



### 3. HIT PROBABILITY [RANGE ESTIMATION METHOD]

#### 1. TARGET SIZE

01- 40 DP .....	+ 2
41- 80 DP .....	+ 4
81- 200 DP .....	+ 6
201- 500 DP .....	+ 8
501-1000 DP .....	+10
over 1000 DP .....	+12

#### 2. BEARING FROM TARGET

Pos. A [ $0^{\circ}$ - $15^{\circ}$ ] .....	0
Pos. B [ $16^{\circ}$ - $45^{\circ}$ ] .....	+12
Pos. C [ $46^{\circ}$ - $90^{\circ}$ ] .....	+22

#### 3. SEA STATE

Beaufort 0 to 6 .....	0
Beaufort 7 (ships under 200 DP) -	4
Beaufort 8 (ships under 400 DP) -	8
Beaufort 9 (ships under 600 DP) -	12
Beaufort 10 (all ships) .....	-20

#### 4. FIRING SHIP UNDER FIRE

Hit during last turn .....	- 4
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#### 5. OVER CONCENTRATION

1 ship only firing at target...	0
2 or 3 ships firing at target..	- 3
4 or more ships firing .....	- 6

#### 6. FIRE CONTROL SYSTEM

Post 1930 DCT System .....	+48
Post 1930 Local RF .....	+35
1914-30 DCT System .....	+28
1914-30 Top RF .....	+23
1914-30 Local RF .....	+16
1900-19 Top RF .....	+10
1900-19 Local RF .....	+ 6
1880-99 Top spot .....	+ 2
1880-99 Local spot .....	- 2

#### 7. RADAR ASSISTED FIRE CONTROL

1939-42 FC Radars .....	+25
1942-44 FC Radars .....	+40
1944-45 FC Radars .....	+54

#### 8. SPOTTER AIRCRAFT

Aircraft spotting shell splashes..	+16
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#### 9. SMOKE SCREENS

Target behind chemical screen ....	-16
Target behind funnel smoke .....	- 6

#### 10. EVASIVE MANEUVER

Target only in E.M. ....	- 5
Firing ship only in E.M. ....	-10
Both ships in E.M. ....	-15

#### 11. VISIBILITY

##### DURING DAYLIGHT

Code 9 (Exceptionally Clear) .....	+ 4
Code 8 (Very Clear) .....	0
Code 7 (Clear) .....	- 4
Code 5 or 6 (Haze) .....	- 8
Patchy fog .....	-16

##### MORNING/EVENING TWILIGHT

Target afire or silhouetted .....	+ 2
Target in darkness .....	-10
None of the above .....	- 4

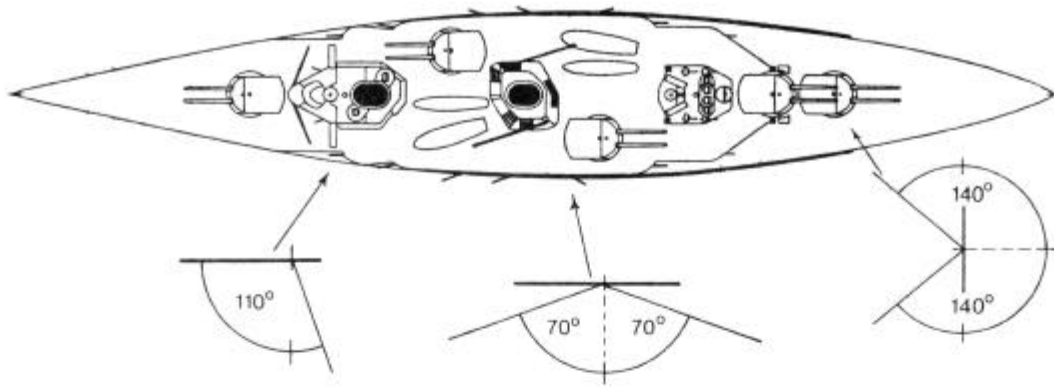
##### NIGHT

No moonlight .....	-18
Moonlight .....	- 9
Target afire or silhouetted .....	+ 2
Target illuminated by searchlight.	0
Target using a searchlight .....	- 4
Target in a starshell pattern ....	- 2

