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Serial No. 119

TACTICAL PROBLEM I-1934 - Senior

ORANGE

STAFF SOLUTION

by

COMMANDER C.E. BATTLE, Jr., U.S.N.

(This problem is a continuation of Operations Problem I-1934-Sr., based on Vice Admiral OC's Strategic Estimate of the Situation).

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TACTICAL PROBLEM I-1934-Sr.

ORANGE STAFF SOLUTION

1. OWN MISSION.

Vice Admiral OC having completed his strategic estimate of the Strategic Situation, arrived at a decision, and prepared an Operation Order embodying as paragraph 2 (general plan) this decision, is now concerned with the tactical phases of the situation and the preparation of a battle plan. The decision arrived at in the Strategical Estimate is quoted below:

"To destroy the reinforcements last reported off SATAWAN ISLAND, by attacking the escort with submarines as soon as they can reach attack positions, and by engaging promptly and decisively during daylight with all surface forces, in order to prevent BLUE reinforcements from reaching the PHILIPPINES prior to the capture of MANILA BAY."

The tactical mission is derived from this paragraph and is formulated as follows:

"To destroy BLUE reinforcements last reported off SATAWAN ISLAND in daylight action with all surface forces in order to prevent their reaching the PHILIPPINES prior to the capture of MANILA BAY."

The Situation confronting us is one where-in our Scouting Operations having definitely located the BLUE reinforcements, we must concentrate our forces and engage him in decisive action. BLUE is confronted with the defense of a slow convoy.

SECTION II

(a) Political Status. Does not apply.

(b) Economic Status. Does not apply.

(c) Geographical features. The area in which this engagement may be expected is that south of the CAROLINES, which in general is free from land and shoals, though the battle may be fought in the vicinity of islands or other dangers to navigation, which might influence tactics and maneuver ability.

(d) Weather. In this area, at this season of the year the Northeast trade wind is blowing, force 3 to 5. The weather is clear, the rainy season is over and normal visibility can be expected. The sea will normally be smooth at night and in the early forenoon, though rising to a moderate sea as the wind increases. There are thirteen hours of daylight. Moonlight conditions will prevail during the latter half of the night. Conditions favor flight operations during the forenoon. With the strengthening of the wind in the afternoons there will exist some risk to planes landing on the surface of the sea.

(e) Information and Security. It is improbable that BLUE will gain information of our force except through friendly merchantmen, reports from own C-in-C, should his observations disclose the absence from ORANGE Fleet of these units, and from his own limited air patrols until our scouts make contact. His method of denial of information of his force will be limited to driving off or keeping down of ORANGE submarines, and to driving off of ORANGE cruisers.

(f) Materiel characteristics. The materiel readiness of BLUE is assumed to be excellent in all respects, except as to some foulness of boilers and bottoms which may to some extent lower the maximum listed speed. This however, will not be a decisive factor.

(g) (1) The original report from TRUK gives the BLUE Force as composed of

- 3 Battleships
- 3 Heavy Cruisers
- 4 Light Cruisers
- 21 Destroyers
- 30 Convoy Vessels
- ? Submarines

The materiel tactical characteristics of this force are tabulated in Annex A.

(2) The enemy force was last sighted south of SATAWAN ISLAND at zero seven hundred six January, steaming west with a convoy of about thirty vessels. Until our own search operations result in contacts and information, we will not know his disposition or exact composition.

(h) BLUE personnel is known to be well trained and skillful; they are determined and courageous. Previous engagements during this campaign have undoubtedly keyed their morale at a high standard.

(i) Logistic support available. Only that contained within the force. It is assumed that BLUE has refuelled his destroyers en route and will not be handicapped in this respect. Ammunition supply must be replete.

(j) BLUE is aware that his position was ascertained on six July south of SATAWAN, and is without doubt expecting ORANGE to conduct scouting operations and to oppose his advance. BLUE should be unaware of the composition of ORANGE Force and should be so unaware until attack is imminent.

Own Strength.

(a), (b), (c), (d) same as for BLUE.

(e) Our information is limited to that of the report of six January. It is believed that BLUE has no information of our forces either as to location, strength or disposition. Considering BLUE force as we know it, it is believed that he has little

opportunity of gaining this information until our attack is imminent.

(f) Our materiel condition is satisfactory. Previous operations have put some strain on our propelling machinery, and some diminuation of maximum speed exists, but this will not be of vital importance.

(g) We must await contacts of own scouts and the developments of these contacts for further information of the enemy's exact composition and disposition.

(h) Our personnel is efficient and well trained. Morale is high.

(i) Our force has ample fuel and ammunition.

Relative Strength.

(a) BLUE expects an attack, but has no knowledge of the type of this attack. It may be for purposes of attrition by night raids with light forces, or it may be a decisive attack by major forces. BLUE is under a nervous strain and constant expectancy. ORANGE, on the other hand, knows very closely the strength of his opponent and after contact by his scouts will know the definite location of his objective and his disposition.

BLUE is handicapped by the defense of a large slow convoy. ORANGE has speed and freedom of movement.

(b) The comparison of forces available to each side is given below, by types:

Submarines:

<u>ORANGE</u>	<u>BLUE</u>
12	?

The ORANGE submarines have maximum surface speeds of from 19 to 17 knots and maximum submerged speeds of 9 knots. Their employment in the search operations place them on a scouting line about 300 miles in length. It is problematical as to how many submarines will be in the immediate vicinity of the battle area.

In considering submarine types it is not their strength, one to another that we are as much concerned with as it is their relative ability to get at heavy ships, particularly Battle Line units. Their effectiveness in the engagement will in large extent depend on the position relative to their objective that they find themselves in when battle is joined and their ability to make maximum use of their surface speed to gain favorable positions for attack.

It is a reasonable assumption that we are superior in total number of submarines. It is unreasonable to assume, however, that we shall have superiority in this type in the battle area.

Surface Types:

<u>ORANGE</u>	<u>Type</u>	<u>BLUE</u>
--	BB	3
3	CC	--
8	CA	3
5	CL	4
16	DD	21
--	Convoy	30 (armed?)

Capital Ships.

