org/wikipedia/commons/8/8d/TRADOC_Pamphlet_350-14_-_Heavy_Opposing_Force%2C_OPFOR_Operational_Art_Handbook_%28September_1994%29.pdf), pg. 66 (3-11), gives the bound of 600-1000 km/day (including loading/unloading), so I take the middle (800km/day).

<sup>7</sup> Tracking here is not just knowing where something is loosely, but knowing where it is more or less exactly in real time. Loose tracks (i.e., the general location) in the game are more or less always known, but the ability to track a system in real time to strike it is much harder (e.g., "being detected" in game terms). As such, think about the chance of detection as Chance of finding the target x Chance of being able to maintain continuous track on the target = Detection (Finding and Track). This is why a target like a CSG in the Pacific is more difficult to find. While you may get a glimpse of it (e.g., see its location on the board), you will have a hard time being able to get a track on it (detection marker on it).

Approximate areas are always known for most units, land units and air units as they are easy by satellite, UAV, and aerial reconnaissance, or from HUMINT, OSINT, cyber sources, captured personal, etc. The other main reason is the massive complexity and increase in time involved if the game were designed to be double blind (though it can be done).

Ships approximate position by long range over the horizon radar would be known, using ground based over the horizon radar out to 3000km with a CEP of 36-178km (22-110mi, basically the size of a hex, remembering that a CEP is a 50% chance to be in it, and the average of 22-100 is 60 or approximately 1/2 of a hex, so the 95% chance seems to fall roughly around a hex size for game purposes), or space based with extended coverage (18 passes a day, 3,500km coverage). See *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996-2017*, RAND, published 2015, Heginbotham et. al., pg. 157-159, particularly footnote 12.

OTH radars and SIGINT satellites would probably be used to cue other assets, such as EO/IR and SAR satellites (*The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996-2017*, RAND, published 2015, Heginbotham et. al., pg. 159-163), maritime patrol aircraft or drones, ELINT, HUMINT, OSINT, (the now famous) ISR balloons, USV's, hydrophone networks ([http://www.hisutton.com/Cn\\_Underwater\\_Great\\_Wall.html](http://www.hisutton.com/Cn_Underwater_Great_Wall.html), <https://www.thedrive.com/the-war-zone/17903/china-reveals-it-has-two-underwater-listening-devices-within-range-of-guam>), buoys (<https://www.theglobeandmail.com/politics/article-canadian-military-found-chinese-monitoring-buoys-in-the-arctic/>), as well as coast guard, maritime militia, and fisherman as ISR assets.

Submarines additionally can be detected at longer ranges (25-75nm) by specialized ocean surveillance ships like the US's T-AGOS ships (*The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996-2017*, RAND, published 2015, Heginbotham et. al., pg. 191), alongside the hydrophone networks and buoys. Of course, submarines are the necessary sacrifice of accuracy here by knowing the hex that they are in, but they still only represent a loose position in a 6,495 mi<sup>2</sup> area.

The ability of all units to see (and strike) a unit once it has been detected, is assumed both for ease, and to simulate C4ISR networking together all units' operating picture. Of course, if this bothers you the game can be run double blind if desired.

<sup>8</sup> *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996-2017*, RAND, published 2015, Heginbotham et. al., pg. 158, 165

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<sup>9</sup> This section is primarily based on an interview with Paul Kendal OBE.

<sup>10</sup> This section is *generally* informed by the following:

- *Fleet Tactics and Naval Operations 3rd Edition*
- *Carrier Killer, China's Anti-Ship Ballistic Missiles and Theater of Operations in the early 21st Century* (2022), Gerry Doyle and Blake Herzinger, specifically Chapters 3, 4, and 5

<sup>11</sup> Assuming 18 x aircraft, each armed with 2 missiles (see *Armed to the Teeth*, Akhil Kadiyal, Janes Defense Weekly, 1 February 2023, pg. 22-27 (pg. 22) for # of munitions carried, 2 ASHM or air to surface missiles), this is 36 missiles, perhaps more/less depending on the size of the strike package and supporting assets.

<sup>12</sup> *Armed to the Teeth*, Akhil Kadiyal, Janes Defense Weekly, 1 February 2023, pg. 22-27 (pg. 22)

<sup>13</sup> [https://www.esd.whs.mil/Portals/54/Documents/FOID/Reading%20Room/Selected\\_Acquisition\\_Reports/FY\\_2012\\_SARS/F-A-18E-F\\_December\\_2012\\_SAR.pdf](https://www.esd.whs.mil/Portals/54/Documents/FOID/Reading%20Room/Selected_Acquisition_Reports/FY_2012_SARS/F-A-18E-F_December_2012_SAR.pdf) (2012)

<sup>14</sup> <https://www.airforce.gov.au/technology/f-35a-specifications> (Accessed March 5, 2022)

<sup>15</sup> <https://missilethreat.csis.org/missile/hong-niao/> (Accessed May 28, 2022)

<sup>16</sup> [IV range] <https://missilethreat.csis.org/missile/tomahawk/> (accessed May 28, 2023), [V range] <https://www.defensenews.com/naval/2020/12/14/the-us-navy-has-an-upgraded-tomahawk-heres-5-things-you-should-know/> (2020)

<sup>17</sup> With lower Pk's for interceptors, a shoot-shoot-look-shoot strategy, or the need to shoot 3 or more times, a ratio of 2:1 defensive to offensive missiles is roughly the minimum required to stop a given number of missiles. While neither of these (low Pk, S-S-L-S, 3+ engagements) would always be the case individually, overall, this 2:1 rule is the closest to reality overall (at least for the purpose of modeling here). See *Commanding The Seas - The U.S. Navy And The Future Of Surface Warfare* by Brian Clark from the Center for Strategic and Budgetary Assessment (2017) [https://csbaonline.org/uploads/documents/CSBA6292-Surface\\_Warfare\\_REPRINT\\_WEB.pdf](https://csbaonline.org/uploads/documents/CSBA6292-Surface_Warfare_REPRINT_WEB.pdf) pg. 17-18

<sup>18</sup> For sub attacks with missiles this represents the fact that submarines engage from within the detection and engagement envelope of the defensive systems of the group, thus allowing for less chances to engage incoming missiles making their more limited salvo more effective. This also rolls in torpedo attacks as well into the same system without having to make something separate.

