

APPENDIX 1. BATTLE AND CRUISER SQUADRONS-Pearl Harbor to Leyte Gulf

DECEMBER 1941

1S MUTSU, NAGATO, YAMASHIRO
2S FUSO, ISE, HYUGA
3S HIEI, KIRISHIMA, KONGO, HARUNA
4S ATAGO, CHOKAI, MAYA, TAKAO
5S HAGURO, MYOKO, NACHI
6S KAKO, FURUTAKA, AOBA, KINUGASA
7S KUMANO, MOGAMI, MIKUMA, SUZUYA
8S TONE, CHIKUMA
9S KITIKAMI, OI
16S ASHIGARA, KUMA, NAGARA
18S TENRYU, TATSUTA, KASHIMA
21S TAMA, KISO

JUNE 5, 1942

1S NAGATO, YAMATO, MUTSU
2S FUSO, YAMASHIRO, ISE, HYUGA
3S HIEI, KIRISHIMA, KONGO, HARUNA
4S ATAGO, CHOKAI, MAYA, TAKAO
5S MYOKO, HAGURO
6S KAKO, FURUTAKA, AOBA, KINUGASA
7S KUMANO, MOGAMI, SUZUYA
8S TONE, CHIKUMA
9S KITIKAMI, OI
16S NACHI, ASHIGARA
18S TENRYU, TATSUTA, KASHIMA
21S KISO, TAMA

AUGUST 1, 1943

1S MUSASHI, YAMATO
2S NAGATO, FUSO, YAMASHIRO
3S KONGO, HARUNA
4S ATAGO, MAYA, TAKAO
5S HAGURO, MYOKO
6S AOBA, CHOKAI, YUBARI, NAGARA
7S SUZUYA, MOGAMI, KUMANO
8S TONE, CHIKUMA
14S KASHIMA, ISUZU, NAKA
16S ASHIGARA, OI, KITIKAMI, KINU, KUMA
21S NACHI, TAMA, KISO

MAY 1, 1944 through OCTOBER 24, 1944

1S YAMATO, MUSASHI, NAGATO
2S YAMASHIRO, FUSO
3S KONGO, HARUNA
4S ATAGO, MAYA, CHOKAI, TAKAO
5S MYOKO, HAGURO
7S SUZUYA, KUMANO, TONE, CHIKUMA
16S AOBA, KINU
21S NACHI, ASHIGARA

This listing is not complete for the entire war, but only representative. Most light cruisers were assigned to destroyer flotillas as flagships. Squadrons 1-9 were the ships assigned to the battle and scouting forces of the navy in 1942-1943 and Diversion Attack Force in 1944. The other squadrons were assigned to area fleets for local defense. After May 1, 1944 heavy cruiser MOGAMI was assigned to Third Fleet, the carrier force.

APPENDIX 2. BATTLESHIP AND HEAVY CRUISER NAMES

As in the U.S. Navy Japanese ship types were assigned names in a category. As in the U.S. Navy there were variations from the system. The names for battleships were taken from the names of ancient provinces of Japan while heavy cruisers were named after mountains. The KONGO class ships were originally designated battle cruisers and consequently were named after mountains, while the TONE and MOGAMI class ships were originally designed as light cruisers and were named after rivers (the light cruiser category).

YAMATO	Ancient province in Nara prefecture and poetic name for Japan
MUSASHI	Ancient province in Tokyo, Kanagawa and Saitama
NAGATO	Ancient province in Yamaguchi
MUTSU	Ancient province in Aomori and Iwate
ISE	Ancient province in Mie
HYUGA	Ancient province in Miyazaki
FUSO	Land of the Rising Sun-Japan
YAMASHIRO	Ancient province in KYOTO
KONGO	Stability-the stability one has from faith in Buddha
HIEI	Mountain in Kyoto
KIRISHIMA	Volcano in Kagoshima and Miyazaki
HARUNA	Volcano in Gunma

KAKO	River in Hyogo
FURUTAKA	Mountain in Hiroshima
AOBA	Mountain in Sendai
KINUGASA	Mountain in Kyoto
MYOKO	Volcano in Niigata
NACHI	Mountain in Wakayama
HAGURO	Mountain to Yamagata
ASHIGARA	Mountain in Kanagawa
CHOKAI	Volcano in Yamagata
MAYA	Mountain in Kobe
ATAGO	Mountain in Kyoto
TAKAO	Mountain in Tokyo
MOGAMI	River near Yamagata
MIKUMA	River in Oita
SUZUYA	River in Sachalin
KUMANO	River in Honshu
TONE	River in Ebene
CHIKUMA	Mountainous region near Nagano

APPENDIX 3. BATTLESHIP AND CRUISER GUNNERY

Japanese Naval guns and their associated equipment were conventional. The 46cm guns mounted in the YAMATO class ships were old fashioned when compared with contemporary American, British and German designs. The 41cm and 36cm guns mounted in their other battleships and their turrets were nearly identical to the Royal Navy's outstanding 15" gun. The Japanese guns had better elevation (than the 15"), about 33° as built. In their final configuration their elevation was 43° except the two aft turrets (X and Y) in the ISE class ships. Hull depth precluded the necessary alterations in the revolving structure for the change in those turrets. The turrets were also better subdivided than the R.N. 15". The gunloading cages varied somewhat from the R.N. type in KONGO and NAGATO classes.

Their 20cm and 15.5cm turrets were very similar in layout to the R.N. Mark XXI and XXII six inch turrets.