In capital ships BLUE is superior in life in the ratio of 46 to 36. Two BLUE BBs are capable of 22,000 yards range, and one of 23,000 yards range. Our maximum gun range is 30,000 yards. BLUE can penetrate our side armor at 22,000 yards and under, but our deck armor cannot be penetrated with his short range guns. Our 14" guns penetrate BLUE deck armor outside of 25 to 26,000 yards, and his side armor inside of 17 to 18,000 yards with 90 degree target angle. Plane spot is important to us if long range fire is to be employed. Due to superior gun range our fire effect between 30,000 and 23,000 is overwhelming to BLUE, though the damage mounts slowly. At 21,000 yards and under the damage inflicted by BLUE is about double that inflicted by ORANGE at 90° target angles. Individually the CCs are weaker than the BBs, but we possess the great advantage of outranging our enemy by 7,000

yards in a rangeband where real damage can be inflicted.

ORANGE has a speed margin of $5\frac{1}{2}$ knots and carries a considerable torpedo armament while BLUE carries none.

Heavy Cruisers.

Our MYOKO class are opposed to BLUE's ASTORIA class. Ship for ship, assuming a 90° target angle, we are superior at ranges below 15,000 yards; in ranges 15,000 to 20,000 yards inclusive BLUE is superior on account of our inability to penetrate either his side or deck armor; then we are about equal to our limiting range of 31,000 yards. BLUE can outrange us from 32,000 to 34,000 yards inclusive but damage is small. In this class, however, we have 8 ships to his 3.

Light Cruisers.

Our YURA class is opposed to his OMAHA class. Ship for ship BLUE is superior at all ranges. We have 5 ships to his 4.

In cruiser strength we are decidedly superior to BLUE in all appropriate combinations and neither side possesses a speed margin. BLUE CAs carry no torpedoes.

Destroyers.

In destroyers BLUE is superior in the ratio 21 to 16. BLUE DDs carry a heavier torpedo armament but are lighter gunned than ours. Speeds are about equal.

Considering the Light Forces as a whole ORANGE is superior in torpedoes in the ratio of almost 2 to 1. Both sides carry depth charges but we carry a considerable number of mines in our CLs while BLUE carries none.

Convoy.

BLUE convoy will be composed of various type of auxiliaries having low individual maximum speeds and probably armed with a few 5" or 6" guns. We will not be handicapped with a Train.

Aircraft

No carriers are present in either force and the only aircraft available are the VO and VS types carried on capital ships and cruisers. It is improbable that BLUE will be able to make use of his aircraft in cargo. BLUE is superior 26 to 22 in numbers. BLUE is superior in the air.

Outstanding Factors of Strength and Weakness.

From a tactical point of view, the above shows the following to be the outstanding factors of strength and weakness.

BLUE

Strength

Individual fighting strength of battle line units within their range.

Weakness

Presence of convoy.

Short gun range of battle-ships.

Inferior battle line speed.

Inferiority in cruisers.

ORANGE

Strength

Opportunity to employ the initiative, and surprise.

Superior gun range of capital ships.

Superior battle line speed.

Superiority in cruisers.

Weakness

Individual weakness of CCs.

Inferiority in aircraft.

Inferiority in destroyers.

SECTION III

ENEMY'S PROBABLE INTENTIONS

(a) Enemy Mission.

In the strategical estimate already made we have deduced an Enemy Mission and his probable intentions which will form the background for his Tactical Mission. The Strategic Mission so arrived at is stated as follows:

"To ensure the safe and timely arrival of the reinforcements in the Southern PHILIPPINES in order to permit the relief of MANILA BAY".

In that estimate the BLUE most probable intentions were:

To escort the convoy to TAWI TAWI,

1. by continuing with the present escort in concentrated defensive formation,

2. by proceeding at best sustained speed over a direct route,

3. by driving off or destroying enemy forces opposing the advance,

in order to insure the safe and timely arrival of the reinforcements in the Southern PHILIPPINES.

(b) Courses of Action Open to Enemy.

With consideration of the deduced BLUE strategical decision i.e., enemy's most probable intention we find that, the escort is in a concentrated defensive formation, and that he will endeavor to drive off or destroy enemy forces opposing his advance, as points pertinent to the tactical phase. There appears to be no reason why they are not as sound tactically as they were strategically. While this is the most probable formation, yet we must examine further for possible variations that we may not be surprised. BLUE's Cruising Disposition is pertinent as his Battle Disposition will be made from his Cruising Formation. BLUE may be unaware of the imminence of the approaching engage-

ment, yet he may have information that leads him to believe that an attack is not far off, and certainly when our scouts make contacts, with the developments of them, he will have warning. It may be taken for granted that his combatant forces will be disposed for prompt action to repel attacks.

It would be desirable for BLUE to have a distant screen but a consideration of the limited forces at his command restricts this screen to one of a size of doubtful value, and subjects BLUE to defeat in detail. Therefore it is considered most unlikely that there will be a distant screen of surface vessels. Inasmuch as we do not know whether BLUE has submarines or not, a distant screen of submarines is doubtful, but if BLUE has submarines it is reasonable to assume that there is such a distant screen.

BLUE will be confronted with the necessity of fighting our force, and the general courses of action open to BLUE, to carry out the task of his mission would seem to be:

1. To fight offensively.
2. To fight defensively.

Examination of Course I.

To fight offensively means that BLUE would advance to meet the attacking force, to force the fight, which would entail the abandonment for the time being, the close defense of the Convoy, and to maneuver the Convoy to avoid the engagement.

Strength

Retains the initiative.
Moral factors of aggression.
Free to maneuver without being hampered by Convoy.

Weakness

Inferior Battle Line speed, therefore could not force action.
Inferior cruiser strength.
Could not force employment of all ORANGE Light Forces in the battle, and ORANGE excess cruisers could raid Convoy.

Summary

The strength factors are of small value when weighed against the weakness factors. The effort would in all probability both fail in bringing the enemy to a decisive action, drive them off,

or defend the Convoy. ORANGE CC's superior speed could decoy the BB's out of position and then the CC's could elude and join in the raid on the Convoy.

Course II.

To fight defensively means that BLUE would maintain a strong defensive disposition close to his Convoy and wait for the attack to come to him, keeping interposed between the attacking forces and his Convoy. BLUE would endeavor to defeat attacking forces and to counter attack at favorable opportunities.

Course I is discarded and Course II is adopted.

Further examination of Course II.

Strength.

At point where defense is most needed.

On interior lines, which compensates for BLUE's lower speed.

Mutual support of combatant forces.

Can keep interposed between Convoy and attacking forces.

Analysis.