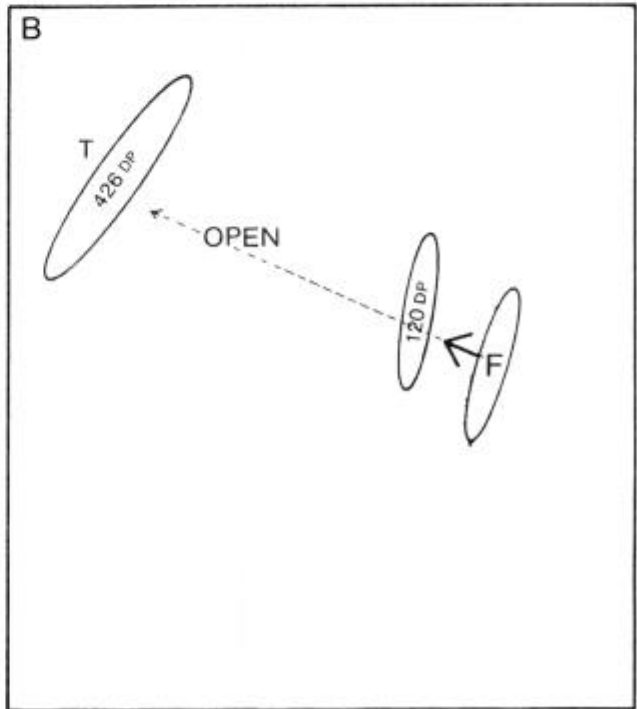
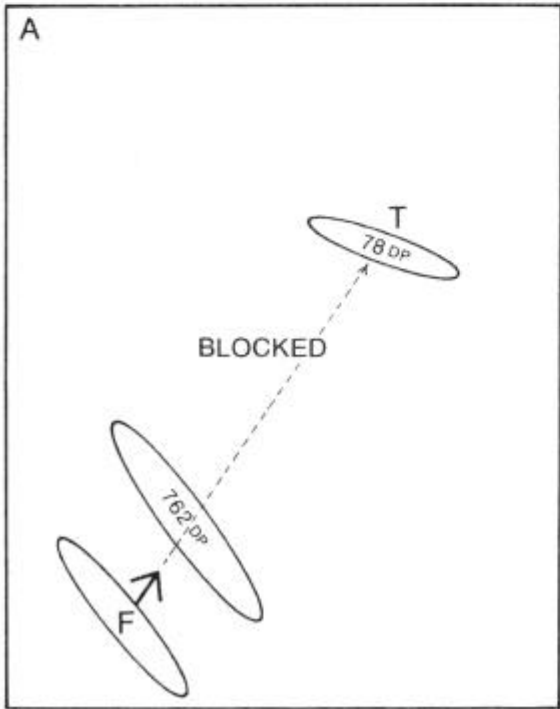
#### 12. ACQUIRED FIRE

Same target hit last turn .....	+ 4
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1. ARCS OF FIRE



2. LINE OF SIGHT



1. SURFACE GUNFIRE COMBAT RESOLUTION

RESULT FROM HIT PROBABILITY TABLE [CHART H]

		01-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140
1	1	01-01	01-02	01-03	01-04	01-05	01-06	01-07	01-08	01-09	01-10	01-11	01-12	01-13	01-14
	2	01-02	01-04	01-06	01-08	01-10	01-12	01-14	02-15	02-17	02-19	02-21	02-23	03-24	03-26
	3	---	---	---	---	---	---	---	01-01	01-01	01-01	01-01	01-01	01-02	01-02
3	1	01-03	01-06	01-09	01-12	02-14	02-17	02-20	03-22	03-25	04-27	04-30	05-32	06-34	06-36
	2	---	---	---	---	01-01	01-01	01-01	01-02	01-02	01-03	01-03	01-04	01-05	01-05
	3	01-04	01-08	02-11	02-15	02-19	03-22	04-25	04-28	05-31	06-34	07-37	08-40	09-43	12-45
5	1	01-05	01-10	02-14	02-18	03-23	04-27	05-30	06-34	08-38	09-41	11-44	12-47	14-50	17-56
	2	---	---	01-01	01-01	01-02	01-03	01-04	01-05	02-07	02-08	02-10	02-11	03-13	03-15
	3	---	---	---	---	---	---	---	---	01-01	01-01	01-01	01-01	01-02	01-02
6	1	01-06	02-11	02-17	03-22	04-26	06-31	07-35	09-39	11-43	12-47	14-50	17-53	19-57	21-60
	2	---	01-01	01-01	01-02	01-03	01-05	02-06	02-08	02-10	03-11	03-13	04-16	04-18	05-20
	3	---	---	---	---	---	---	01-01	01-01	01-01	01-02	01-02	01-03	01-03	02-04
	4	---	---	---	---	---	---	---	---	---	---	---	---	---	01-01
7	1	01-07	02-13	03-19	04-25	05-30	07-35	09-40	11-44	14-48	16-52	19-56	21-59	24-62	27-65
	2	---	01-01	01-02	01-03	01-04	02-06	02-08	02-10	03-13	04-15	04-18	05-20	06-23	07-26
	3	---	---	---	---	---	01-01	01-01	01-01	01-02	01-03	01-03	02-04	02-05	02-06
	4	---	---	---	---	---	---	---	---	---	---	---	01-01	01-01	01-01
8	1	01-08	02-15	03-22	05-28	07-34	09-39	11-44	14-49	17-53	20-57	23-61	26-64	29-67	32-70
	2	---	01-01	01-02	01-04	02-06	02-08	02-10	03-13	04-16	05-19	06-22	07-25	08-28	10-31
	3	---	---	---	---	01-01	01-01	01-01	01-02	01-03	02-04	02-05	02-06	02-07	03-09
	4	---	---	---	---	---	---	---	---	---	01-01	01-01	01-01	01-01	01-02
9	1	01-09	02-17	04-24	06-31	08-37	11-43	14-48	17-53	20-57	24-61	27-65	31-68	34-71	38-74
	2	---	01-01	01-03	01-05	02-07	02-10	03-13	04-16	05-19	06-23	08-26	09-30	11-33	13-37
	3	---	---	---	---	01-01	01-01	01-02	01-03	02-04	02-05	02-07	03-08	03-10	04-12
	4	---	---	---	---	---	---	---	---	01-01	01-01	01-01	01-02	01-02	02-03
	5	---	---	---	---	---	---	---	---	---	---	---	---	---	01-01
10	1	01-10	03-18	04-26	07-34	10-40	13-46	16-52	20-57	24-61	27-65	31-69	35-72	39-75	43-78
	2	---	01-02	01-03	02-06	02-09	03-12	04-15	05-19	06-23	08-26	10-30	12-34	14-38	16-42
	3	---	---	---	01-01	01-01	01-02	01-03	02-04	02-05	02-07	03-09	03-11	04-13	05-15
	4	---	---	---	---	---	---	---	01-01	01-01	01-01	01-02	01-02	02-03	02-04
	5	---	---	---	---	---	---	---	---	---	---	---	---	---	01-01