Japanese Guns Mounted in Battleships and Heavy Cruisers

Designation	Caliber		Length in cal.	Proj. wt. A.P.	Rate of Fire	Range
	Nominal	Actual				
40 cm/45 cal Type 94	40cm	46cm 18.1"	45	3200#	1.5-2rpm	42,050m
40 cm/45 cal 3d yr type	40cm	41cm 16.1"	45	2260#	1.5-2rpm	38,400m
36 cm/45 cal 41 st yr type	36cm	35.56cm 14"	45	1490#	1.5-2rpm	35,500m
20 cm/50 cal 3d yr type	20cm	20.32cm 8"	50	278#	2.4-4rpm	28,900m
15.5cm/60 cal 3d yr type	15.5cm	15.5cm 6.1"	60	122.9#	5 rpm	27,400m
15cm/50 cal 41 st yr type	15cm	15.24cm 6"	50	100#	4-6rpm	
14cm/50 cal 3d yr type	14cm	14cm 5.5"	50	83.8#	5rpm	
12.7cm/40 cal type 88	12.7cm	12.7cm 5"	40	50.8#	8rpm	14,800m

Japanese surface fire control equipment was generally similar to that in use in Western navies. With the exception of the YAMATO class ships and battleship HIEI, all Japanese battleships and heavy cruisers were equipped with the Type 92 Main Low Angle Fire Control Computer or Table (SHAGEKIBAN) and Type 94 Low Angle Director (HOIBAN). The equipment in the TONE and MOGAMI class cruisers was an advanced and somewhat modified model of the basic Type 92/94 equipment, closely resembling HIEI's equipment in outward appearance. The Type 92/94 system was very similar to the Royal Navy's 1924 model Fire Control Table and could track a 40 knot target at 40,000 meters. The YAMATO class ships were equipped with the Type 98 Fire Control System which was capable of tracking a 40 knot target at 50,000 meters. HIEI was equipped with the Type 97 Fire Control System which was similar to the Type 98 in most particulars, being the prototype for the Type 98.

The secondary armament of Japanese battleships and the main battery of the modern light cruisers was controlled by the Type 94 Low Angle Fire Control System (different from the Type 94 H.A. system). The Type 94 Low Angle System could track ships at 20,000 meters at 40 knots.

Fire Control Installations in Japanese Battleships and Heavy Cruisers

Ship/class	Main Battery	Secondary	H.A. Battery	M.G. Battery	Comments
YAMATO class	1-15 meter R.F. 3-15 meter turret R.F. 1-10 meter R.F. Type 98 Shagekiban Type 98 Hoiban	Type 98 Sha. ban Type 98 Hoiban	Type 94 Kosha Sochi	Type 95 Shageki Sochi	Turrets I, II, & III each 1 15meter R.F. 15.5cm Turrets 1-8meter R.F. each
NAGATO class HARUNA, KONGO, KIRISHIMA	1-10 meter R.F. 2-10 meter turret R.F. Type 94 Hoiban Type 94 Sokuteikiban* Type 92 Shagekiban	Type 94 Hoiban Type 94 Sha. ban	Type 91 Kosha Sochi	Type 95 Shageki Sochi	Turrets II & III each 1 10 meter R.F.
HIEI	1-10 meter R.F. 2-10 meter turret R.F. Type 97 Hoiban Type 97 Shagekiban	Type 97 Hoiban Type 97 Sha. ban	Type 94 Kosha Sochi	Type 95 Shageki Sochi	Turrets II & III each 1 10 meter R.F.
ISE class	1-10 meter R.F. 4-10 meter turret R.F. Type 94 Hoiban Type 94 Sokuteikiban* Type 92 Shagekiban	Type 94 Hoiban Type 94 Sha. ban	Type 91 Kosha Sochi**	Type 95 Shageki Sochi	Turrets II, III, IV & V each 1 10 meter R.F. When converted Turret V re- moved with associated fire control equip- ment
FUSO class	1-8 meter R.F. 4-10 meter turret R.F. Type 13/14 Hoiban- Shagekiban (obsolete)	Type 94 Hoiban Type 94 Sha. ban	Type 91 Kosha Sochi	obsolete AA fire control equipment	Turrets II, III, IV, & V each 1 10 meter R.F.
TONE class	1-8 meter R.F. 2-8 meter turret R.F. Type 94 Hoiban Type 92 Shagekiban		Type 94 Kosha Sochi	Type 95 Shageki Sochi	Turrets II & IV each 1-8 meter R.F.
MOGAMI class	1-8 meter R.F. 2-8 meter turret R.F. Type 94 Hoiban Type 92 Shagekiban		Type 91 Kosha Sochi**	Type 95 Shageki Sochi	Turrets III & IV each 1-8 meter R.F. When MOGAMI converted tur- ret IV removed

Ship/class	Main battery	Secondary	H.A. Battery	M.G. Battery	Comments
ATAGO class MYOKO class	1-8 meter R.F. 2-8 meter turret R.F. Type 94 Hoiban Type 94 Sokuteikiban* Type 92 Shagekiban		Type 91 Kosha Sochi	Type 95 Shageki Sochi	Turrets II & IV each 1-8 meter R.F.
KAKO	1-8 meter R.F. 2-8 meter turret R.F. Type 94 Hoiban Type 94 Sokuteikiban* Type 92 Shagekiban		Type 91 Kosha Sochi	Type 95 Shageki Sochi	Turrets II & III each 1-8 meter R.F.

*SOKUTEIKIBAN-Japanese fire control equipment somewhat similar to director in function, however its specific function was not fulfilled by separate equipment in other navies. In the TONE and MOGAMI class ships the function was merged into the SHAGEKIBAN and in outward appearance their equipment resembled the HIEI's type 97 and YAMATO class Type 98 equipment where the function was also merged into a section of the SHAGEKIBAN.

**When the ISE class ships and cruiser MOGAMI were converted to seaplane carriers their H.A. fire control equipment was upgraded to Type 94 Kosha Sochi.

Kosha Sochi-High Angle Fire Control System
Shageki Sochi-Short Range High Angle Fire Control System

Generally the H.A. fire control system consisted of one director rangefinder system on each side of the ship. Most ships only had two director rangefinders for AA fire control.

Generally each two-three mount M.G. battery had its own Shageki Sochi

Cruisers had the Type 97 Torpedo Fire Control System installed. This equipment is discussed in the Japanese Destroyer booklet of this series.

The types 94 Kosha Sochi and Type 95 Shageki Sochi are discussed in JAPANESE AIRCRAFT CARRIER TACTICS.