BLUE's slow Battle Line speed and inferior gun range as compared to ours is his most serious handicap. If ORANGE can maintain gun fire outside of 23,000 yards, BLUE will suffer damage without ability to return, and may be faced with destruction. Should BLUE be able to deny ORANGE plane spot, the effect of ORANGE gunfire will be decreased. BLUE can lay smoke screens to cover his force when in unfavorable range bands and can be expected to do so to deny us the benefits of long range fire and to conceal the movements of his Convoy. By use of smoke BLUE may force us to close the range to avoid a stalemate. The superior speed of ORANGE CC's is the factor that subjects BLUE to having long ranges imposed on him, and it is important to BLUE to slow them down. One torpedo hit in a CC would destroy its speed superiority over a BB, and BLUE must realize the desirability of effecting this if possible, with his light forces or submarines.

Enemy's Probable Intention.

We conclude that BLUE's principal concern is the safety of his Convoy and that his most probable Course of Action is:

To fight defensively, on interior lines near his Convoy keeping interposed between his Convoy and attacking forces, and with mutual support between combatant units, by driving off attacks and counter attacking at favorable opportunities, by using smoke liberally to off set our gunnery advantage and to create opportunities to strike our forces in detail and by using delaying and evasive tactics. If faced with certain defeat he will disperse his Convoy to seek safety in flight.

SECTION IV

COURSES OF ACTION OPEN TO ME

Appreciation of Own Mission.

Our Tactical Mission is:

"To destroy BLUE reinforcements last reported off SATAWAN ISLAND in daylight action with all surface forces in order to prevent their reaching the PHILIPPINES prior to the capture of MANILA BAY".

The task is explicit, to destroy BLUE reinforcements, no distinction is made between the combatant types and the vessels of the Convoy.

The purpose is to prevent the reinforcements from reaching the PHILIPPINES prior to the capture of MANILA BAY.

Prompt action is necessary, our main fleet is weakened by our absence and delays favor BLUE.

Time will give BLUE an opportunity to send additional units to strengthen BLUE reinforcements resistance.

Delay on our part offers opportunity to BLUE for escape.

To accomplish our task we have the following factors of strength:

The presence of some submarines in close proximity to the enemy.

Opportunity for initiative and surprise.

Superior Battle Line speed and gun range.

Superiority of cruisers.

Our tactical attitude is offensive.

Courses of Action Open to Me.

To accomplish the destruction of BLUE reinforcements we have the following courses of action:

Course I. To attack BLUE combatant ships first and the convoy later.

Course II. To attack BLUE combatant ships and convoy simultaneously.

Examination of Course I.

It has the advantage of employing all of our forces against his escort, and then all of our remaining forces against the convoy. This employs the tactical principle of maximum force at the point^{of}/combat. Avoids the difficult operation of tactically concentrating divided forces, and of coordinating the activities of divided units. Does not subject my force to isolation of a part and defeat in detail.

The disadvantages are - that while engaging the escort, the convoy is left unmolested, and may endeavor to escape. Should the action be prolonged approaching darkness may give convoy or a part a good opportunity to effect their escape.

Course II.

Provides for striking the convoy at the same time as the escort which would inflict damage on convoy while the Battle Lines were engaged, and lessen the chance of escape of convoy units during the engagement.

Provides for a division of strength, and requires close coordination to prevent my forces being defeated in detail. This division of my forces, however, would force BLUE to divide his forces also to oppose these attacks.

Failure to destroy BLUE combatant ships would not be so serious as failure to destroy the convoy. Damaged ships would impose further handicaps on BLUE, and the materiel and personnel of the convoy are urgently needed.

Discussion of relative merits of Courses I and II.

The outstanding advantage of Course I is the employment of full and superior strength against his combatant force. The outstanding possible weakness factor is that the convoy, equally if not more valuable than the BLUE combatant ships are for a time unmolested offering a possible opportunity for escape.

The strength factor of Course #2 - is that both combatant units and convoy are attacked simultaneously. Less chance of an opportunity for the convoy to escape.

Weakness factors.

Division of forces. Difficulty of coordination of activities.
Chance of isolation of a part of my force and defeat in detail.
Does not insure superior strength at point of action.

In order to give convoy attack units a chance of success, the battleships must be effectively engaged by the CC's and they are not so engaged until the BB guns are employed on the CC's. While the BB batteries are not engaged they are a serious menace to raiding light forces, and when the CC's are within range, the BB's have greatly superior fire effect.

Course I has one source of weakness, which if employed must be guarded against. It has a powerful strength factor, concentrated, employed superior strength.

Course II has one merit, and several weakness as outlined above. Discarded.

Course I is adopted.

Analysis of Course I.

Any course of action available to us calls for a decisive engagement. To accomplish our mission Course I will ensure a decisive engagement, victory in this engagement will insure the accomplishment of the task and the purpose of our mission.

Our problem now is how best to attack, when and where. The when has been decided. We are to attack promptly, on earliest date and during daylight. The number and type of ships assigned, were in accordance with an estimate that indicated this. Therefore there is no point for a deliberation as to the date, nor to the merits of a night vs a day engagement. The time element also answers the question as to where. The where, however, would be subject to revision by virtue of tactical considerations, of proximity of land, shoals, etc. The How to attack is within our hands and must be decided on .

At this point we again review own forces and comparison of forces; to the end that our strength factors be utilized to their

best advantage and our weakness factors guarded against. A study of Annex A and our comparison curves show us that - the CC's have a seven thousand yard range advantage and have a $5\frac{1}{2}$ knot speed advantage, on the other hand the life of the CC's is 36 as against 46 for BLUE BB's and inside of 22,000 yards BLUE BB fire effect is about double that of CC's at 90° target angles. So long as the CC speed superiority is retained, they can choose the range. From 30,000 to 23,000 yards the CC's may deliver damage without return. This range band then might appear to be the answer. However, at long ranges plane spot is valuable - we may and we may not have it. While damage is delivered when the CC's have a target the damage mounts slowly and the ammunition expenditure is large, and it cannot be expected that BLUE will accept this damage without effort to avoid. We have arrived at the conclusion that BLUE will use smoke liberally to off set this advantage. If smoke screens could be maintained continuously, (this is not accepted) the CC range advantage would be of no value, if smoke screens can be effective part of the time, part of our range advantage is lost, and time is lost, it is indecisive. Yet some damage can be done, possibly a considerable amount. A decisive engagement is desired, it now appears that unaided the CC's cannot be expected to provide this with success to ORANGE.