NUMBER OF SHELLS



### 1. TIME OF SUNRISE BY LATITUDE (L.C.T.)

		NORTH LATITUDE												
		0	10	20	30	35	40	45	50	55	60	65	70	75
APR	1	0601	0558	0555	0552	0550	0546	0544	0540	0537	0530	0528	0512	0455
	15	0557	0550	0542	0534	0529	0524	0517	0509	0500	0446	0429	0400	0310
MAY	1	0554	0544	0531	0518	0511	0502	0452	0440	0423	0402	0332	0240	L
	15	0553	0538	0523	0507	0457	0445	0432	0415	0353	0323	0237	L	L
JUN	1	0554	0537	0520	0458	0447	0433	0417	0357	0328	0251	L	L	L
	15	0557	0538	0520	0458	0444	0430	0412	0350	0320	0335	L	L	L
JUL	1	0600	0542	0523	0502	0448	0433	0416	0354	0324	0240	L	L	L
	15	0602	0546	0528	0508	0457	0443	0426	0406	0340	0301	L	L	L
AUG	1	0603	0549	0534	0517	0507	0457	0443	0427	0405	0338	0252	L	L
	15	0601	0551	0539	0527	0518	0511	0500	0448	0433	0412	0343	0353	L
SEP	1	0557	0551	0544	0536	0529	0525	0519	0512	0502	0450	0434	0405	0320
	15	0553	0550	0547	0544	0542	0540	0538	0534	0530	0526	0519	0509	0452
OCT	1	0546	0548	0550	0553	0555	0556	0557	0559	0600	0602	0605	0610	0615
	15	0543	0548	0554	0602	0605	0610	0615	0621	0628	0637	0650	0710	0741
NOV	1	0540	0550	0600	0613	0619	0628	0637	0647	0700	0718	0743	0820	D
	15	0540	0554	0609	0625	0634	0644	0652	0712	0730	0752	0835	D	D
DEC	1	0545	0600	0618	0637	0648	0701	0716	0735	0759	0833	0924	D	D
	15	0552	0608	0627	0648	0700	0714	0731	0751	0818	0857	D	D	D
JAN	1	0559	0617	0634	0656	0708	0722	0738	0759	0827	0903	D	D	D
	15	0605	0621	0638	0657	0708	0721	0736	0754	0816	0849	D	D	D
FEB	1	0610	0622	0631	0651	0700	0710	0721	0736	0754	0818	0855	D	D
	15	0611	0620	0630	0641	0647	0654	0702	0712	0725	0740	0805	0840	D
MAR	1	0609	0616	0621	0628	0632	0636	0641	0646	0654	0704	0718	0737	0807
	15	0606	0608	0609	0611	0612	0613	0615	0616	0617	0624	0624	0628	0632