APPENDIX 4. BATTLESHIP AND CRUISER AIRCRAFT

In the Japanese Navy floatplanes were important adjuncts to the Navy's reconnaissance effort. The two principal types of aircraft carried by cruisers and battleships were the El3A "Jake" three place long range scout seaplane and the FLM "Pete" two seat observation aircraft. These aircraft were preceded in the fleet by the E7K "Alf" three place and E8N "Dave" two place machines. The numbers and types of aircraft usually carried by Japanese battleships and heavy cruisers were:

YAMATO class	three two place machines
NAGATO class	two two place machines
ISE class	two two place machines(as BB)
FUSO class	two two place machines
KONGO class	two three place machines
TONE class	five three place machines
MOGAMI class	three three place machines
MOGAMI(1944)	six three place machines
TAKAO class	two three place machines
MYOKO class	two three place machines
KAKO class	two three place machines

At the beginning of the war most shipboard aircraft were painted light gray. Battleship and cruiser float planes were marked in a manner similar to the method used on carriers. Until May 1944 a Roman letter designated the squadron(A=1S, B=2S C=3S etc), a Roman numeral the ship within the squadron(I=#1 ship etc) followed by a two digit number for designation of the aircraft within the ship board organization thus: HI-01(H=8S, I=first ship, 01=#1 aircraft). By mid-1942 the familiar dark green upper surface, light gray underside paint scheme had become the standard for the Japanese Navy. In May 1944 the marking system for all aircraft changed to a digit only system. The battleship and cruiser aircraft were marked thus:

SECOND FLEET SHIPS		color	Squadron
YAMATO	211-01 etc	White or blue	1S(21)
MUSASHI	212-01 etc	do	1S(21)
NAGATO	213-01 etc	do	1S(21)
HARUNA	231-01 etc	do	3S(23)
KONGO	232-01 etc	do	3S(23)
ATAGO	241-01 etc	do	4S(24)
TAKAO	242-01 etc	do	4S(24)
MAYA	243-01 etc	do	4S(24)
CHOKAI	244-01 etc	do	4S(24)
HAGURO	251-01 etc	do	5S(25)
MYOKO	252-01 etc	do	5S(25)
SUZUYA	271-01 etc	do	7S(27)
KUMANO	272-01 etc	do	7S(27)
TONE	273-01 etc	do	7S(27)
CHIKUMA	274-01 etc	do	7S(27)
NOSHIRO	220-01 etc	do	2Sd(22)
THIRD FLEET SHIPS			
YAHAGI	370-01 etc	Red or yellow	10Sd(37)
MOGAMI	380-01 etc	do	THIRD FLEET
FIFTH FLEET SHIPS			
NACHI	511-01 etc	per orders of	21S(51)
ASHIGARA	512-01 etc	Fleet commander	21S(51)

SOUTHWEST AREA FLEET		color	Squadron
AOBA	961-01 etc	Per orders of	16S(96)
KINU	962-01 etc	Fleet Commander	16S(96)

The number in parenthesis is the TAI number for the squadron when operating as a tactical entity. This is explained in another section.

 APPENDIX 5. RADAR INSTALLATIONS

At the beginning of the war no Japanese warship had radar installed. By late 1942 they had begun installation of radars in their carriers, battleships and cruisers. By 1944 all battleships and cruisers were to carry three types of radar: Type 21 air/surface; Type 13 air and Type 22 surface. The practice was to mount a type 21 atop the foremast usually on top of the rangefinder or director in battleships and atop the mast in cruisers. In the YAMATO class there were two Type 21 sets, one on each 15m rangefinder arm. A Type 22 was mounted on each side of the foremast pagoda and a type 13 on the mainmast. Japanese radars were very poor compared with American or British equipment. By 1944 they hadnt advanced beyond the stage Allied radar development had reached in 1940. They didnt have fire control radar though the Type 22-4 could give range and bearing information to the main battery computers. AA radar fire control was not developed.

APPENDIX 6. TACTICAL AND ADMINISTRATIVE ORGANIZATION

The Japanese Navy's basic administrative organization was the type Fleet (KANTAI). Each Fleet was divided into Squadrons (SENTAI) and in the case of destroyers the Squadrons were further subdivided into Divisions or Groups (RENTAI).

The tactical units were the Force (BUTAI), Group (TAI) and Unit (TAI G)

The methods for designating organizations varied widely early in the war. They used Arabic numerals, Roman letters and numerals, Chinese numerals and calendrical characters, Kana* characters and descriptive titles to designate forces. All were used serially so the Western reader should have no problem with Forces etc that were designated 1, 2, 3 etc, A, B, C etc or I, II, III etc. The KANA designations were principally used in serializing raid or contact designations and similar formats though this method could be used in Force designation. The Chinese calendrical method was often used interchangeably with the Roman alphabet thus KO=A, OTSU=B HEI=C etc.

The two main methods were as follows:

KANA	I	RO	HA	NI	HO	HE	TO	CHI	RI	NU
	イ	ロ	ハ	ニ	ホ	ヘ	ト	チ	リ	ヌ

CHINESE CALANDER	KO	OTSU	HEI	TEI	BO	KI	KO	SHIN	JIN	KI
	甲	乙	丙	丁	戊	己	庚	辛	壬	癸
	A	B	C	D	E	F	G	H	I	J

The General method for determining call signs for tactical forces was:

CALL SIGN	FORCE
TAI A	KO FORCE
TAI B	OTSU FORCE
TAI C	HEI FORCE
TAI D	TEI FORCE
TAI E	BO FORCE
TAI N	STANDBY FORCE (TAIKI) FORCE
TAI S	MAINTENANCE FORCE (SEIBI)
TAI X	MOBILE FORCE (KIDO)
TAI Y	DIVERSION ATTACK FORCE (YUGEKI)
TAI Z	MAIN BODY
TAI 1	GROUP 1
TAI 2	GROUP 2
TAI U-0	GROUP 10
TAI U-1	GROUP 11
TAI U-2	GROUP 12
TAI G-1	GROUP 1 (within a larger group)
TAI G-2	GROUP 2 (within a larger group)