<sup>19</sup> This table is based on my own custom salvo combat model informed by:

- *Fleet Tactics and Naval Operations 3rd Edition*
- *Using kill-chain analysis to develop surface ship CONOPS to defend against anti-ship cruise missiles* Smith, Roy M. Naval Postgraduate School (2010)
- To determine survivability analysis of missile and bomb effects against military grade ships built after 1970 sunk/put OOA, and ships hit by missiles even if they were not sunk I did an analysis of missile and bomb effects against military grade ships. Ships damaged by mines were not included as they strike below the waterline. The given data may not account for advancements in damage control techniques and materials on newer ships. Full data and assumptions available upon request.

<sup>20</sup> The reason for a 3<sup>rd</sup> damage on CSG's and ESG's is due to the ability of larger combatants to 1) provide more ISR and (slightly) more defensive capacity, 2) to provide extra assistance (beyond what a SAG would provide) to other ships in the task force if damaged (extra damage control teams, helicopters, ability to take ships into tow, etc.), 3) to soak up a lot of damage as they are big, see the following discussion on killing/sinking a large combatant like a carrier or amphib.

<sup>21</sup> It should be noted that a "sunk" result does not necessarily mean that all ships are sunk, but rather that the unit (CSG, SAG, etc.) has lost so many ships, or sustained such damage that it is unable to continue operations and must return to repair yards for a long period of time, e.g. a mission kill. As major Blue repair yards not under kinetic threat from Chinese fires are far away from the battle space, even moderate damage can result in a mission kill (See *Forward Battle Damage Repair Keeps Ships in the Fight*, Proceedings, January 2022, Cmdr. Trevor Prouty USN, pg. 20). Also consider also the US may not be able to repair surface combatants in any reasonable amount of time. In addition, as US forces do not have any destroyer tenders, repair ships, and/or sufficient tug capability, the number of mission kills that have to be abandoned instead of taken under tow and repaired may be higher. (see *Sustaining The Fight: Resilient Maritime Logistics For A New Era*, Timothy A. Walton, Ryan Boone, Harrison Schramm, Center For Strategic And Budgetary Assessments, 2019, pg. 62-63, 65-66). For the Chinese as their yards are within the area of operations, ships being repaired are likely to be struck again and damaged/destroyed, so the chance of a mission kill becoming a real kill is much higher for them.

Here with the larger combatants LPD, LHD, carriers, etc. (and carriers especially) it seems unlikely that ASHM could sink them short of a catastrophic hit on fuel stores or magazines, and that "sunk" here really represents a mission kill. For more on this, and the source that I draw my view of carrier battle damage from see *Carrier Killer: China's Anti-Ship Ballistic Missiles and Theater of Operations in the Early 21st Century* by Gerry Doyle and Blake Herzinger, pg. 21-22.

<sup>22</sup> The following pieces generally inform this section:

- *Use Emerging Technology for ASW* by Cpt. Walker Mills USMC, Lt. Cmdr. Collin Fox USN, Lt. Cmdr. Dylan Philips-Levine USN, and Lt. Cmdr. Trevor Philips-Levine USN. October 2021 Proceedings, pg.32-37, pg. 34-35 especially. And the response to it <https://www.thedrive.com/the-war-zone/reviving-the-use-of-navy-tactical-jets-as-submarine-hunters> (2023)
- *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996-2017*, RAND, published 2015, Heginbotham et. al., pg. 184-197, somewhat pg. 207-214

<sup>23</sup> This represents the ability to operate ASW aircraft for long periods required to persecute a contact. If superiority or supremacy are not present there is a good chance the aircraft will not fly the mission due to risk or will be driven off by enemy aircraft.

<sup>24</sup> Note that this is an extremely simplified view of a highly complex system, with the exact numbers (+15%, +/-0, -30%) being pure guesses by the author. This simplification is especially true in the context of the South China Sea, see pg. 24 of *Blue Water Buildup*, Aika Torruella, Alessandra Giovanzanti, Georgios

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Papangelopoulos, and Matteo Scarano, *Janes Defense Weekly*, 18 May, 2022, pg. 22-29 – “high maritime traffic (especially in the South China Sea), marine life, industrial coastal infrastructure, currents and a complex seabed, temperature, and salinity profile, there is an inhomogeneous and noisy undersea environment. In many areas there is also a high sea bottom reverberation level. The result is an operating environment in which passive and active ship mounted sonars are challenged to meet ASW detection, classification, and target—tracking requirements”

<sup>25</sup> While Chinese submarines are often discounted as being of extremely poor quality in some literature and “Blue subs are never sunk”, there do exist some cases of note: In 2006 a Chinese Type 39 submarine got to within 5 miles of a carrier (though it is unclear to me how much ASW was being conducted by the CSG) <https://www.cbsnews.com/news/chinese-sub-came-close-to-us-ships/>, and in 2015 a Chinese submarine conducted a simulated missile attack on the USS Ronald Reagan - <https://freebeacon.com/national-security/chinese-submarine-practiced-missile-attack-on-uss-reagan/>. This is to say nothing of the litany of examples in NATO training of submarines managing to get kills on carriers or other surface combatants. The overall ability to detect (the numbers given here) are based upon the following sources:

- Expert analysis from CNA
- *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., pg. 186 (Figure 7.6), pg. 191 (Table 7.9), and light mind paid to pg. 194 (Table 7.10), somewhat pg. 213 (Figure 8.6) on the relative survivability of US submarines compared to a very heavy ASW screen (note the fact that these were primarily air kills as per pg. 223)
- From H.I. Sutton
  - <https://twitter.com/CovertShores/status/1554804240006238210> (2022)
  - <http://www.hisutton.com/Chinese-Type-039C-Yuan-Class-Submarine.html> (2021)
  - <http://www.hisutton.com/Chinese-Navy-Type-093-Shang-Class-Submarine.html> (2020)
- The availability and usefulness of various airframes for conducting ASW: <https://www.thedrive.com/the-war-zone/reviving-the-use-of-navy-tactical-jets-as-submarine-hunters> (2023), see especially the latter end of the section “So easy, a Harrier pilot can do it”, and partly the problems presented in *Use Emerging Technology for ASW* by Cpt. Walker Mills USMC, Lt. Cmdr. Collin Fox USN, Lt. Cmdr. Dylan Philips-Levine USN, and Lt. Cmdr. Trevor Philips-Levine USN. October 2021 Proceedings.
- *Quick Look Report “Chinese Undersea Warfare: Development, Capabilities, Trends”*, April 2023, China Maritime Studies Institute <https://www.andrewerickson.com/2023/05/quick-look-summary-cmsis-11-13-april-2023-conference-chinese-undersea-warfare-development-capabilities-trends/> (2023) for a look at Chinese submarine capabilities.
- *Blue Water Buildup*, Aika Torruella, Alessandra Giovanzanti, Georgios Papangelopoulos, and Matteo Scarano, *Janes Defense Weekly*, 18 May, 2022, pg. 22-29 for a look at Chinese ASW capabilities and the ASW environment of the Pacific. See figure pg. 23: of their escorts 88 (62%) are fully equipped for ASW, 8 (6%) are partly equipped, and 46 (32%) are not equipped (hulls only, ASW helicopters could be embarked). Notes on ASW helicopters on pg 27.
  - The overall lack of Chinese ASW assets (both fixed wing and rotary wing) at this time is also of interest here, though this problem will be remedied over time.

<sup>26</sup> Estimating the Pk of a torpedo is difficult (see the section on “Kill Probability” in <https://www.strikepod.com/strikepod-command-counter-poseidon-2/> for a brief overview). The Pk of a ASROC is ~.2 (see pg. 39-40 of *Probability of kill for VLA ASROC torpedo launch*, Valerio, Stephen M. Monterey, California. Naval Postgraduate School, 2009, [https://calhoun.nps.edu/bitstream/handle/10945/4820/09Mar\\_Valerio.pdf](https://calhoun.nps.edu/bitstream/handle/10945/4820/09Mar_Valerio.pdf)). The paper takes as a given that the target has been detected (as per the detection table) and assumes that 3 shots from a torpedo with a Pk of .2 occurs against the sub (.512 chance of 3 misses, or .488 cumulative chance of a hit on the Sub). I choose three shots in a given engagement as it makes good probabilities (it’s ~50%) and seems a reasonable number to the author for the maximum number of torpedoes fired across a whole sub vs. sub or sub vs. ASW engagement which may go through several phases of attempting to detect and attack the sub over several hours in a 24 hour period which makes up one turn. Thus the 3 torpedoes may well be spread out over several minutes or several hours, but the aggregate over one turn is roughly 3. E.g., approximately three is a reasonable number of possible engagements and at three the chance of a kill or mission kill is high enough to warrant rolling dice. In this context the Pk is almost the same as the Ph because hitting a submarine is either a) enough to kill it, or b) enough to make it loud enough to kill it with a follow-on attack shortly after. If the sub is attacked, but not killed it suffers a temporary mission kill for the rest of the turn in that it needs to evade and reposition to carry on its mission. (See *Commanding The Seas - The U.S. Navy And The Future Of Surface Warfare* by Brian Clark from the Center for Strategic and Budgetary Assessment (2017) [https://csbaonline.org/uploads/documents/CSBA6292-Surface\\_Warfare\\_REPRINT\\_WEB.pdf](https://csbaonline.org/uploads/documents/CSBA6292-Surface_Warfare_REPRINT_WEB.pdf) pg. 25)

<sup>27</sup> If necessary limited operations can be conducted by a squadron’s teeth element operating in a very expeditionary capacity, backed by one or two cargo planes/tankers as demonstrated by US exercises in the Pacific, then allowing the rest of the squadron to flow in over several days (so operations can be conducted from the first day). Alternatively, if there are already forces there, they are merely reinforcing existing squadrons and can leach off of their logistics for a short period until the squadron’s own logistics and maintenance arrive. However, the main reason for this is to ease the amount of work Control has to do while running the game.