Fortunately we have other forces, these are cruisers, destroyers, submarines and aircraft. The submarines are a part of our force but will be operating independently, though offensively. We hope for assistance from them, but we can not count on it. We will depend on our airplanes for plane spot for long range firing. Let's consider cruisers; we have 8 CA against 3 for BLUE and 5 CL against 4 for BLUE. Here is a real superiority for ORANGE. How can we capitalize it to accomplish our mission, under the selected course of action. The life of our CA is 37.6 as against 14.1 for BLUE CA's and of our CL's 14 against 14.8

for BLUE CL's or cruiser life in our favor of 51.6 against 28.9. The operation of the N^2 law under concentration gives ORANGE cruisers a far greater fire effect than the life ratio. By consulting the fire effect diagrams it is found that the BLUE cruisers are all destroyed during the run in from 30,000 to 10,000 yards. This under the assumed conditions of visibility of targets and plane spot for ORANGE CA's.

BLUE is superior in number of destroyers by twenty-one to sixteen. It may well be that a part of BLUE destroyers will be assigned as anti-submarine screen for the convoy, and not initially available for defense of own Battle Line. Should, however, ORANGE find all DD's opposed we find that BLUE life is 27.5 against 20.8 for ORANGE. However the BLUE 4"-50 caliber gun is only from 75 to 80 percent as effective as the ORANGE 4"7-45 calibre gun, which in fighting effect brings the forces almost on a parity. This is without consideration of the employment of the secondary battery of the cruisers, nor their entire availability at about a range of 12,000 yards on the run in.

It now seems that a powerful light force attack can be launched on BLUE BB's with an indicated damage from BLUE light force defense of about 15%. With consideration of the fact that ~~BLUE~~ ^{ORANGE} light forces carry 288 torpedoes in the CA's, 108 in the CL's, and 192 in the DD's or a total of 588 torpedoes, and except for BB main battery fire can get them to the firing point, here is a serious threat for BLUE, and a powerful weapon for ORANGE. The BB main battery is a menace to this attack if free to be used against it. What can be done about this? The BB's will be under fire of the CC's, but unless the CC's are within gun range of the BB's, 22,000 and under the BB fire will be directed against this attack. By closing the range with the CC's the BB's will be forced to employ their batteries against them or absorb the punishment without return. BLUE will be faced with the problem of accepting the fire of the CC's without return, or

of accepting the light force attack and maneuvering to avoid. What may we expect and what will be its effect on ORANGE?

By consulting the Fire Effect Diagrams, it is found that with both forces presenting a 90° target angle (improbable while closing except head on) from 22,000 to 16,000 BLUE averages about 1.5 fourteen inch hit per 3 minute move more than ORANGE, or ORANGE pays a relative penalty of .5 hit per ship. However, if ORANGE presents a 45° target angle and BLUE a 90° target angle the picture changes and ORANGE has an advantage of .5 of a hit or .166 hit per ship. Again if both forces present a 45° target angle BLUE has the advantage of .53 hit per 3 minute move or .176 per ship. But to 17,000 yards this advantage is only .23 hit or .08 hit per ship. ORANGE must not present a 90° target angle to BLUE's 45° target angle, this would be fatal. Assuming ORANGE presents a 45° target angle, the worst conditions would result in a small disadvantage of fire effect to ORANGE, and under good conditions in an advantage. This estimate does not consider the accumulated damage on BB's from previous long range fire.

Then ORANGE CC's must fight at seventeen to eighteen thousand yards for maximum advantage. Analysis shows that by this time, ORANGE Light Forces should have secured the ascendancy over the BLUE Light Force. Computation shows that ORANGE cruisers with plane spot for CA's can render BLUE cruisers ineffective on the run in from 30,000 to 12,000 yards with only about 15% damage to ORANGE.

ORANGE light forces are now in position to make a determined attack on the BLUE Battle Line driving the attack well home. Should the BLUE BB's shift main battery fire to this force, it can lay a smoke screen for protection, it is contemplated making the attack from windward. During this time ORANGE Battle Line could pile up a tremendous fire superiority. Having visualized the growing plan to this point we are ready to move on to the next

phase. ORANGE light forces have defeated and destroyed most of BLUE light forces, and have delivered a strong torpedo attack. The Battle Lines are heavily engaged. The remaining ORANGE light forces, by computation should be considerable, can now stand on to attack the Convoy. Should the successive blows delivered on the battleships i.e., CC long range attack 30,000 to 26,000 yards, the approach firing to seventeen to eighteen thousand yards, the firing in this favorable band, and the results of the light force torpedo attack, have resulted in reducing the BB strength below that of the CC's, then they may be left to the CC's while the light forces go about the work of destruction of the Convoy.

Plane spot is important to us.

Our speed advantage must be preserved.

SECTION V

DECISION

decisively
To engage enemy from windward in a three phase action; first at long ranges, own light forces defending battle line; second at decisive ranges, own light forces destroying enemy light forces and delivering torpedo attack on enemy battle line; third, attack by all forces on enemy convoy and remaining escort, in order to destroy BLUE reinforcements.

SECTION VI
SUPPORTING MEASURES

(a) Operations to be inaugurated.

In formulating the operations to be included in the battle plan we shall assume that:

Our scouting force has a definite contact with BLUE reenforcements and has reported his position, course and speed;

Our surface forces have effected tactical concentration;

Our tactical scouting and air reconnaissance has given us BLUE's strength, disposition and the escort's position relative to his escort.

Our decision involves the following:

1. Security of plane spot to own battle line and during phase two to our CAs. We have 22 VO and VS planes against 26 for BLUE. Plane spot for us is the most important function for air.
2. Maintenance of speed superiority and strength of own battle line. This calls initially for defense of own Battle Line by light forces from torpedo damage. This menace is considered to lie chiefly from BLUE submarines. It is believed that BLUE's inferior light forces have but little chance of a successful attack through our superior light forces. In addition to this, in phase one, the CCs are not under fire, therefore are free to use main battery and to maneuver to avoid an attack.
3. Maintenance of visibility of targets during phase I. It is expected that BLUE will make liberal use of smoke to deny the CCs fire outside of twenty-two thousand yards. As we intend to attack from windward, any surface vessels laying smoke will be visible to our forces, we must destroy such units, and use our superior speed to maintain visibility. Our cruisers are effective for knocking out surface smokers and remain outside of BB fire.