In May 1944 Combined Fleet redesignated all forces in the Navy by a numbering system somewhat akin to the U.S. Navy's Task Force System. Each squadron was given a TAI number that usually decoded as follows: First number=Fleet; Second number=Squadron. Ships within the squadron were given a number according to seniority (for example BB YAMATO would be unit number 211-2=Second Fleet; 1=First Squadron; 1=First ship). If the unit was an aircraft assigned to a ship the numbers continued thus 211-01=YAMATO #1 aircraft (see appendix 4). The TAI designations of the major afloat forces of the Japanese Navy as of May 1944 were as follows:

FORCES	TAI NUMBER
<u>COMBINED FLEET</u>	
OYODO	15
<u>SECOND FLEET</u>	
FIRST SQUADRON (1S)	21
THIRD SQUADRON (3S)	23
FOURTH SQUADRON (4S)	24
FIFTH SQUADRON (5S)	25
SEVENTH SQUADRON (7S)	27
SECOND DESTROYER SQUADRON (2Sd)	22
<u>THIRD FLEET</u>	
FIRST CARRIER SQUADRON (1sf)	31
SECOND CARRIER SQUADRON (2sf)	32
THIRD CARRIER SQUADRON (3sf)	33
FOURTH CARRIER SQUADRON (4sf)	34
TENTH DESTROYER SQUADRON (10Sd)	37
MOGAMI	38
CinC 3 Fleet will determine Fleet designations for remaining surface forces attached in accordance with the following number system	35-35 and 2351-2400
CinC Mobile Fleet will determine Fleet designations for remaining surface forces of SECOND and THIRD Fleets attached to his command as follows	2301-2350
<u>SIXTH FLEET</u>	
SUBMARINE SQUADRON 7	61
SUBMARINE SQUADRON 8	62
SUBMARINE SQUADRON 11	63
<u>FIFTH FLEET</u>	
TWENTY FIRST CRUISER SQUADRON (21S)	51
FIRST DESTROYER SQUADRON (1Sd)	55
CinC FIFTH Fleet	2551-2600
<u>NORTH EAST AREA FLEET</u>	
TWENTY SECOND CRUISER SQUADRON (22S)	52
<u>SOUTH WEST AREA FLEET</u>	
SIXTEENTH CRUISER SQUADRON (16S)	96

APPENDIX 7. PLOTTING SYMBOLS COMMONLY USED IN THE JAPANESE NAVY



Commander in Chief Combined Fleet (RENGO KANTAI)



KANTAI (FLEET) or BUTAI (FORCE) COMMANDER



SENTAI (SQUADRON) or RENTAI (DIVISION/GROUP) COMMANDER



Naval Force including Capital ships (also 4S)



Naval Force excluding Capital ships



Aircraft Carrier (KOKUBOKAN)



Guide Ship



Commander, SECOND DESTROYER SQUADRON

1S

First Squadron (SENTAI)

3S

Third Squadron

4S

Fourth Squadron

K

Kilometer

$\frac{2D}{4S}$

Second Section/Fourth Squadron

KdF

KIDO KANTAI (MOBILE FLEET)

KdMB

Main Body



Convoy Commander

$\frac{1}{3S}$

Ship #1 Third Squadron

dg

DESTROYER GROUP/DIVISION (KUCHIKU RENTAI)

Sd

DESTROYER FLOTILLA/SQUADRON

CS	CRUISER SQUADRON
BS	BATTLESHIP SQUADRON
B	BATTLESHIP
C	CRUISER
D	Section of a Division or Squadron
Ng	Night Operations Unit
sf	KOKU SENTAI (Carrier Squadron/Air Flotilla)
m	Meter(s)
fb	Dive Bomber
fc	Fighter
fd	Flying Boat
flo	Land based attack/torpedo
fo	Torpedo/attack
	Submarine
	Flying Boat

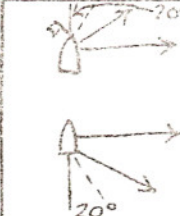
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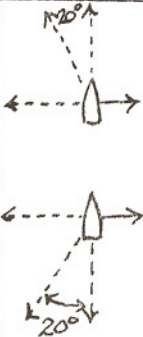
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REGULATIONS FOR THE USE OF SEARCHLIGHTS

best of quality.

and, if necessary, to engage the enemy at close quarters, all ships will cooperate and engage as many ships as possible with gunfire and illumination in order to destroy the enemy and to maximize the effectiveness of the attack.

METHODS (Cont'd)	OUTLINE	WHEN USED
Ship for Ship		When ship for ship fire is to be used
Alternating	 Illumination will be alternated every few minutes One minute will be standard.	To make enemy counter- attack difficult and when converging fire is to be carried out.
Designated #__ Ship		When security measures to the fore and aft are particularly necessary.
Dispersed		To confuse as many enemy ships as possible.
Search	 (a) No. 1 ship will search the area in front of the enemy (aft in engagement on opposite course). No. 2 ship will search the area aft of the enemy ship (or in front when engagement on opposite course) (b) When enemy is in a beam ships will switch automatically to dispersed method. (c) Sometimes searchlight il- lumination will be carried out by one designated ship.	To determine the pre- sence of enemy ships fore or aft of enemy ship being fired upon.

METHODS (Cont'd)	OUTLINE	WHEN USED
Disengaged Side	 No.1(2) ship will search on bow(quarter) of disengaged side.	To determine the presence of the enemy on the dis- engaged side.

When there are more than three ships and they are engaged on opposite course, they will follow the rules laid down in the above tables.

93. It will be standard practice to use a minimum number of searchlights. However it is sometimes necessary to use all the searchlights against the enemy in order to develop firepower and to confuse him.

94. In using searchlights each ship must take strict precautions against silhouetting other friendly ships and the cones of light must be kept in focus. At the same time, care must be taken so that the source of light does not give away our bearing or formation.