<sup>28</sup> This section is generally informed by the following:

- *The Russian Air War and Ukrainian Requirements for Air Defense*, Justin Bronk with Nick Reynolds and Jack Watling, RUSI, November 2022, <https://static.rusi.org/SR-Russian-Air-War-Ukraine-web-final.pdf>. This work identifies three key elements: effectiveness of GBAD (mainly deconfliction and electronic warfare), the value of better technology (generally radar ability, missile range and missile seekers), and consequently to the value of better technology the effects of being forced to operate at low levels. These are represented thusly:
  - Effectiveness of GBAD: due to the high overmatch in numbers between the ROCAF and the PLAAF, I assume that Chinese GBAD would rarely fire as Chinese aircraft would be the primary tool to engage threats for the Chinese IADS as Taiwanese aircraft would rarely be in range to be engaged by Chinese GBAD. Taiwan operates only medium and short ranged GBAD systems, which would be a high priority target for the PLA. As I assume a general competence for all sides in a fight, I contend that there would be heavy suppression of such systems, but that numerous SHORAD and MANPADS would have effects. As a consequence of assuming general competence, this means that deconfliction is assumed to be relatively effective, and where it is not, an equal rate of fratricides occur, meaning that I can wrap up fratricides from deconfliction as part of the general attrition of squadrons. The ground-based EW talked about in the article will be less effective than in Ukraine due to the fact that there is a great deal of water that prevents the PLA from positioning ground-based EW

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platforms closer to Taiwanese air defenses. Air based EW from jamming pods is already assumed to be flying with strikes and therefore does not need to be addressed specifically as part of this.

- Better technology: this is part of the attack and defense modifiers system for various generations of aircraft. 4.5<sup>th</sup> Gen aircraft are abstracted purely for easing the work of the air liaison umpire (if the players wish to include them (+1 attack, +0 defense would be my recommendation). It is assumed that Chinese and Western missiles and radar are of comparable quality for each generation given a lack of unclassified data on the subject and my general assumption for the purposes of this game (though this should not be construed as an endorsement of this position) is that all sides are generally competent, with this extending to their R&D sectors and military-industrial base unless otherwise known. Given the fact that most sides have some 4<sup>th</sup> gen and 4.5<sup>th</sup> gen aircraft in the fray, mixing the effects of 4<sup>th</sup> and 4.5 Gen aircraft, and the higher level modeling employed by this game means that the affects can be abstracted and that no side has such a distinct advantage in 4.5 gen fighters as to be worth modeling (note that this may be incorrect for someone like the US however). Some may disagree with this point, see *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, pg. 38, the table on pg. 44, or 44-45 for example.
- Low level operations:
  - This is also discussed in other sources
    - <https://www.thedrive.com/the-war-zone/a-mig-29-pilots-inside-account-of-the-changing-air-war-over-ukraine>
  - This is not accounted for in this game to avoid too much complexity, but if you want to add it a -1 to attack and a +1 to defense would be the way to do it.
  - PLAAF may have to do low level operations if they fail to suppress Taiwanese air defense as Ukrainian medium range air defense forced the Russians to abandon medium and high-altitude operations (RUSI, pg. 14). If this is the case in a Taiwan scenario, then any such effects of low-level operations would be a wash. However, later sources (see other sources above, and note that while the RUSI article and the Drive article were published a month apart, the RUSI article interviews are somewhat older than the publication date), indicate that Russia may be able to operate at higher altitudes and keep the Ukrainians low.
    - Note that in light of the analysis of *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, [https://www.rand.org/pubs/research\\_reports/RR1051.html](https://www.rand.org/pubs/research_reports/RR1051.html), I feel that the Taiwanese would not be able to project an air defense bubble over the island or their forces for a long period of time given competent Chinese SEAD/DEAD operations.

- *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., particularly pg. 49-93

- *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, particularly pg. 36-49, 53-54, 58, 60-62, 65-68, 97-121, [https://www.rand.org/pubs/research\\_reports/RR1051.html](https://www.rand.org/pubs/research_reports/RR1051.html). Note that a good chunk of this report is looking at different structures for air defense for Taiwan and as such various models may have different assumptions from current Taiwanese air defense.

- *Geopolitics Decanted, Episode 41: How Ukraine Can Survive the Exhaustion of Its Air Defense Stocks*, Dmitri Alperovitch, Justin Bronk, and Dara Massicot. April 17, 2023.

<sup>29</sup> While a “Squadron” is the unit used here (16 3<sup>rd</sup> or 4<sup>th</sup> Gen aircraft, or 12 5<sup>th</sup> Gen aircraft), given the turn length (1 day) the employment of a squadron in a sector doesn’t necessarily mean that all planes are up at once. A squadron indicates the capability of a squadron to conduct missions (note here that enablers are abstracted but assumed to be present), and not all the aircraft are up in the air at any given time. This could mean no sorties or several sorties per day for each aircraft depending on the mission and tasking. A RAND report found that “assuming a 1.25 crew ratio with weekly and monthly restrictions in place for a mission with a two-hour on-station time. Flying from Kadena AB on Okinawa (roughly 770 km from the center line between Taiwan and the mainland), U.S. aircraft could fly 1.6 sorties per day for the first seven days and 0.9 sorties per day thereafter. From Andersen AFB on Guam (roughly 2,870 km from the center line), aircraft could achieve rates of 0.8 sorties per day for the first seven days and 0.5 thereafter.” Given the model they present and the numbers they give for Chinese airbases, Chinese aircraft could fly between 2-2.5 sorties per day. Note that there are ways to bump up US numbers, and the Chinese are assumed to be equivalent to the US ability to conduct air operations (whether or not that is accurate is up to you). See *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, Heginbotham et. al., pg. 79-80. As a general rule of thumb for specific adjudication of things if specific numbers are needed at a specific point in time (any given hour for example): assume “1/3 of available airframes are in the fight; 1/3 preparing to launch or enroute; and 1/3 recovering, refueling and rearming” (<https://www.airandspaceforces.com/article/crisis-in-the-fighter-force-eric/>, Lt. Gen. David A. Deptula USAF (Ret.) and Heather Penney, Jan 2022)

<sup>30</sup> Damage here represents a combination of loss of airframes, decrease in sortie generation due to pilot and airframe fatigue, and other miscellaneous factors that decrease the overall effectiveness of the squadron. Thus, a Destroyed result does not mean that all aircraft have been destroyed, but that the squadron’s effective fighting power has been reduced to the point where it has a negligible impact on the air battle.