4. Attack of our light forces on BLUE Light Force and BLUE Battle Line under supporting fire of own Battle Line. This is to be done in phase II when the CCs are engaging down to 17,000 yards drawing the BB fire. For destruction of BLUE light forces we have a tremendous cruiser superiority, allowing for a double concentration on all but one BLUE CL ; in this we gain the advantage in the ratio of 5 to 1. The path to the torpedo firing position should be cleared with relative ease. Our cruiser torpedoes have a range of 16,400 yards and those of our destroyers 13,500 yards. The enemy battle line of three BBs is short if closed up, if spread, then there are three targets. The attack must be driven well home to the point where accuracy of torpedo fire is assured.
5. Attack on convoy and remaining BLUE combatant ships. After torpedo attack is delivered, the light forces will stand on for the convoy and set about its destruction. This function is best performed by the cruisers. The DD may reload torpedoes and attack BBs again, or if not needed elsewhere go down on convoy and use the torpedoes there.
6. Defensive smoke if desired.
7. Pursuit. The convoy may disperse if it is seen that the battle is going against them. They must be caught and destroyed; our cruisers have the speed and strength to do this.

From the above considerations, the following tasks are formulated:

1. Secure plane spot for own Battle Line and CAs.
2. Defend Battle Line against torpedo attack by enemy light forces and submarines.
3. Maintain Battle Line gun range outside twenty-three thousand yards, preferably at about 26,000 yards during

1st phase. Close gun range to seventeen - eighteen thousand yard range band in 2nd phase.

4. Prevent smoke screens being laid by enemy to interfere with our gun fire.
5. Attack enemy light forces.
6. Attack enemy Battle Line with torpedoes.
7. Attack enemy Convoy.
8. Follow up Pursuit.
9. Furnish information.

Task Groups:

1. Battle Line
Batcrudiv One Assigned Tasks 3, 7, and 8.
Desdiv Four " " 2 and 6.
2. Light Forces Assigned Tasks 2, 4, 5, 6, 7, 8 and 9.
Crudiv Three
Crudiv Six
Crudiv Seven
Desron One
3. Aircraft Assigned Tasks 1 and 9.
All VO and VS planes
4. Submarines Assigned Tasks 6, 7, 8 and 9.
All submarines in
Battle Area.

(b) Command Organization

The Battle Line will be under the immediate command of Commander Eastern Detachment who will act as O.T.C.

The light forces will be under the general command of Vice Admiral OCA, in command of Crudiv Six. When deployment is ordered the Senior Officer of each flank force will have command in that area.

The command of aircraft is assigned to Commander AC, the senior aviator.

The command of submarines will be exercised by the senior submarine commander in the Battle Area.

(c) Coordinating Measures.

Information is vital to all groups. The O.T.C. will initiate the attack, and the start of each phase.

All units should know the location of the Convoy and take advantage of opportunities to damage it.

O.T.C. will order pursuit.

(d) Train.

Train will remain at PELEWS.

(e) Special Provisions.

O.T.C. in CC-3. Use minus nine time. Rendezvous Affirm, PELEWS; Baker, GUAM.

Battle Radio Frequency Plan.

Pursuit Plans I and II.

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TACTICAL PROBLEM I - 1934 - SENIOR

THE BATTLE PLAN

SECRET

Battle Plan
No. 1

Latitude 12°-00' N
Longitude 127°-00' E
7 January 193-

TASK ORGANIZATION

(a) Battle Line

Batcrudiv One

Desdiv Four

(b) Light Forces, Vice Admiral OCA.

Crudivs Three, Six, Seven

Desron One

(c) Aircraft, Commander Top Flite.

All VO and VS planes

(d) Submarines, Commander Deep Under.

All submarines in Battle Area.

1. Mission. To destroy BLUE reinforcements last reported off SATAWAN in daylight action with all surface forces in order to prevent their reaching the PHILIPPINES prior to the capture of MANILA BAY.

Information. As contained in my Operation Order No. 1. No further information.

Assumptions. That the enemy will take up a strong defensive disposition and endeavor to destroy or drive off our attacking units; that he will counter attack at favorable opportunities; that he will use delaying and evasive tactics, in defense of his convoy. That he will employ smoke liberally to offset the superior gun range of our battle line. If the battle turns against him he will disperse his convoy to seek safety in flight. That visibility conditions will permit long range gun fire.

2. This force will engage enemy decisively ^{from windward} in a three phase action; first, at long ranges, own light forces defending Battle Line; second, at decisive ranges, own light forces destroying enemy light forces and delivering torpedo attack on enemy battle line; third, attack by all forces on enemy convoy and remaining escort, in order to destroy BLUE reinforcements.

3. (a) Battle Line. Phase I, attack enemy battle line outside of twenty-three thousand yards, preferably at twenty-six thousand yards. Phase II, close to decisive ranges, seventeen, eighteen thousand yard range band indicated. Phase III, continue attack on enemy battle line until destroyed or rendered ineffective, then attack escort and convoy.

(b) Light Forces. Phase I, defend own battle line. Deny enemy surface vessels laying smoke screens between battle lines. Phase II, attack and destroy enemy light forces, attack enemy battle line with torpedoes. Phase III, attack enemy convoy and remaining enemy escort.

(c) Aircraft. Phase I, secure and maintain plane spot for battle line, secure information of enemy movements. Phase II, secure plane spot for battle line and CAs, supply information. Phase III, supply information and plane spot as needed.

(d) Submarines. Phases I, II, III, attack enemy heavy ships and convoy at every opportunity. Battleships primary objective.

(x) Information vital to all units. O.T.C. will direct execution of this plan and of the start of each phase by signal. Pursuit will be initiated by O.T.C. who will direct the plan to be used. Use smoke as necessary but avoid interference with fire of own battle line.

4. Train remain at PELEWS.
5. Rendezvous Affirm, PELEWS; Baker, GUAM. Use minus nine time. Battle Radio Frequency Plan. O.T.C. in CC-3.

OC
Vice Admiral,
Commander, Eastern Detachment
and O.T.C.

Distribution:

By despatch to:
Task Force Commanders
Unit Commanders and
Commanding Officers.

A,
Lieutenant Commander
Flag Secretary.

2BB-34,35, 1BB 33
 3CA-36,34,32
 4CL 9, 11,12,13
 20-DD-148-160 incl. 142-145 incl.
 241,244,248, 1DL-6

3CC 4,3,1.
 8CA 32-39 incl.
 4CL 21-24 incl, 1CL-18
 16DD 79-86 incl. 87-94 incl.
 12SS-17-23 incl. 1-5 incl.