### 2. TIME OF SUNSET BY LATITUDE (L.C.T.)

		NORTH LATITUDE												
		0	10	20	30	35	40	45	50	55	60	65	70	75
APR	1	1810	1810	1810	1810	1812	1812	1812	1813	1814	1815	1815	1815	1818
	15	1804	1810	1818	1827	1832	1838	1845	1853	1902	1916	1933	2002	2050
MAY	1	1800	1811	1823	1836	1839	1853	1903	1916	1931	1954	2020	2111	L
	15	1759	1814	1828	1846	1856	1907	1921	1938	2000	2030	2113	L	L
JUN	1	1801	1817	1835	1855	1907	1922	1938	1959	2025	2104	L	L	L
	15	1804	1821	1840	1902	1915	1931	1947	2010	2041	2124	L	L	L
JUL	1	1807	1824	1843	1905	1917	1933	1951	2013	2043	2126	L	L	L
	15	1810	1825	1843	1903	1915	1928	1944	2005	2030	2108	L	L	L
AUG	1	1810	1823	1838	1854	1904	1916	1927	1945	2005	2035	2123	L	L
	15	1808	1818	1829	1842	1849	1858	1907	1920	1935	1955	2029	2120	L
SEP	1	1803	1810	1816	1825	1829	1835	1841	1848	1856	1909	1930	1955	2045
	15	1758	1801	1803	1806	1808	1810	1813	1815	1818	1823	1832	1843	1900
OCT	1	1753	1752	1750	1748	1747	1745	1744	1743	1740	1737	1735	1730	1722
	15	1748	1743	1737	1730	1726	1722	1717	1711	1704	1654	1644	1624	1554
NOV	1	1747	1737	1726	1714	1707	1659	1651	1639	1626	1608	1545	1506	D
	15	1747	1735	1720	1704	1655	1645	1632	1617	1557	1532	1457	D	D
DEC	1	1752	1736	1719	1700	1649	1636	1621	1602	1538	1505	D	D	D
	15	1758	1741	1723	1702	1649	1635	1618	1558	1531	1453	D	D	D
JAN	1	1806	1749	1731	1710	1658	1644	1628	1607	1542	1502	D	D	D
	15	1813	1758	1741	1722	1711	1658	1644	1625	1602	1530	1536	D	D
FEB	1	1818	1805	1751	1736	1727	1718	1705	1651	1634	1611	1533	1434	D
	15	1818	1809	1759	1748	1742	1736	1727	1717	1705	1649	1619	1550	1440
MAR	1	1816	1811	1805	1758	1755	1750	1745	1739	1732	1723	1708	1648	1617
	15	1812	1811	1810	1808	1807	1806	1805	1804	1803	1801	1758	1752	1746



### 3. DURATION OF TWILIGHT

	NORTH LATITUDE									
	0	30	40	45	50	55	60	65	70	75
JANUARY	0113	0123	0135	0143	0155	0212	0236	D	D	D
FEBRUARY	0109	0121	0131	0139	0149	0204	0224	0256	0355	D
MARCH	0109	0121	0131	0140	0151	0206	0230	0305	0409	0500
APRIL	0110	0125	0135	0150	0207	0235	0320	T	T	T
MAY	0111	0130	0151	0205	0255	T	T	T	T	T
JUNE	0113	0135	0201	0227	T	T	T	T	T	T
JULY	0113	0134	0156	0220	0305	T	T	T	T	T
AUGUST	0111	0126	0144	0209	0222	0320	T	T	T	T
SEPTEMBER	0109	0121	0135	0144	0156	0217	0248	0330	T	T
OCTOBER	0109	0120	0132	0140	0150	0203	0222	0255	0335	0455
NOVEMBER	0113	0123	0135	0143	0155	0207	0231	0313	0440	D
DECEMBER	0115	0126	0137	0147	0159	0215	0243	0342	D	D

### 4. SOUTH LATITUDE ADJUSTMENTS

MONTH	USE	APPLY
APRIL	OCTOBER	+0015
MAY	NOVEMBER	+0011
JUNE	DECEMBER	+0005
JULY	JANUARY	-0003
AUGUST	FEBRUARY	-0009
SEPTEMBER	MARCH	-0014
OCTOBER	APRIL	-0015
NOVEMBER	MAY	-0011
DECEMBER	JUNE	-0005
JANUARY	JULY	+0003
FEBRUARY	AUGUST	+0010
MARCH	SEPTEMBER	+0014

L = Continuous light  
 D = Continuous darkness  
 T = Continuous twilight and light

CHART 5165 (Sunrise, Sunset, and Twilight Diagrams) is available from the Defense Mapping Agency (address on Page 3 of the Rulebook) and contains more detailed information.

The times listed on CHARTS K1 and K2 are for North Latitudes and are correct within the given time zones [all times are expressed as Local Civil Time]. Use CHART K4 to adjust the times for use in South Latitudes. [For April in the Southern Hemisphere, use the values for October in the Northern Hemisphere and add 15 minutes].

**1. AIRCRAFT NAVIGATIONAL ERROR [NO RADAR]**

	MILES OFF COURSE							
	0	10	15	20	25	30	40	50*
Beaufort 0-1	01-50	51-65	66-75	76-80	81-85	86-90	91-95	96-00
Beaufort 2-3	01-45	46-55	56-65	66-75	76-80	81-85	86-90	91-00
Beaufort 4	01-40	41-52	53-60	61-65	66-70	71-75	76-80	81-00
Beaufort 5	01-35	36-42	43-48	49-53	54-58	59-66	67-74	75-00
Beaufort 6	01-30	31-40	41-45	46-50	51-55	56-62	63-69	70-00
Beaufort 7	01-25	26-30	31-35	36-40	41-48	49-58	59-69	70-00
Beaufort 8	01-22	23-27	28-32	33-40	41-48	49-56	57-64	65-00

The above percentages are for strikes of 200 miles or less. For strikes of distances over 200 miles, read one line down [for a 300 mile strike during Beaufort 5, use the line for Beaufort 6].

\* Aircraft are considered completely lost and must return to base.