95. It will be fundamental for the #2 ship to take over the illumination duties of the flagship whenever possible. However an exception will be made when firing by use of searchlight illumination on strange targets.

96 When enemy airplanes attack at dusk or dawn, searchlights will be used vigorously to dazzle them.

97. Normally when searchlight illumination is to be used for a reason other than as an aid to firing, it will be directed by this command.

Note: Sections 78-92 are unrelated to searchlight doctrine and procedure.

APPENDIX 9. JAPANESE NAVAL WARGAMING

The Japanese Navy played table top wargames before most of their major operations. Their method of combat resolution and maneuver was chance, with empirical factors. The orders issued by Commander Northern Forces for Interception Zone Table Top Maneuvers is a good example of a typical Japanese Navy Table Top wargame and is printed here in full.

NORTHERN AREA ULTRASECRET SPECIAL ORDER # 23, 26 Nov. 1943

Plan for Northern Force Table Top Maneuver # 5

A. Daily Schedule and Place

DATE	AM/PM	SUBJECT	PLACE
18 Dec (Sat.)	AM	Preliminary arrangements (Board of Critique and Personnel of both side par- ticipating in operation)	Ominato Guard District Telephone Exchange Office
	PM	Maneuvers	
19 Dec (Sun.)	AM/PM	Maneuvers	
20 Dec (Mon.)	AM/PM	Maneuvers	
21 Dec (Tues.)	AM	Preparation	
	PM	Critique	

Note: The starting(ending) time; unless specified, will be 0900(1200) in the morning and 1300(1630) in the afternoon.

B. Principal Items for Study

Northern Force Operations in Combined Fleet KO Operations for the early part of the coming spring.

C. Participating personnel

1. Supervisory personnel

- a. Director and Chief Umpire-Chief of Staff, 5th Fleet
- b. Umpires
 - (1) Staff Officer 2nd Fleet
 - (2) Staff Officer NE Area Fleet
 - (3) Staff Officer DesRon 1
- c. Assistant Umpires and Personnel in charge of maneuvers
 - (1) Navigation Officer CL ABUKUMA
 - (2) Chief Code and Navigation Officer 5th Fleet

2. Maneuver personnel

FLEET	FORCES	COMMANDING OFFICER
Blue Force (Japanese)	CinC NE Area Fleet	Staff Officer NE Area Fleet
	CinC Northern Force	Senior Staff Officer 5th Fleet
	DesRon 1	Senior Staff Officer DesRon 1
	Kurile Island Defense Force	Senior Officer Kurile Is. Force
	51 Guard Unit	Senior Officer 51 Guard Unit
	Submarine Forces	Sub. Cdr designated by ComSub 7
	Army Forces	Staff Officer NE Area Fleet
	12 Air Fleet	Staff Officer NE Area Fleet
Red	To be designated by Com5th Fleet	Captain of TAMA. In addition to Communications Officer 5th Fleet, Gunnery Staff Officer DesRon 1, Gunnery Officer ABUKUMA, Flight Operations Officer Ominato Koku- tai, the various commanding

Note: Each Commanding Officer may be accompanied by suitable assistants.

D. Organization of the Maneuvers

1. General Plan)
2. Blue Fleet Special Plan) To be sent to proper authorities.
3. Red Fleet Special Plan)

E. Charts and Maps to be used.

1. HONSHU to the ALEUTIANS (to be prepared at 5th Fleet HQ)
2. 1:50,000 map (to be distributed to proper authorities)
3. Various local maps and charts (to be used for defense plans)

F. C.O. Northern Force for the Blue Fleet, Senior C.O. Red Fleet and the C.O. Kurile Island Defense Force will distribute the Plan of Operations (the C.O. Kurile Island Defense Force will distribute a sketch of the defense plan) to those concerned by 16 Dec. and will forward three copies by way of report.

G. The various C.Os. in the maneuvers, the supervisory personnel who have special criticisms and the various commanding officers of Northern Force observing the table top maneuvers will submit their observations to the board of critique as soon as possible after termination of the maneuver.

H. Attendance at the table top maneuvers will be limited to the following:

1. Maneuver personnel
2. Captains NACHI, ABUKUMA, KISO
3. Staffs NE Area Fleets and Ominato Guard District.

I. Permission first must be obtained from the board of critique to use new weapons or tactics.

GENERAL PLAN

A. Blue Force represents N Country and Red Force A Country.

B. Since the A country force is strengthening its bases in the Western AO area, at AO and AOB and is steadily preparing to mount devastating air attacks against the Northern Area of N country, the feeling at central command seems to be strongly in favor of carrying out the northern operations in concert with the counterattack on Southwest PA area when favorable flying weather prevails.

C. It appears that the N country force is favorably preparing a northern interception zone and is increasing its strength in preparation for the attack by the A country force.

D. With the growing intensity of the war between N and A, A is requesting R to grant use of military bases, especially air bases. However it appears that R is not taking immediate steps to comply with this request.

APPENDED ORDER

1. This maneuver will commence at 1330, 18 Dec. on the basis of the situation at 2400, 2 Apr. 1944.
2. Central Standard Time will be used.
3. Separate instructions will be given regarding meteorology, and other operational matters.

APPENDIX 10. PROJECTILE AND RANGE SELECTION

In determining the penetration capabilities of their projectiles the Japanese used DeMarre's formula:

$$V_d = 1530 \frac{D^{0.75} T^{0.70}}{P^{0.50}}$$

Where V_d =critical velocity in meters per second (the terminal velocity required just to penetrate a plate of given thickness with no velocity remaining after penetration); D =Projectile diameter in decimeters; T =plate thickness in decimeters and P =projectile weight in kilograms. Using English units the formula is $V_d = 1020 \frac{D^{0.75} P^{0.70}}{P^{0.50}}$ where

D and T are in inches, P in pounds and V_d in feet per second. The formula was based on an old type 3 A.P. projectile fired against homogeneous armor at normal obliquity. To adjust to the type 91 projectile (the most modern type A.P. projectile in use) at oblique angles an adjustment referred to as a "Figure of Merit" was used. Figure of Merit tables for various tactical situations were developed. At normal obliquity the FM was between 1.1 and 1.4 while it was about 2.5 at high obliquities.