BLUE FORCES

Type	BB	BB	CA	CL	DD	DL	SS
Number	2	1	3	4	20	1	?
Speed	20.5	20.5	32.5	33	$\frac{35}{34}$	36.5	
Armor	Side	12"	11"	5"00	3"	0	0
	Deck	4"1	4"4	2"25	1"5	0	0
Life	31	15.2	14.1	14.8	26	1.5	
Main Battery	No./Cal.	$\frac{20}{14"/45}$	$\frac{12}{12"/50}$	$\frac{27}{8"/55}$	$\frac{40}{6"/53}$	$\frac{80}{4"/50}$	$\frac{6}{5"/40}$
	One Side	20	12	27	28	60	6
	Max Range	22	23	34	$\frac{22}{18}$	13	17
	Am per G	100	100	100	235	125	125
Secondary Battery	No./Cal.	$\frac{32}{5"/51}$	$\frac{16}{5"/51}$				
	One Side	16	8				
	Max Range	15	15				
	Am per G	235	235				
* Anti Air Battery	No./Cal.	$\frac{16}{3"/50h}$	$\frac{8}{3"/50h}$	$\frac{12}{5"/25h}$	$\frac{16}{3"/50h}$	$\frac{20}{3"/23h}$	
	Range	13	13	14	13	7	
Torpedoes	Total No	0	0	0	48 A	240 C	12 G
	Speed				26	27	27
	Range				17	13.5	15
Tubes	On Broadside				12	120	12
	Deck				24	240	12
	Submerged						
Mines							
Depth Charges					1000	50	
Aircraft	VO	4	2				
	VS			12	8		

ORANGE FORCES

Type	CC	CA	CL	CL	DD	SS	SS
Number	3	8	4	1	16	7	5
Speed	$\frac{26}{27.5}$	33	33	33	34	$\frac{19}{9}$	$\frac{17}{9}$
Armor	Side	8"	4"	2"5	2"	0	0
	Deck	$\frac{3"75}{4"}$	1"25	0	0	0	0
Life	36	37.6	12	2	20.8	4.8	4.5
Main Battery	No./Cal.	$\frac{24}{14"/45}$	$\frac{80}{8"/50}$	$\frac{28}{5.5/50}$	$\frac{6}{5.5/50}$	$\frac{64}{4.7/45}$	$\frac{10}{4.7/40}$
	One Side	24	80	24	6	64	
	Max Range	30	31	20	20	15	10
	Am per G	100	100	235	235	125	100
Secondary Battery	No./Cal.	$\frac{48}{6"/50}$					
	One Side	24					
	Max Range	20					
	Am per G	235					
* Anti Air Battery	No./Cal.	$\frac{12}{3"/40h}$	$\frac{32}{4.7/45h}$	$\frac{12}{3"/40h}$	$\frac{2}{3"/40h}$		
	Range	7	19	7	7		
Torpedoes	Total No.	36	288	96	12	192	84
	Speed	28	28	28	28	27	$\frac{27}{34}$ $\frac{46}{46}$
	Range	16.4	16.4	16.4	16.4	13.5	$\frac{15}{10}$ $\frac{6}{6}$
Tubes	On Broadside	6	48	16	4	96	
	Deck		96	32	4	96	
	Submerged	12					14 Stern 42 bow
Mines			320	40			10 Stern 20 bow
Depth Charges					800		
Aircraft	VO	6					
	VS		16				

NOTES:-

1. VO and VS planes have cruising radius of 457 miles at 107 Kts.

* 2. Allowances in 050 Cal. machine guns, BB's & CCs 8, CAs & CLs 8, DDs & DLs 4.

Total	Number of Type	Main Batt'y Guns	Secondary Batt'y Guns	Major Ships		Light Forces		Submarines		Mines Depth Charges	Aircraft		* Anti Aircraft Battery Guns
				Tubes One Side	Torpedoes Total	Tubes One Side	Torpedoes Total	Guns	Tarps Total		VO	VS	
BLUE FORCES	3BB 3CA,4CL 20-DD, 1DL	20-14"/45 12-12"/50 27-8"/55	54-5" 40-6" 80-4"	0	0	144	300	Unknown		1050 dc.	6	20	40-3"/50 12-5"/25 20-3"/23
ORANGE FORCES	3CC 8CA,5CL 16DD,12SS	24-14"/45 80-8"/50	64-4"7 48-6" 34-5"5 6-5"1	6	36	164	588	6-4"7/40 10-5"5/50 44-50 m.h.	134	360 m. 800 dc.	6	16	26-3"/40 32-4"7/45 192 m.h.

ANNEX A
 COMPARISON OF FORCES
 TACTICAL PROBLEM-I.
 (STAFF SOLUTION)
 (1934)

2887 D
7/31/33

1856-B

NAVAL WAR COLLEGE CORRESPONDENCE COURSE

IN

STRATEGY AND TACTICS

PRE-BATTLE ESTIMATE

OF THE

TACTICAL SITUATION

OPERATIONS (DEMONSTRATIVE) PROBLEM I-1934

SOLUTION BY A MEMBER OF THE STAFF

INSTALLMENT XI

Item 5

DEPARTMENT OF OPERATIONS
Naval War College,
Newport, R.I.
August, 1933.

~~RESTRICTED~~
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Military Service.

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DECLASSIFICATION OF WWII RECORDS

2887 D
7/31/33

NAVAL WAR COLLEGE CORRESPONDENCE COURSE

IN

STRATEGY AND TACTICS

OPERATIONS (DEMONSTRATIVE) PROBLEM I-1934

STATEMENT OF THE PROBLEM

TACTICAL PHASE

INSTALLMENT X

Item (6)

DEPARTMENT OF OPERATIONS

Naval War College,
Newport, R.I.
August, 1933.

CONFIDENTIAL

Not to pass out of the custody of officers of the U.S. Naval
or Military Service.

OPERATIONS (DEMONSTRATIVE) PROBLEM I-1934

TACTICAL PHASE

- MOTIVES: (1) Solution of a Pre-Battle Estimate of a Tactical situation.
(2) Exercise in formulating a Battle Plan.

ORANGE SITUATION:

The situation is that of the preceding problem except that Vice Admiral OC has now made his Strategic Estimate of the Situation and has issued his Operation Order to the Eastern Detachment.

The statement of the ORANGE Situation, and the Estimate of Vice Admiral OC together with his order, as solved by a member of the Naval War College Staff, (Item "(5)" of Requirement Sheet of Installment X), are forwarded with the return of the student's solution of Installment IX.

REQUIREMENTS:

(1) Given the Staff Solution and Order of Vice Admiral OC to the Eastern Detachment, the student will make a pre-battle estimate of the tactical situation which will confront the Eastern Detachment in carrying out the order of Vice Admiral OC. The estimate will be made and bound by sections following the same procedure as used in Installment IX.