**2. AIRCRAFT DROP-OUT**

MILES TO TARGET	% DROP-OUT AND RETURN TO BASE
Less than 100	use 11-20 on CHART I
100 - 300	use 21-30 on CHART I
301 - 500	use 31-40 on CHART I
Over 500	use 61-70 on CHART I

For each strike group of aircraft

**4. AIR SEARCH ACCURACY**

ROLL	REPORT ACCURACY
01-30	Position reported accurately
31-34	Reported 10 miles North of actual
35-38	Reported 10 miles West of actual
39-42	Reported 10 miles South of actual
43-46	Reported 10 miles East of actual
47-50	Reported 20 miles North of actual
51-54	Reported 20 miles West of actual
55-58	Reported 20 miles South of actual
59-62	Reported 20 miles East of actual
63-66	Reported 30 miles North of actual
67-70	Reported 30 miles West of actual
71-74	Reported 30 miles South of actual
75-78	Reported 30 miles East of actual
79-82	Reported 50 miles North of actual
83-86	Reported 50 miles West of actual
87-90	Reported 50 miles South of actual
91-94	Reported 50 miles East of actual
95	Reported 70 miles North of actual
96	Reported 70 miles West of actual
97	Reported 70 miles South of actual
98	Reported 70 miles East of actual
99-00	No report until return to base

**3. CAP VECTORING**

No Air Warning Radar	Use 0.50 column on CHART Y1
1940-42 Air Warning Radar	Use 0.75 column on CHART Y2
1942-43 Air Warning Radar	Use 0.85 column on CHART Y2
1944-45 Air Warning Radar	Use 0.95 column on CHART Y2

This table gives the number of groups (of 4 aircraft) of CAP that can be vectored to detected raid on the first turn of detection [using the 0.75 column on CHART Y2, if there are 5 groups (20 aircraft total), the defender may vector up to 3 of those groups if he rolls 64-90 on the first turn of detection].



### 1. RAID DETECTION PROBABILITY

SHIP CONDITION	ATTACK AIRCRAFT LEVEL	DIE ROLL									
		1	2	3	4	5	6	7	8	9	0
1. No radar and no CAP	(S )	2	2	3	3	3	4	4	4	4	5
2. No radar and no CAP	(L M H V )	2	3	3	3	4	4	4	5	5	6
3. No radar and CAP	(S L M H V)	4	4	5	5	5	6	6	6	7	7
4. Radar and no CAP	(S )	4	4	4	4	5	5	6	7	8	9
5. Radar and no CAP	(L M H V )	6	6	8	8	9	9	10	11	12	12
6. Radar and CAP	(S L M H V)	7	7	9	9	10	11	12	14	16	18

### 2. AA FIRE CALCULATION

$$\left( \frac{\text{TOTAL ADJUSTED AA FACTOR}}{\text{TOTAL NUMBER OF AIRCRAFT MAKING ATTACK}} \right) \div \left( \frac{2 \times \text{DEFENSE FACTOR OF 1 AIRCRAFT}}{\text{Percentage along top of CHARTS Y}} \right)$$

### 3. AA FACTOR MODIFIERS

#### FUZE TYPE

Mechanical Time                      Multiply AA by 1.2  
 Variable Time (VT)                  Multiply AA by 1.6

#### FIRE CONTROL TYPE

Radar & Director Control          Multiply AA by 1.3  
 Director Control Only              Multiply AA by 1.0  
 Visual                                  Multiply AA by 0.6

The MT fuze was used by most navies from 1935 on and available for nearly all sizes of shells. The VT fuze was available only on the U.S. 5"/38 gun from October 1942 on.

### 4. AERIAL ORDNANCE HIT TABLE [METHOD 1]

	SPEED OF TARGET SHIP				
	0-6 kts	8-14 kts	16-22 kts	24-30 kts	32-40 kts
[S] Sea Level less than 2,000 ft	2	3	4	5	6
[L] Low Level 2,000 - 10,000 ft	3	4	5	6	7
[M] Medium Level 10,100 - 18,000 ft	4	5	6	7	9
[H] High Level 18,100 - 27,000 ft	6	7	8	10	14



### 5. AERIAL ORDNANCE HIT TABLE [METHOD 2]

	SPEED OF TARGET SHIP				
	0-6 kts	8-14 kts	16-22 kts	24-30 kts	32-40 kts
[S] Sea Level less than 2,000 ft	.50	.35	.25	.20	.15
[L] Low Level 2,000 - 10,000 ft	.35	.25	.20	.15	.15
[M] Medium Level 10,100 - 18,000 ft	.25	.20	.15	.15	.10
[H] High Level 18,100 - 27,000 ft	.15	.15	.10	.10	.05

### 6. AERIAL ORDNANCE PENETRATION

LEVEL OF ATTACK	USE CHART R PENETRATION FOR
SEA LEVEL	17,600-22,500 yards
LOW LEVEL	17,600-22,500 yards
MEDIUM LEVEL	12,600-17,500 yards
HIGH LEVEL	12,600-17,500 yards

[For Dive-Bombers, use MEDIUM LEVEL]