<sup>31</sup> Sectors are used in this system mostly for simplicity. I am therefore making the assumption (though do not necessary agree with it) that in a full scale war, for Blue there would be adequate (abstracted in this game) tanking capability, plus the opening of Japanese air bases, and use of civilian airports/dispersed basing to provide reasonable ability to use aircraft without significant non-combat degradation (the Chinese have 40+ military airfields in range of Taiwan, plus a large number of civilian airports so this is not an issue for them). For more details on shutting down airbases via missile attacks see *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., pg. 58-68, pg. 61, 71-87 specifically, pg.133-150, 40 airports = pg. 72, for a full map pg. 138.

<sup>32</sup> This represents both offensive and defensive counter air missions, as some portion of assigned squadrons would be conducting DCA and come under attack, while others would be on the attack and therefore come into contact.

<sup>33</sup> While Conducting and Escorting strikes are abstracted to squadron level in these rules, conducting a strike would likely involve some escort aircraft either from the same squadron or another, (for example a F-18 strike with Harpoons escorted by a small number of F-35’s) but due to level of abstraction, they are not represented here in that manner, but rather at the squadron level.

<sup>34</sup> It is extremely difficult to tell how effective CAS will be in inflicting damage as its effectiveness is contingent on a great bevy of factors that vary greatly at various different points. This attrition can therefore be argued over greatly. Given the potential effectiveness posed in *Air Defense Options for Taiwan, An*

Assessment of Relative Costs and Operational Benefits, Lostumbo et. al., RAND, 2016, particularly pg. 61, the 1 attrition falls close to the numbers from the RAND report.

<sup>35</sup> 7 regiments \* 3 squadrons apiece based on *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., pg. 82. The ability of the US to use any number represents better ability to manage airspace and coordinate aircraft.

<sup>36</sup> Here IADS represents both short, medium, and long-range air defense. For details informing this section overall, the value of stealth, and IADS values on the map see *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, Heginbotham et. al., pg. 97-132.

<sup>37</sup> Increasing by one, rather than doubling, or some other operation is based on my view that SHORAD is a relative static value in all cases (e.g. it is always present, but is not more effective in one case or another or depending on where you are as SHORAD occurs around where the target is, not as you are flying in, in the specific case of Taiwan, (if this were Ukraine for example, the SHORAD would increase the deeper you penetrate though enemy lines). As it is well integrated as part of an IADS with cueing (e.g., SPAAGs and MANPADs) it is a static value rather than something else.

<sup>38</sup> The accuracy of the lethality of the air-to-air table is up for debate but given analysis in *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., pg. 81, I feel that the given lethality of these rules is squarely within the bounds of probability. E.g., if a squadron of 16 aircraft can achieve a maximum of 32 kills as per the report, in an air-to-air engagement on this table, a 4<sup>th</sup> gen fighter squadron will achieve on average 4 kills, and a maximum of 16 (with a standard deviation of 5.37).

	Average Kills	Average Kills (Damaged)
5th Gen vs. 4 <sup>th</sup> Gen	7.2	3.6
4th Gen vs. 4 <sup>th</sup> Gen	4	1.4

<sup>39</sup> The rate of damage to squadrons here is heavily colored by *Defending Mother Russia's Skies*, RUSI (July 13th, 2022), particularly the point that in the 142 days after the invasion, Ukraine had lost 19% of its pre-war stockpiles (not including decreases in readiness rates due to mechanical fatigue which are not able to be documented), *in a war seeing limited amounts of air power*, which also generally stayed behind the respective side's forward line own troops (FLOT). Furthermore, air operations also took place over a piece of land, where pilots are easy to recover (especially as they were likely to be shot down close to, or behind their own FLOT), something made more difficult in the contested airspace and water (instead of land) that would characterize a war in the Pacific (not to mention a lack of long-range CSAR capabilities for the US).

<sup>40</sup> Generally informing the value of different generations of aircraft (see the last 1/4<sup>th</sup> of the piece for a general overview): <https://www.thedrive.com/the-war-zone/26880/enough-with-the-indian-mig-21-bison-versus-pakistani-f-16-viper-bullshit>. Note the lack of a modifier for one side or the other based on quality of pilots is due to these rules assuming all sides are of equal capability. An alternative view on force quality may be found at *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., pg. 80-81.

In terms of comparison for the numbers laid out in the rules to other data see *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al. On pg. 82 is presented lethality and vulnerability numbers for aircraft. A comparison to the numbers of this game follows:

Numbers have had the force quality degradation removed. Note that the report calls out several other assumptions the numbers make.

	Lethality	Vulnerability
2nd-3rd Gen	0.14	2.42
4th Gen	2	0.7
5th Gen	2	0.1

The numbers are then normalized to be equal to be a value between 0-1.