(2) From his own Pre-Battle Estimate the student will draw up a Battle Plan for the Eastern Detachment following in general the plan form as shown on page 41 of the Estimate pamphlet (Edition of 1932). Such contributory plans as may be required will be noted in the Estimate and in the Battle Plan, but these plans need not be prepared.

NOTE

1. The Tactical Phase of Operations Problem I flows from the Strategic Phase. The estimate of the Strategic Phase decided that the best way of preventing the BLUE Reinforcements from joining the BLUE Main Body was by locating them at the earliest possible time and by engaging them decisively. This estimate then decided upon the details of how to locate BLUE, and an operation order was drawn up to cover this.

2. How to engage the enemy decisively was not considered in the estimate of the Strategic Phase. This was reserved for a later estimate - that of the Tactical Phase to which we have now come.

3. The student should assume that BLUE Reinforcements have been successfully located, and that he has all necessary information with which to assemble his forces. Then, taking as the Task of his mission "to engage BLUE Reinforcements decisively," he proceeds in his estimate to consider HOW he will fight BLUE. As a result of this consideration, he draws up a battle plan for his forces. The student should try to avoid getting out a battle plan which contains specious generalities but lacks concreteness. He should put himself in the place of his subordinates, who are to receive and act on the plan. He should ask himself if he understands his commander's intentions well enough to go into battle with confidence.

ORANGE STAFF SOLUTION

1. OWN MISSION.

Vice Admiral OC having completed his strategic estimate of the Strategic Situation, arrived at a decision, and prepared an Operation Order embodying as paragraph 2 (general plan) this decision, is now concerned with the tactical phases of the situation and the preparation of a battle plan. The decision arrived at in the Strategical Estimate is quoted below:

"To destroy the reenforcements last reported off SATAWAN ISLAND, by attacking the escort with submarines as soon as they can reach attack positions, and by engaging promptly and decisively during daylight with all surface forces, in order to prevent BLUE reenforcements from reaching the PHILIPPINES prior to the capture of MANILA BAY."

The tactical mission is derived from this paragraph and is formulated as follows:

"To destroy BLUE reenforcements last reported off SATAWAN ISLAND in daylight action with all surface forces in order to prevent their reaching the PHILIPPINES prior to the capture of MANILA BAY."

The Situation confronting us is one where-in our Scouting Operations having definitely located the BLUE reenforcements, we must concentrate our forces and engage him in decisive action. BLUE is confronted with the defense of a slow convoy.

SECTION II

(a) Political Status. Does not apply.

(b) Economic Status. Does not apply.

(c) Geographical features. The area in which this engagement may be expected is that south of the CAROLINES, which in general is free from land and shoals, though the battle may be fought in the vicinity of islands or other dangers to navigation, which might influence tactics and maneuver ability.

(d) Weather. In this area, at this season of the year the Northeast trade wind is blowing, force 3 to 5. The weather is clear, the rainy season is over and normal visibility can be expected. The sea will normally be smooth at night and in the early forenoon, though rising to a moderate sea as the wind increases. There are thirteen hours of daylight. Moonlight conditions will prevail during the latter half of the night. Conditions favor flight operations during the forenoon. With the strengthening of the wind in the afternoons there will exist some risk to planes landing on the surface of the sea.

(e) Information and Security. It is improbable that BLUE will gain information of our force except through friendly merchantmen, reports from own C-in-C, should his observations disclose the absence from ORANGE Fleet of these units, and from his own limited air patrols until our scouts make contact. His method of denial of information of his force will be limited to driving off or keeping down of ORANGE submarines, and to driving off of ORANGE cruisers.

(f) Materiel characteristics. The materiel readiness of BLUE is assumed to be excellent in all respects, except as to some foulness of boilers and bottoms which may to some extent lower the maximum listed speed. This however, will not be a decisive factor.

(g) (1) The original report from TRUK gives the BLUE Force as composed of

- 3 Battleships
- 3 Heavy Cruisers
- 4 Light Cruisers
- 21 Destroyers
- 30 Convoy Vessels
- ? Submarines

The materiel tactical characteristics of this force are tabulated in Annex A.

(2) The enemy force was last sighted south of SATAWAN ISLAND at zero seven hundred six January, steaming west with a convoy of about thirty vessels. Until our own search operations result in contacts and information, we will not know his disposition or exact composition.

(h) BLUE personnel is known to be well trained and skillful; they are determined and courageous. Previous engagements during this campaign have undoubtedly keyed their morale at a high standard.

(i) Logistic support available. Only that contained within the force. It is assumed that BLUE has refuelled his destroyers en route and will not be handicapped in this respect. Ammunition supply must be replete.

(j) BLUE is aware that his position was ascertained on six July south of SATAWAN, and is without doubt expecting ORANGE to conduct scouting operations and to oppose his advance. BLUE should be unaware of the composition of ORANGE Force and should be so unaware until attack is imminent.

Own Strength.

(a), (b), (c), (d) same as for BLUE.

(e) Our information is limited to that of the report of six January. It is believed that BLUE has no information of our forces either as to location, strength or disposition. Considering BLUE force as we know it, it is believed that he has little

opportunity of gaining this information until our attack is imminent.

(f) Our materiel condition is satisfactory. Previous operations have put some strain on our propelling machinery, and some diminuation of maximum speed exists, but this will not be of vital importance.

(g) We must await contacts of own scouts and the developments of these contacts for further information of the enemy's exact composition and disposition.

(h) Our personnel is efficient and well trained. Morale is high.

(i) Our force has ample fuel and ammunition.

Relative Strength.

(a) BLUE expects an attack, but has no knowledge of the type of this attack. It may be for purposes of attrition by night raids with light forces, or it may be a decisive attack by major forces. BLUE is under a nervous strain and constant expectancy. ORANGE, on the other hand, knows very closely the strength of his opponent and after contact by his scouts will know the definite location of his objective and his disposition.

BLUE is handicapped by the defense of a large slow convoy. ORANGE has speed and freedom of movement.

(b) The comparison of forces available to each side is given below, by types:

Submarines:

<u>ORANGE</u>	<u>BLUE</u>
12	?

The ORANGE submarines have maximum surface speeds of from 19 to 17 knots and maximum submerged speeds of 9 knots. Their employment in the search operations place them on a scouting line about 300 miles in length. It is problematical as to how many submarines will be in the immediate vicinity of the battle area.