### 7. BOMB DAMAGE FACTORS

WEIGHT OF BOMB		DF	PENETRATION CLASS
10 lb. to	20 lb.	2	CLASS U2
21 lb. to	50 lb.	4	CLASS T3
51 lb. to	90 lb.	5	CLASS S3
91 lb. to	160 lb.	7	CLASS P3
161 lb. to	350 lb.	10	CLASS M4
351 lb. to	600 lb.	13	CLASS L1
601 lb. to	900 lb.	16	CLASS J3
901 lb. to	1,200 lb.	18	CLASS H3
1,201 lb. to	1,600 lb.	21	CLASS F1
1,601 lb. to	2,400 lb.	26	CLASS C2
2,401 lb. to	2,900 lb.	29	CLASS B2
2,901 lb. to	3,600 lb.	31	CLASS B1
3,601 lb. to	4,100 lb.	35	CLASS A1
4,101 lb. to	4,900 lb.	41	CLASS A1
4,901 lb. to	6,000 lb.	48	CLASS A1

### 8. BOMB DAMAGE MODIFIERS

	AP	SAP	GP
PENETRATION FACTOR	1.0	0.7	0.1
DAMAGE FACTOR MODIFIER (penetration)	3.0	3.5	4.0
DAMAGE FACTOR MODIFIER (no penetration)	1.0	2.0	3.5
PROBABILITY OF CRITICAL DAMAGE (penetration)	*75%	*75%	*75%
PROBABILITY OF CRITICAL DAMAGE (no penetration)	*20%	*25%	*30%
PROBABILITY OF PASS-THROUGH	60%	50%	0

[ \* CHECK FOR SHIPBOARD FIRE DURING THIS ROLL ]



**3. SUBMARINE CD**

ROLL	CD NUMBER
01-10	52
11-18	51
19-23	53
24-29	54
30-36	55
37-42	56
43-50	57
51-58	58
59-67	59
68-72	60
73-76	61
77-82	62
83-90	63
91-00	No damage

**5. C.D. DURATION**

ROLL	DURATION OF CRITICAL DAMAGE
01-10	2 minutes (1 turn)
11-20	4 minutes (2 turns)
21-30	6 minutes (3 turns)
31-40	10 minutes (5 turns)
41-50	16 minutes (8 turns)
51-60	24 minutes (12 turns)
61-70	30 minutes (15 turns)
71-80	60 minutes (30 turns)
81-00	PERMANENT

**2. CLASS B CD DETERMINATION**

D	H	C	S	B	CD NUMBER
01-02	01-05	01-06	---	01-04	1
03-06	---	07-10	---	05-10	2
07-12	---	11-14	---	11-14	3
13-16	06-09	15-18	---	15-17	4
17-20	---	19-22	---	18-23	5
---	---	23-25	---	24-28	6
---	---	26-30	---	29-32	7
21-25	---	---	01-03	33-34	8
26-30	---	---	04-10	---	9
---	---	31-34	11-15	35-39	10
---	---	35-40	16-20	40-44	11
---	---	---	21-26	---	13
---	---	---	27-33	---	14
31-34	---	41-43	34-37	45-47	17
35-38	---	---	38-40	48-50	18
39-42	---	---	41-43	51-53	19
43-46	---	---	44-47	---	20
47-50	---	44-50	48-50	54-56	21
51-54	---	51-54	51-60	57-59	22
---	---	55-57	---	60-63	23
55-58	---	---	61-65	---	26
59-61	---	---	66-72	---	27
62-65	---	---	73-76	---	28
66-70	---	---	77-80	---	29
---	---	58-63	81-85	---	30
---	---	63-65	86-88	---	31
---	---	66-70	89-92	---	32
---	---	---	93-95	---	33
71-74	10-15	71-76	---	64-67	36
---	---	77-84	96-98	---	37
75-77	16-22	---	---	---	38
78-80	23-30	---	---	68-70	40
---	---	---	---	71-74	41
---	---	---	---	75-78	42
---	---	---	---	79-80	43
---	---	---	---	---	44
---	---	---	---	81-84	45
---	---	---	---	85-87	46
81-90	70-85	---	---	---	47
91-95	86-00	---	---	---	48
96-00	---	85-00	99-00	---	49
---	---	---	---	88-95	49
---	---	---	---	96-00	50