	Lethality	Vulnerability
2nd-3rd Gen	0.07	1
4th Gen	1	0.29
5th Gen	1	0.04

I am not sure of what exactly the variables in the report represent so I have to assume, but the normalized numbers for the given air-to-air engagement and modifiers in these rules are presented:

	Lethality	Vulnerability
2nd-3rd	0.28	0.84
4th	0.47	0.52
5th	1	0.23

The difference between the two sets:

	Lethality	Vulnerability
2nd-3rd	0.21	-0.16
4th	-0.53	0.23
5th	0	0.19

Note that given the fact that the Report's numbers come from 4 on 4 head on engagements without enablers, and as per the previously cited Drive piece at the start of this footnote, I feel that this scenario undervalues the effectiveness of properly upgraded lower generations of aircraft. There are a number of reasons I value stealth less: 1) more investments have occurred in anti-stealth technologies which mitigates some of their effect, 2) a desire not to include stealth as a "Wunderwaffe" in games as it leads to sloppy planning and thinking from teams ("the bomber/stealth aircraft always gets through"), 3) enablers were not included in the report (AWACS, ground radar, etc.) would help to mitigate the effects of stealth, 4) the modeling scenario in the report is a head on approach 4 vs. 4 which overvalues the effectiveness of stealth aircraft as per point 3 and also as many optimize their front on RCS, and as it means that more complex anti-stealth tactics like having a group to jump the stealth aircraft after they are engaged/have been revealed by firing can't be used, 5) other effects like EW, C2 degradation, munitions shortfalls, ISR degradation, tanker aircraft degradation, etc. that reduce the overall effect of stealth fighters in sum, but much less as individuals (therefore being missed by the modeling). As for the differences in 4<sup>th</sup> gen lethality/vulnerability, I think part of the difference can be accounted for by a lack of enablers in the Report's study, though not all of the difference can. I maintain the +0/+0 here therefore for the ease of control in adjudication as 4<sup>th</sup> gen aircraft are

the most numerous and adding more modifiers would slow down the air combat resolution dramatically. If you wish to include, add +1 to the attack modifiers of 4<sup>th</sup> generation aircraft. That modification would produce the following table:

	Lethality	Vulnerability
2nd-3rd	0.28	0.87
4th	0.61	0.55
5th	1	0.29

Other sources from which I draw views on this subject are

- *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., pg. 108 for intercept ranges as informing some of my views.
- *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, particularly pg. 36 (value of 4.5 gen), the table on pg. 44 (aircraft lethality), 44-45 (value of 4.5 gen), 48-49, 107 (figures on pages 104 and 106 are reproductions) (aircraft survivability), 100-101 (aircraft lethality/survivability). Note that on pg. 100-101, they provide estimates of various aircraft effects, but I weight these as lower than The US-China Military Scorecard due to the considerations noted by the authors on pgs. 97-99 and 101-102. Much the same for exchange ratios presented on 105.
  - Aircraft generation effectiveness findings from the report. The averages should be considered extremely rough first order approximations due to how the numbers were derived (expert estimates).

F-35 Effectiveness Compared to F-16C/D or V (4.5 Gen Fighter)				
Page # For Info	Lethality	Survivability	Overall	Vs.
105			4	2016 PLA Capabilities
107			5.6	Projected PLA Capabilities
48 or 104		1.35		2016 PLA Capabilities
49 or 106		1.8		Projected PLA Capabilities
100	1.14	6 or 3.5		2016 PLA Capabilities
101	1.19	2.5		Projected PLA Capabilities
44	3.7+ (V), 9.3+ (C/D)			2016 PLA Capabilities
Average	3.8325	3.03	4.8	

Numbers are expressed as wholes (4 times better, 1.14 times better than 4.5 gen)

F-35 Effectiveness Compared to F-16A/B (4th Gen Fighter)				
Page # For Info	Lethality	Survivability	Overall	Vs.
105			15.3	2016 PLA Capabilities
107			15	Projected PLA Capabilities
48 or 104		1.65		2016 PLA Capabilities
49 or 106		3		Projected PLA Capabilities
100	1.39	13 or 5.25		2016 PLA Capabilities
101	1.47	3.4		Projected PLA Capabilities
44	15.5+			2016 PLA Capabilities
Average	6.12	5.26	15.15	

F-16C/D or V (4.5 Gen Fighter) Effectiveness Compared to F-16A/B (4th Gen Fighter)				
Page # For Info	Lethality	Survivability	Overall	Vs.
105			3.5	2016 PLA Capabilities
107			3	Projected PLA Capabilities
48 or 104		1.26		2016 PLA Capabilities
49 or 106		1.5		Projected PLA Capabilities
100	1.15	2.16 or 1.5		2016 PLA Capabilities
101	1.24	1.36		Projected PLA Capabilities
44	4.17 (V), 1.7 (C/D)			2016 PLA Capabilities
Average	2.065	1.556	3.25	

<sup>41</sup> The value here is drawn from a talk by a F-35 pilot about F-35 employment and tactics at Red Flag, which I cannot find the reference for. For an illustration of how it might work, see a good description of the Indian use of Su-30K's in Cope India 2004, (<https://www.thedrive.com/the-war-zone/26880/enough-with-the-indian-mig-21-bison-versus-pakistani-f-16-viper-bullshit>, 2019) where one plane picks up information for the others then datalinks it to them allowing them to shoot, the inherent stealth of the F-35 makes it better for this than other aircraft. The point the pilot made was that the F-35 had a unique capability for data collection, fusion, and transmission. As of 2022ish, F-22 Raptors also have this ability as well with their new R1 upgrade (<https://www.thedrive.com/the-war-zone/f-22-raptor-being-readied-for-aim-260-missile-by-green-bats-testers>, 2022), and it seems likely that the J-20 has a datalink (<https://airpowerasia.com/2020/08/15/chengdu-j-20-overhyped-or-reality-a-comprehensive-story/>, 2020). Given the lack of information on the abilities of the J-20 compared to Western 5<sup>th</sup> Gen aircraft, I do what I have done through the rules and rate it in these rules as being equivalent (see this article for further discussion on how good J-20's really are: <https://www.thedrive.com/the-war-zone/air-force-generals-arent-losing-sleep-over-chinas-j-20-stealth-fighter>, 2022)

<sup>42</sup> Unit movement is based on numbers from *TRADOC Pamphlet 350-14, Heavy Opposing Force (OPFOR) Operation Art Handbook*, September 1994, or if that does not provide the desired information numbers from Warfighter 2 Remote by Maj. Tom Mouat MBE.