FM values for the 20 cm and 40 cm guns at various obliquities were:

	Obliquity	0°	10°	20°	30°	40°	50°	55°	60°	65°	70°
20cm FM		1.3	1.3	1.32	1.37	1.48	1.72	1.92	2.17	2.49	2.91
40cm FM		-1.3	-1.3	1.30	1.45	1.60	1.88	-	2.10	-	-

Nominal conditions for penetration were:

PROJECTILE	VH ARMOR		NVNC ARMOR	
	THICKNESS	OBLIQUITY	THICKNESS	OBLIQUITY
46cm	560mm 22"	16.5°	200mm 7.9"	55°
	420mm 16.5"	37°, 33°, 30°	125mm 4.9"	55°
	410mm 16.1"	37°, 33°, 30°		
	380mm 15.0"	37°, 33°, 30°		
	350mm 13.8"	45°		
41cm	380mm 15.0"	20°	150mm 5.9"	55°
36cm	410mm 16.1"	16.5°	125mm 4.9"	55°
	330mm 13.0"	30° 20°		
20cm			165mm 6.5"	30° 15°
			140mm 5.5"	45° 30° 15°
			100mm 3.9"	45° 30° 15°
15.5cm			100mm 3.9"	30° 15°
			75mm 3.0"	45° 30° 15°

In tests the following conditions were regularly used (V_s =terminal velocity) with full penetration of the plate with the explosive cavity intact being the goal:

46cm 410mm VH plate at 30° obliquity
 $V_s=525\text{m/s}(1732\text{f/s})$; $V_d=337.8\text{m/s}(1109\text{f/s})$
 $F.M._s=1.554$

41cm 380mm VH plate at 20° obliquity
 $V_s=480\text{m/s}(1575\text{f/s})$; $V_d=350.1\text{m/s}(1149\text{f/s})$
 $F.M._s=1.371$

36cm 330mm VH plate at 20° obliquity
 $V_s=485\text{m/s}(1591\text{f/s})$; $V_d=353\text{m/s}(1154\text{f/s})$
 $F.M._s=1.378$

20cm 100mm NVHC plate at 30° obliquity
 $V_s=350\text{m/s}(1148\text{f/s})$; $V_d=232\text{m/s}(761\text{f/s})$
 $F.M._s=1.509$

15.5cm 75mm NVHC plate at 30° obliquity. About the same as 20cm.

PENETRATION CAPABILITIES WERE:

CALIBER	TYPE ARMOR	THICKNESS	MEAN IMPACT VEL(ft/sec)	STRIKE ANGLE
46cm	Vickers Hard.	22.05"	1822	16.5°
41cm	Vickers Cem.	18.1"	1610	22°
36cm	Vickers Hard.	16.15"	1763	16.5°
20cm	Non Cement	6.5"	1553	30°
15.5cm	Non Cement	3.94"	2224	60°

RANGES FOR PENETRATION WERE:

CALIBER	10,000m	15,000m	20,000m	30,000m
46cm			22.3"V 6.6"H	16.4"V 9.1"H
41cm		17.7"V	10.6"V	8.0"V
36cm	17.6"V	11.4"V	7.5"V	
15cm	3.3"V	2.0"V		

V=Vertical plates

H=Horizontal plates

Japanese armor was supposed to have the following resistance: Vertical plate(20° obliquity) the projectile should penetrate no deeper than the projectile shoulder(bouretlet) using the following projectiles and impact velocities(meters/second):

PLATE THICKNESS	PROJECTILE			
	40cm	36cm	20cm	15.5cm
400mm and over	*			
400mm	395			
375mm	375			
350mm	355			
325mm	335	385		
300mm		360		
275mm		335		
250mm		310		
150mm			355	
125mm			305	
100mm			260	315
75mm				265

For horizontal plate the explosive cavity should not penetrate the plate though a fragment may using the following projectile and impact velocities(meters/second):

PLATE THICKNESS	PROJECTILE			
	40cm	36cm	20cm	15.5cm
200mm and over	*			
200mm	400			
175mm	360			
150mm	315	365		
125mm		315		
100mm		265	405	
75mm			320	415
50mm				230
50mm (65° impact angle)				330
35mm (" " ")				250

*46cm used against 400mm plus vertical and 200mm plus horizontal plates. Terminal velocities assumed to be similar to those in the chart(i.e. 250-400m/s.)

REFERENCES-BATTLESHIP AND CRUISER DOCTRINE, IMPERIAL JAPANESE NAVY

1. COMBINED FLEET DOCTRINE, BOOK 1-COMBAT; Combined Fleet UltraSecret Standing Order # 81 of Dec. 5, 1943(CFDOCT)
2. CRUISER DOCTRINE, SECOND FLEET; Second Fleet UltraSecret Standing Order # 8 of Jan 22, 1944(CRUDOCT)
3. NIGHT OPERATIONS FORCE DOCTRINE; Second Fleet UltraSecret Standing Order # 1 of Jan 1, 1944; revised May 1, 1944(NOFORDOCT)
4. DIVERSION ATTACK FORCE DOCTRINE; Second Fleet UltraSecret Standing Order # 2 of Jan 1, 1944; revised May 1, 1944(DAFDOCT)
5. MEMORANDUM ON COMBINED FLEET OPERATIONS ORDERS; Combined Fleet Memorandum # 13 of Aug. 15, 1943(CFM-13)
6. DESTROYER DOCTRINE, SECOND FLEET; Second Fleet UltraSecret Standing Order # 20 of Dec. 18, 1943(DESDOCT)
7. DESTROYER PROCEDURE, SECOND FLEET; Second Fleet UltraSecret Standing Order # 21 of Dec. 18, 1943(DESPRO)
8. CURRENT TACTICAL ORDERS, BATTLESHIPS, U.S. FLEET, 1938; (USF-16)
9. COMMANDER BATTLESHIPS, PACIFIC FLEET, OPERATION ORDER 13-44 (CBP 13-44)
10. U.S. NAVAL WAR COLLEGE ANALYSIS, BATTLE FOR LEYTE GULF (WCA)

REFERENCES AND COMMENTS SECTION BY SECTION

If a section of doctrine is unusual in any manner or if specific application of doctrine, tactics or technique can be illustrated by reference to popular historical works then this will be done. If a section is fairly conventional in its makeup then no comment is necessary. To insure an authentic flavor all of the drawings in the text are copied from Japanese tactical handbooks. The drawings in this section are for additional clarification of the text where the original Japanese manual(s) lacked illustrations.