**1. CLASS A CD DETERMINATION**

D	B	C	T	S	CD NUMBER
01-04	01-04	01-03	01-09	---	1
05-09	05-10	04-11	---	---	2
10-13	11-14	12-16	---	---	3
14-19	15-18	17-25	10-21	---	4
20-24	19-22	26-30	---	---	5
25-28	23-30	31-35	---	---	6
29-31	31-35	36-40	---	---	7
32-34	---	---	22-31	---	8
35-40	---	---	---	01-04	9
41-43	36-40	41-48	---	05-10	10
44-48	41-46	49-54	---	11-15	11
---	---	---	---	16-20	12
---	---	---	---	21-25	13
---	---	---	---	26-30	14
---	---	---	---	31-34	15
---	---	---	---	35-42	16
49-52	---	---	---	43-49	17
53-55	47-51	55-60	---	---	18
56-58	52-54	61-63	32-39	---	19
59-61	55-59	64-66	40-46	---	20
62-64	---	---	47-56	---	21
---	---	67-72	---	50-54	22
65-68	---	73-75	---	55-59	23
---	60-65	76-80	---	---	24
---	---	---	---	60-63	25
---	---	---	---	64-67	26
---	---	---	57-64	68-73	27
69-72	---	---	65-71	74-78	28
73-75	---	---	---	79-85	29
76-78	---	---	---	86-88	30
---	---	---	---	89-91	31
---	---	---	---	92-95	32
79-81	---	---	---	96-97	33
---	---	---	72-74	98-99	34
82-83	---	---	---	00	35
84-86	---	---	75-88	---	36
87-90	66-75	81-86	---	---	37
91-93	---	---	89-94	---	38
94-98	76-80	87-91	---	---	39
99-00	81-85	92-95	95-96	---	40
---	86-92	---	---	---	41
---	---	96-00	97-00	---	42
---	93-96	---	---	---	43
---	97-00	---	---	---	44



#### 4. CRITICAL DAMAGE EFFECTS

1. Magazine explosion - ship destroyed and removed from playing area at end of game turn.
2. Engine room damaged - reduce maximum speed by  $\frac{1}{2}$  of original maximum speed for the next  $\bar{N}$  turns.
3. Engine room destroyed - reduce maximum speed by  $\frac{1}{2}$  of original maximum speed permanently.
4. Magazine fire (roll to determine PRIMARY or SECONDARY battery and roll again to determine location of battery magazine affected - FORWARD/CENTER/AFT or PORT/STARBOARD). Multiply DP caused by this hit by 3 and add this to total. For the next 3 game turns roll dice to determine progress of firefighting; 01-59 FLOODING SUCCESSFUL / 60-79 ADDITIONAL DAMAGE - ADD DP CAUSED BY ORIGINAL HIT AGAIN / 80-00 FIRE GOES OOC AND SHIP DESTROYED BY MAGAZINE EXPLOSION. Regardless of the rolls (made at the end of the next 3 turns), all guns being serviced by this magazine may not fire for the remainder of the battle.
5. Fire in engine room - reduce maximum speed by 2 knots each turn for the next  $\bar{N}$  turns and remain at the final reduced speed an equal number of turns before increasing speed.
6. Magazine flooded - Guns serviced by this magazine may fire for the next 3 turns and may not fire again for the remainder of the battle (roll to determine battery affected and location of flooding as in #4).
7. Flooding in fireroom - multiply DP caused by this hit by 2 and add this to total. Reduce maximum speed by  $\frac{1}{4}$  of original maximum speed permanently.
8. One turret of gunmount OOA for  $\bar{N}$  turns (roll to determine which battery PRIMARY/SECONDARY, and roll again to determine location of turret or gunmount affected).
9. One TT mount, DC mount, or AA mount OOA for  $\bar{N}$  turns (roll to determine type of mount and roll again to determine location of mount affected).
10. Steerage OOA for  $\bar{N}$  turns - maximum turn reduced to half of normal per game turn. No EM possible.
11. Steerage jammed for  $\bar{N}$  turns - ship must continue on same course as this game turn and reduce speed to no more than 16 knots. No EM possible.
12. Searchlight destroyed (roll to determine location of destroyed light).
13. Signal bridge OOA for  $\bar{N}$  turns - no visual communications with other ships in company.
14. Radio room OOA for  $\bar{N}$  turns - no radio communications possible.
15. Funnel damage - when firing guns abaft of forward-most funnel without radar assist, reduce the total from CHART H by 4 for each gun. Reduce speed by 4 knots permanently.
16. Aircraft stowage hit - multiply DP caused by this hit by 2 and add this to total. Automatic SF of severity 10. Catapult and all aircraft aboard destroyed. If ship not carrying catapult, use CD #9.
17. Aux. Steering destroyed - if ship affected by CD #10 or #11 during battle then it has no steerage and must reduce speed to no more than 10 knots and retreat from action. Maximum turning capability is then  $\frac{1}{4}$  that of the normal capability of the ship per game turn. Until affected by 10 or 11, this has no effect.
18. Ammo hoist in one turret or gunmount OOA for  $\bar{N}$  turns - reduce MAXIMUM ROF by 50% in the affected turret (roll to determine which battery PRIMARY/SECONDARY and roll again to determine location of mount).
19. Handling room OOA for  $\bar{N}$  turns - reduce MAXIMUM ROF by 50% for all mounts serviced by this magazine (roll to determine which battery PRIMARY/SECONDARY and roll again to determine location of affected magazine FORWARD/CENTER/AFT or PORT/STARBOARD).
20. One turret or gunmount destroyed (roll to determine which battery PRIMARY/SECONDARY and roll again to determine location of mount destroyed).
21. Service to 25% of AA battery OOA for  $\bar{N}$  turns - reduce AA Factor by 25% for affected battery. If ship has no AA battery, then use CD #15.