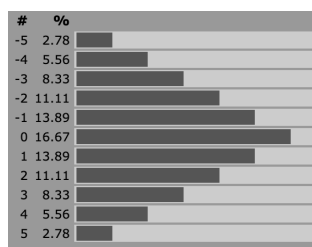
<sup>43</sup> Combat power is calculated by using the Force Equivalent numbers from (the download takes some time to load properly) [https://rdl.train.army.mil/catalog/view/100.ATSC/CE5F5937-49EC-44EF-83F3-FC25CB0CB942-1274110898250/aledc\\_ref/cas3\\_force\\_ratio\\_calc.xls](https://rdl.train.army.mil/catalog/view/100.ATSC/CE5F5937-49EC-44EF-83F3-FC25CB0CB942-1274110898250/aledc_ref/cas3_force_ratio_calc.xls) which are based on CGSC ST 100-3, Back Cover.

<sup>44</sup> Here attrition is a combination of KIA, WIA, morale, equipment losses, supply issues, C2 degradation, unit quality degradation, etc. (see *The Relationship of Battle Damage To Unit Combat Performance*, Leonard Wainstein, 1986, Institute for Defense Analyses, specifically pg. 2 and pg. 11-12 for several of these attritional factors). Thus, small attritions (represented as attrition) add up to the point (represented as points of damage) where rotating the unit out of combat doesn't fix the problem without long periods to reconstitute combat power.

<sup>45</sup> This number is a guess. The inability to replace damage represents key, unreversible degradation of the unit due to losses (requiring regeneration), where attrition can be repaired as it is lower level and requires reorganization ( $\neq$  regeneration). For further details see *ATP 3-94.4 Reconstitution Operations*, May 2021. [https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/ARN32296-ATP\\_3-94.4-000-WEB-1.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/ARN32296-ATP_3-94.4-000-WEB-1.pdf). Obviously, this is a loose rule of thumb and there are many exceptions to this where damage could be repaired, in such cases use professional judgement to come to a conclusion.

<sup>46</sup> This view of units remaining effective in combat even when ground down to a much lower number than classically assumed to make a unit "combat ineffective" is based on of *The Relationship of Battle Damage To Unit Combat Performance*, Leonard Wainstein, 1986, Institute for Defense Analyses.

<sup>47</sup> The use of a d6 here leads to high potential variability (+5/-5), though the use of two dice means that this is (approximately) a normal/Gaussian distribution. While some would argue about the accuracy of such variability in combat, I would note that combat is inherently complicated, confusing, and dependent upon a menagerie of different factors that make outcomes imprecise. Adding in such variability using the d6 system (a 44% chance of being inside the bounds of +1/-1, and a 66% chance of being inside the bounds of +2/-2), is less unrealistically "swingy" than might be initially presumed. The 1d6-1d6 distribution is as follows:



<sup>48</sup> This difference between attritional combat which slowly wears at units and maneuver combat which expends great numbers of men and material to achieve results (hence d6 as maneuver combat varies greatly in losses depending on distance, terrain, supply, and enemy resistance) allows for both types of warfare to be fought with these rules. For an indication of just how lethal maneuver warfare can be see Table 1, page 1 of *Our Readiness Problem: Brigade Combat Team Lethality*, LTC Bradford T. Duplessis, 2017, <https://www.benning.army.mil/armor/eARMOR/content/issues/2017/Fall/4Duplessis17.pdf>

<sup>49</sup> This is due to the fact that each individual piece of equipment generates a much higher combat value than in a regular unit. E.g., losing one piece of equipment is much more damaging than it is to a normal unit.

<sup>50</sup> This combat results table is based on the DSTL Force Ratio Risk Table. Available at <https://www.professionalwargaming.co.uk/Force%20Ratio%20Table%20with%20Numbers%20v0.1.png>. Given the turn time of the game (1 turn = 1 day) I do not include hasty attacks as it would add another level of unnecessary complexity and uncertainty to adjudication and could cause players to argue if an umpire judged an attack to be hasty when players believed otherwise. Given the nature of fighting on Taiwan to include many dug-in positions, difficult terrain, and high force density around initial beachheads, I believe it likely that hasty attacks will not be especially efficient in taking ground and inflicting casualties (except perhaps on the attacker), thus meaning that they can be abstracted into prepared attacks that do have a larger effect on the battle without too much issue.

<sup>51</sup> This allows the representation of a unit screening the enemy while withdrawing (fall back in correspondence to the strength of enemy push) or choosing to stand and fight (in which case you trade casualties for holding your position). However, at very high force ratios one will be forced to pull out to avoid being surrounded and destroyed hence (N), while with breaching you can generally safely pull out hence no need for (N) as it represents a rapid need to disengage due to overwhelming speed of enemy movement due to high numbers of forces available to the enemy.