I. GENERAL: CFM-13

II. BATTLESHIP DOCTRINE AND PROCEDURE:

- A. TACTICS: WCA, DESPRO, USF-16, CFDOCT. WCA indicates standard distance for IJN BB as 800 meters. CFDOCT contains BATTLE SPEED SIGNALS for battleships but no acc.-dec. tables. DESPRO has light cruiser and destroyer acc.-dec. tables coupled with BATTLE SPEED SIGNALS. USF-16 and CBP 13-44 have USN battleship acc.-dec. tables. The IJN BB/CA acc.-dec. tables are conjectural but are believed to be accurate.
- B. DOCTRINE-GENERAL: CFDOCT. Also see the various approach dispositions in the text at pp. 19-25.
 1. Japanese concentration on the van differs from USN doctrine and the lessons of Jutland. The conventional wisdom was that all targets should be fired upon, since the disruption to the fire control problem of a ship under fire is substantial. The Japanese method was based on their dilemma. How does an inferior battle line offset its smaller numbers. The theory was to wreck the van, quickly eliminating the ships under the concentrated fire, and also give the faster (supposedly, though by 1944 this was not true) Japanese battle line an opportunity to cap the American T. The Japanese presumed that high risks were in order to offset their material inferiority and this aspect of their doctrine illustrates their willingness to take great risks in the hope of offsetting gains. The statement that 3S will take station obliquely to the rear of the main body seems in conflict with the fire distribution tables in CFDOCT. This may be a translation error. It would seem that it should read "obliquely in the van". The inferior armor and superior speed of the KONGOs could explain this apparent discrepancy.

The liberal use of torpedoes is expected in Japanese doctrine. The long range firing timed to arrive at the target with "open fire" is a noteworthy use of the long range wakeless "long lance" torpedo.

2. CFDOCT

3. CFDOCT. Night Action OTSU may contain a typographical error. Some Japanese doctrinal publications state "the newest and most powerful units" of a divided enemy should be attacked. Either makes sense and the discrepancy in a policy statement is harmless. Of course the error would have been in the transcribing after translation.

4. CFDOCT

5. CFDOCT

6. CFDOCT

C. DOCTRINE-GUNNERY: CFDOCT. Japanese double fire doctrine in the face of superior numbers is commented upon above. The drawings illustrate just how much they were willing to risk.

III. CRUISER DOCTRINE AND PROCEDURE

A. TACTICS: The comments under BATTLESHIP TACTICS (II A) apply.

B. GENERAL DOCTRINE: CRDOCT

1. CRDOCT. The firing of torpedoes when enemy battle line deploys again emphasizes the Japanese attitude regarding liberal firing of torpedoes at all ranges.

2. CRDOCT

3. CRDOCT

C. CRUISER GUNNERY DOCTRINE: CRDOCT

1. CRDOCT. The same attitude regarding battle line fire distribution is present in Cruiser Fire Distribution.

2. CRDOCT. Night open fire ranges in South Pacific are of interest.

3. CRDOCT.

D. TORPEDOES: CRDOCT

E. AIRCRAFT: CRDOCT. Rules enunciated probably apply to battleship float aircraft also.

IV. DIVERSION ATTACK FORCE DOCTRINE

A. GENERAL: DAFDOCT. As stated in the introduction Diversion Attack Force was considered more descriptive of the role of battleships and cruisers in carrier operations than the old Second Fleet tactical designation "Advance Force"

B. ALERT CRUISING DISPOSITIONS: DAFDOCT. Most historical accounts of the Pacific War contain examples of the type formations illustrated in this section. Some examples are given at the end. The advantage of their standard ALERT CRUISING DISPOSITION was the ability to deploy rapidly on either flank with adequate screen available. The compactness of the disposition is its principal drawback.

C. APPROACH DISPOSITIONS: DAFDOCT. The comments under the Alert Cruising Dispositions section apply here also.

D. DIVERSION ATTACK FORCE COMBAT DOCTRINE: DAFDOCT.

V. NIGHT OPERATIONS FORCE DOCTRINE

A. GENERAL: NOFORDOCT. The comment about "nearest" and "newest" units in II B 3 above applies.

B. OPEN SEAS: NOFORDOCT. The term O HASSHA appears in the text for the first time here. In the original translation this was assumed to be a "window" type projectile. The type 4 fuze projectile was a pyrotechnic type shell (star shell) for firing from major caliber guns (8" and larger).

C. SCOUTING: NOFORDOCT

D. TRACKING: NOFORDOCT

E. ATTACK: NOFORDOCT

F. NIGHT OPERATIONS IN NARROW WATERS: NOFORDOCT. DESPRO has diagrams which indicate that day torpedo attack would be similar to the methods indicated for NIGHT OPERATIONS DISPOSITIONS.