#### 4. CRITICAL DAMAGE EFFECTS

22. Service to 10% of AA battery OOA for  $\bar{N}$  turns - reduce AA Factor by 10% in affected battery. If ship has no AA battery, then use CD #12.
23. Fuel bunker hit - double fuel consumption (half the remaining cruising radius) during search. If oil fuel, ship will leave trail each remaining game turn which will be visible for 24 hours. Automatic shipboard fire, severity 8 for both coal and oil fuel ships.
24. Sonar/Asdic destroyed - no underwater detection capabilities. If ship has no Sonar or Asdic, then use CD #14.
25. Sonar/Asdic OOA for  $\bar{N}$  turns - as CD #24.
26. Fire control radar OOA for  $\bar{N}$  turns (roll to determine which battery PRIMARY/SECONDARY/AA). If no radar, then use CD #28.
27. Fire control radar destroyed - as #26 except permanent. If no radar, then use CD #29.
28. Fire control director OOA for  $\bar{N}$  turns (roll to determine which battery PRIMARY/SECONDARY/AA is affected and roll again to determine location of guns being serviced by director). No DCT bonus for all guns serviced by director for duration of CD. If no DCT, then reduce total from CHART H by 6.
29. Fire control director destroyed - as #28 except permanent.
30. Surface search radar OOA for  $\bar{N}$  turns - use visual sighting during search. If no radar, then reduce visual sighting range by 20% during search.
31. Surface search radar destroyed - as #30 except permanent.
32. Air search radar OOA for  $\bar{N}$  turns - use visual detection on CHART M1. If no radar, then reduce visual sighting range by 20% during search.
33. Air search radar destroyed - as #32 except permanent.
34. Rangefinder destroyed - if using visual fire control, reduce total from CHART H by 6 for battery being serviced by this RF.
35. Barbette of one mount jammed for  $\bar{N}$  turns - cannot traverse or fire (determine location as in CD #18).
36. Powerplant OOA for  $\bar{N}$  turns - all radar out, no radio communications, reduce ROF by 50% for all batteries and reduce AA (if any) by 25% for duration of effect.
37. Bridge hit - ship must continue on same course at same speed as this game turn for the next 4 game turns.
38. Structural damage - double the DP caused by this hit.
39. Severe structural damage - triple DP caused by this hit.
40. Prop/shaft damage - reduce maximum speed by 10 knots permanently.



4. CRITICAL DAMAGE EFFECTS
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41. Damage control party trapped for  $\bar{N}$  turns - no damage control reduction available during turns of effect. If ship currently under the effects of a shipboard fire, then add 25 to die roll when determining fire damage control.
42. Excessive flooding - ships over 75% damaged capsize. Ships with 75% damage or under must reduce speed by 10 knots and may not commence evasive maneuver. If affected by this CD again, ship capsizes regardless of current damage.
43. Avgas storage hit - multiply damage points caused by this hit by 5 and add this to total. Automatic shipboard fire severity 16. No further launch or recovery operations possible until fire is out.
44. Ready-use ammo hit - multiply damage points caused by this hit by 4 and add this to total. Reduce AA by 25% for the next  $\bar{N}$  turns. Automatic shipboard fire severity 10.
45. Hangar fire - roll dice to determine percentage of aircraft remaining aboard destroyed by fire. Automatic shipboard fire severity 8. No further launch or recovery operations possible until fire is out.
46. Elevator OOA for  $\bar{N}$  turns - reduce launch and recovery operations by 50% for duration of effect.
47. Elevator destroyed - as above except permanent.
48. Launch control OOA for  $\bar{N}$  turns - no launch or recovery operation for duration of effect.
49. Excess flooding causes severe list - as above except permanent.
50. Severe flooding - ships moving faster than 18 knots multiply damage caused by this hit by 4 and add to total. Ships moving 18 knots or slower multiply damage caused by this hit by 2 and add to total.
51. Flooding in compartments - sub must surface during any of next 3 turns.
52. Hull crushed - sub is destroyed.
53. Conning tower hit - no further offensive operations possible
54. Damage to bow TT - 50% of bow TT OOA permanently.
55. Severe damage to bow TT - all bow TT OOA permanently.
56. Damage to stern TT - as CD #54 except for stern TT.
57. Sea water in battery compartments - sub must surface next turn (regardless of depth). No offensive operations possible for next 4 turns on surface. No submerged operations for next 30 turns.
58. Diving planes jammed - sub must dive 100 feet per turn for the next 4 turns.
59. Diving planes jammed - sub must surface 100 feet per turn for the next 4 turns.
60. Diving planes jammed - sub must remain at current depth for the next 2 turns.
61. Sub leaking oil - sub must reveal location (not depth) to all ships within 6,000 yards as well as all aircraft for each turn.
62. Leaks in hull - sub may dive to  $\frac{1}{2}$  of its maximum depth.
63. Prop damage - sub must reduce speed to  $\frac{1}{2}$  of its maximum in order to remain undetected.