<sup>52</sup> Strike here is with a squadron of aircraft. Effect is a combination of the strike itself, and aftereffects on morale, unit dispersion, camouflage, and digging in to limit further airstrikes effect thus limiting combat capabilities temporarily.

<sup>53</sup> Ignoring the debates around the accuracy of force ratios, generally a successful attack is likely at 3:1 attacker to defender. For urban operations, a ratio of 4-10:1 seems to be sufficient (average of ~7), so  $7-3 = 4$ , thus 4 shifts for the defender in urban terrain (of course one could argue about different types of urban terrain, but at the game's level of abstraction this is ignored for simplicities sake). For some underlying numbers and discussion on force ratios see: <http://www.dupuyinstitute.org/blog/2018/04/25/u-s-army-force-ratios/> (2018). Do note the complexity (and low number of datapoints), as outlined in this further article specifically on urban terrain <http://www.dupuyinstitute.org/blog/2022/08/11/the-defensive-value-of-urban-terrain/> (2022). Note however that the type of terrain covered by the dataset (from World War II) would in part not account for megacities, ubiquitous modern rebar-concrete, earthquake-proof buildings, negating some of the applicably and leading me to disagree with the assessment that "Urban terrain does not favor the defender more so than other terrain (rolling or rugged). In fact, it appears less." I instead conclude that it is (at least in game terms) equal. My views on urban combat overall are more complicated but the 4 column shifts and ability to ignore 1 retreat is a good enough approximation of a multitude of complex dynamics.

<sup>54</sup> It is extremely difficult to determine the force ratio difference from 3:1 an amphibious assault requires on average to be successful (*Charting the Pathway to OMFTS: A Historical Assessment of Amphibious Operations From 1941 to the Present*, Carter A. Malkasian, CNA, 2002, pg. 53-59). Given data from the same source (on pgs. 55-56), it seems like past 5:1 the chance of an operational pause lessens dramatically, thus giving us a 2-column shift (3:1 -> 5:1).

<sup>55</sup> This section is heavily based upon two pieces of work: *Casualty Estimation for Nuclear and Radiological Weapons*, Carl A. Curling, 2016 <https://www.ida.org/-/media/feature/publications/c/ca/casualty-estimation-for-nuclear-and-radiological-weapons/p-5220.aspx> (henceforth IDA) and the presentation *Low Yield Nuclear Use in Wargames, It's Not "Game Over Man!"* by James Gifford of the US Defense Threat Reduction Agency at Connections 2022. In the IDA paper it is assumed that the study's one light infantry battalion represents 30% of the combat power of a brigade, and that the study's dispersion of the battalion is considered to be a defensive posture. Thus a "Dispersed" posture resulting in 30% damage to the Brigade.

<sup>56</sup> Damage against a fresh unit. Damage here is against the overall combat effectiveness of the unit not the whole brigade itself (a minor but important difference), and rear echelon units of the brigade would likely be less affected than combat units.

<sup>57</sup> For an example of why this would be so devastating to a brigade in an urban environment the frontage of a brigade becomes 6-12 blocks, where 1 block is ~100m (see *ATP 3-06 Urban Operations*, July 2022, section 4-42), putting the entire brigade inside the danger zone of a tactical nuclear weapon.

<sup>58</sup> Note that this sheet rounds up when forced to round.



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<sup>59</sup> This section is heavily informed by *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., 58-68, 133-160, and to some degree by *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, pg. xii-21. Note that a strike on an airbase includes attacks on air defense, radars, infrastructure, attacking aircraft and shelters, and cratering the runway.

<sup>60</sup> Note that while a THAAD battery is not so effective as to be able to shoot down massive waves of ballistic missiles by itself (and cannot to the author's knowledge engage cruise missiles), its presence represents a concentration of other air defense including Patriot batteries (or other similar air defense) that can engage both cruise and ballistic missiles along with THAAD and together help to degrade incoming missile salvos. For a short overview on factors going into missile interception see *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, pg. 12-13

<sup>61</sup> Single salvos can be degraded by air defense at the airbase, and as such have less of a chance of having an effect on the enemy. At 2 or more salvos, the degradation of the missiles by air defense would have minimal effect in relation to the total salvo size that would hit. Note however that interception of supersonic missiles is much more difficult (<https://web.archive.org/web/20230310213624/https://twitter.com/MassDara/status/1634300311744438272>), which is something the rules do not yet fully account for in this section. Missile speed as subsonic, supersonic, or hypersonic is accounted for in other places in the rules, notably missile salvo size/sea combat, which means that this is partly accounted for but not fully accounted for.

<sup>62</sup> This section pulls from the airbase table, but reflavors it to my understanding of ports. Once again see *The U.S.-China Military Scorecard Forces, Geography, and the Evolving Balance of Power, 1996–2017*, RAND, published 2015, Heginbotham et. al., 58-68, 133-160.

<sup>63</sup> Note that while a THAAD battery is not so effective as to be able to shoot down massive waves of ballistic missiles by itself (and cannot to the author's knowledge engage cruise missiles), its presence represents a concentration of other air defense including Patriot batteries (or other similar air defense) that can engage both cruise and ballistic missiles along with THAAD and together help to degrade incoming missile salvos. For a short overview on factors going into missile interception see *Air Defense Options for Taiwan, An Assessment of Relative Costs and Operational Benefits*, Lostumbo et. al., RAND, 2016, pg. 12-13

<sup>64</sup> Based upon locations in *China Maritime Report No. 18: Chinese Special Operations in a Large-Scale Island Landing* (2022) pg. 7 and discussion on pg. 6, and parity on descriptions from <https://twitter.com/nuwangzi/status/1656982424788639746> (2023)