TACTICAL ORDERS AND DOCTRINE, BATTLESHIPS AND CRUISERS U.S. NAVY contains a section entitled, "Maneuvers of a Battleship Formation" consisting primarily of a series of illustrations of elaborate parade ground maneuvers. The sources quoted in this handbook do not contain similar illustrations. MOBILE FLEET DOCTRINE contains a few examples of AXIS ROTATION which will be carried in AIRCRAFT CARRIER DOCTRINE AND AIR COMBAT REGULATIONS, I.J.N. of this series. The sources utilized in preparing this handbook quote from and refer to the following additional handbooks which werent recovered by the Allies but the titles suggest they are the repository of the Japanese equivalent diagrams:

Japanese Tactical Documents cited in the References mentioned in this handbook and other handbooks of this series that werent recovered with the Japanese Tactical Library.

A. TACTICS AND MANEUVERS

1. REGULATIONS FOR NAVAL WARFARE (KAISEN YOMUREI): CFDOCT
2. OUTLINE FOR CRUISING UNDER ALERT: CFDOCT
3. NAVAL COMBAT REGULATIONS: 4 sf DOCT*
4. STANDARD FLEET MANEUVERS, INTERNAL REGULATIONS FOR COMBINED FLEET MANEUVERS: DESPRO
5. COMBINED FLEET MANEUVERS: DESPRO

B. COMMUNICATIONS

1. NAVY SIGNAL BOOK: CFDOCT, FMFDOCT**, DESPRO
2. NAVY SIGNAL REGULATIONS: IFF***
3. CODE TABLES FOR IFF: IFF
4. NAVY TACTICAL COMMUNICATIONS ABBREVIATED CODES: DESPRO
5. REGULATIONS FOR COMBINED FLEET WIRELESS COMMUNICATIONS: DESPRO
6. REGULATIONS FOR COMBINED FLEET SIGNAL COMMUNICATIONS: DESPRO

C. AIR COMBAT AND ANTI-AIR REGULATIONS

1. ESSENTIALS OF COMBINED FLEET AIR COMBAT: CFDOCT
2. ESSENTIALS OF COMBINED FLEET ANTI-AIR WARFARE: CFDOCT
3. STANDARD REGULATIONS FOR ANTI-AIR WARFARE: DESPRO
4. AIR COMBAT REGULATIONS: DESPRO

D. TORPEDOES

1. REGULATIONS FOR TORPEDO ACTION: CRDOCT, DESPRO
2. STANDARD PLAN FOR FIRING TORPEDOES: DESPRO
3. MANUAL FOR TORPEDO ACTION: DESPRO

E. RADAR, SONAR, ETC

1. DIVERSION ATTACK FORCE STANDARD RADAR SEARCH REGULATIONS: DAFDOCT
2. COMBINED FLEET STANDARD RADAR SEARCH PROCEDURE: FMFDOCT
3. MANUAL FOR UNDERWATER RANGING: DESPRO

F. OPERATIONS OF AUXILIARIES, ETC

1. OUTLINE FOR LANDING OPERATIONS: CFDOCT
2. MERCHANT SHIP UNIT MOVEMENTS AND COMMUNICATIONS REGULATIONS: CFDOCT
3. TRANSPORT SHIP UNIT MOVEMENTS AND COMMUNICATIONS REGULATIONS: CFDOCT
4. OUTLINE FOR PROTECTION OF SEA TRAFFIC DURING THE GREATER EAST ASIA WAR: CFDOCT

G. GENERAL

1. COMBINED FLEET REGULATIONS FOR COMBAT PREPARATION: DESPRO

Several of the sources quoted will state without illustration under a section

*FOURTH CARRIER SQUADRON DOCTRINE

**FIRST MOBILE FLEET DOCTRINE

***IDENTIFICATION OF FRIENDLY FORCE REGULATIONS.

regarding some specific tactical situation that COMBINED FLEET STANDARD MANEUVER # _____ will apply. Reference to some of the battle charts in standard histories indicate that Japanese maneuvering regulations were highly developed. The search for the documents in the list continues.

Reference to histories for examples of the Formations illustrated in the
xt.

BATTLE OF JAVA SEA

Ref: Morison, vol. 3, p. 344
Roskill, vol. 2, p. 12

Comment: The Japanese approach the battle in a formation similar to Y-22, with 5S in Station 1; 2sd in Station 2 and 4sd in Station 3. The heavy cruisers deploy to the right. 4sd aggressively steams to favorable torpedo firing position while 2sd moves to gain bearing on the Allied column for torpedo firing.

BATTLE OF SAVO ISLAND

Ref: Morison, vol. 5, p. 34

Comment: Illustrates simple open order of battle. The distance in the line is 1200 meters (1300+yds), very adequate for night fighting.

BATTLE OF CAPE ESPERANCE

Ref: Morison, vol. 5, p. 159

Comment: Similar to Y-22. 6S in Station 1; HATSUYUKI in Station 2; FUBUKI in Station 3. American radar and confusion in execution of a countermarch lead to Japanese defeat.

BATTLE OF GUADALCANAL (11-13-42)

Ref: Morison, vol. 5, p. 241

Comment: Good illustration of STANDARD DIRECT ESCORT DISPOSITION, which is essentially an anti-submarine (or anti-MTB) formation. The battle was in fact a torpedo gunnery engagement.

BATTLE OF GUADALCANAL (11-15-42)

Ref: Morison, vol. 5, p. 274

Comment: The Japanese approach in essentially a Y-21 but split before contact.

BATTLE OF EMPRESS AUGUSTA BAY

Ref: Morison, vol. 6, p. 309

Comment: Japanese approach in Y-22. 5S in Station 1, SENDAI and 3 DDs in Station 2; AGANO and 3 DDs in Station 3.

PALAWAN ACTION

Ref: Morison, vol. 12, p. 171

Comment: Referred to as a Y-19 in Japanese Action Reports, it is essentially an improvised Alert Cruising Disposition. The failure to deploy destroyers in accordance with doctrine was disastrous.

BATTLE OFF SAMAR

Ref: Morison, vol. 12, p. 247

Comment: Essentially a Y-42 with the destroyers in the cruiser picket line at Stations 3 & 4 rather than acting as advance guard. It is also an excellent example of the disposition axis being other than disposition course and of adaptation of doctrine to a changing tactical situation since ships have been switched about in the formation after losses of or damage to several important units.