In considering submarine types it is not their strength, one to another that we are as much concerned with as it is their relative ability to get at heavy ships, particularly Battle Line units. Their effectiveness in the engagement will in large extent depend on the position relative to their objective that they find themselves in when battle is joined and their ability to make maximum use of their surface speed to gain favorable positions for attack.

It is a reasonable assumption that we are superior in total number of submarines. It is unreasonable to assume, however, that we shall have superiority in this type in the battle area.

Surface Types:

<u>ORANGE</u>	<u>Type</u>	<u>BLUE</u>
--	BB	3
3	CC	--
8	CA	3
5	CL	4
16	DD	21
--	Convoy	30 (armed?)

Capital Ships.

In capital ships BLUE is superior in life in the ratio of 46 to 36. Two BLUE BBs are capable of 22,000 yards range, and one of 23,000 yards range. Our maximum gun range is 30,000 yards. BLUE can penetrate our side armor at 22,000 yards and under, but our deck armor cannot be penetrated with his short range guns. Our 14" guns penetrate BLUE deck armor outside of 25 to 26,000 yards, and his side armor inside of 17 to 18,000 yards with 90 degree target angle. Plane spot is important to us if long range fire is to be employed. Due to superior gun range our fire effect between 30,000 and 23,000 is overwhelming to BLUE, though the damage mounts slowly. At 21,000 yards and under the damage inflicted by BLUE is about double that inflicted by ORANGE at 90° target angles. Individually the CCs are weaker than the BBs, but we possess the great advantage of outranging our enemy by 7,000

yards in a rangeband where real damage can be inflicted.

ORANGE has a speed margin of $5\frac{1}{2}$ knots and carries a considerable torpedo armament while BLUE carries none.

Heavy Cruisers.

Our MYOKO class are opposed to BLUE's ASTORIA class. Ship for ship, assuming a 90° target angle, we are superior at ranges below 15,000 yards; in ranges 15,000 to 20,000 yards inclusive BLUE is superior on account of our inability to penetrate either his side or deck armor; then we are about equal to our limiting range of 31,000 yards. BLUE can outrange us from 32,000 to 34,000 yards inclusive but damage is small. In this class, however, we have 8 ships to his 3.

Light Cruisers.

Our YURA class is opposed to his OMAHA class. Ship for ship BLUE is superior at all ranges. We have 5 ships to his 4.

In cruiser strength we are decidedly superior to BLUE in all appropriate combinations and neither side possesses a speed margin. BLUE CAs carry no torpedoes.

Destroyers.

In destroyers BLUE is superior in the ratio 21 to 16. BLUE DDs carry a heavier torpedo armament but are lighter gunned than ours. Speeds are about equal.

Considering the Light Forces as a whole ORANGE is superior in torpedoes in the ratio of almost 2 to 1. Both sides carry depth charges but we carry a considerable number of mines in our CLs while BLUE carries none.

Convoy.

BLUE convoy will be composed of various type of auxiliaries having low individual maximum speeds and probably armed with a few 5" or 6" guns. We will not be handicapped with a Train.

AIRCRAFT

No carriers are present in either force and the only aircraft available are the VO and VS types carried on capital ships and cruisers. It is improbable that BLUE will be able to make use of his aircraft in cargo. The two Forces are equal in Aircraft.

Outstanding Factors of Strength and Weakness.

From a tactical point of view, the above shows the following to be the outstanding factors of strength and weakness.

BLUE

Strength

Individual fighting strength of battle line units within their range.

Weakness

Presence of convoy
Short gun range of battleships
Inferior battle line speed
Inferiority in cruisers.

ORANGE

Strength

Opportunity to employ the initiative, and surprise.
Superior gun range of capital ships.
Superior battle line speed.
Superiority in cruisers.

Weakness

Individual weakness of CCs.
Inferiority in destroyers.

SECTION III

ENEMY'S PROBABLE INTENTIONS

(a) Enemy Mission.

In the strategical estimate already made we have deduced an Enemy Mission and his probable intentions which will form the background for his Tactical Mission. The Strategic Mission so arrived at is stated as follows:

"To ensure the safe and timely arrival of the reenforcements in the Southern PHILIPPINES in order to permit the relief of MANILA BAY".

In that estimate the BLUE most probable intentions were:

To escort the convoy to TAWI TAWI,

1. by continuing with the present escort in concentrated defensive formation,

2. by proceeding at best sustained speed over a direct route,

3. by driving off or destroying enemy forces opposing the advance,

in order to insure the safe and timely arrival of the reenforcements in the Southern PHILIPPINES.

(b) Courses of Action Open to Enemy.

With consideration of the deduced BLUE strategical decision i.e., enemy's most probable intention we find that, the escort is in a concentrated defensive formation, and that he will endeavor to drive off or destroy enemy forces opposing his advance, as points pertinent to the tactical phase. There appears to be no reason why they are not as sound tactically as they were strategically. While this is the most probable formation, yet we must examine further for possible variations that we may not be surprised. BLUE's Cruising Disposition is pertinent as his Battle Disposition will be made from his Cruising Formation. BLUE may be unaware of the imminence of the approaching engage-

ment, yet he may have information that leads him to believe that an attack is not far off, and certainly when our scouts make contacts, with the developments of them, he will have warning. It may be taken for granted that his combatant forces will be disposed for prompt action to repel attacks.

It would be desirable for BLUE to have a distant screen but a consideration of the limited forces at his command restricts this screen to one of a size of doubtful value, and subjects BLUE to defeat in detail. Therefore it is considered most unlikely that there will be a distant screen of surface vessels. Inasmuch as we do not know whether BLUE has submarines or not, a distant screen of submarines is doubtful, but if BLUE has submarines it is reasonable to assume that there is such a distant screen.

BLUE will be confronted with the necessity of fighting our force, and the general courses of action open to BLUE, to carry out the task of his mission would seem to be:

1. To fight offensively.
2. To fight defensively.

Examination of Course I.

To fight offensively means that BLUE would advance to meet the attacking force, to force the fight, which would entail the abandonment for the time being, the close defense of the Convoy, and to maneuver the Convoy to avoid the engagement.

Strength

Retains the initiative.
Moral factors of aggression.
Free to maneuver without being hampered by Convoy.

Weakness

Inferior Battle Line speed, therefore could not force action.
Inferior cruiser strength.
Could not force employment of all ORANGE Light Forces in the battle, and ORANGE excess cruisers could raid Convoy.

Summary

The strength factors are of small value when weighed against the weakness factors. The effort would in all probability both fail in bringing the enemy to a decisive action, drive them off,

or defend the Convoy. ORANGE CC's superior speed could decoy the BB's out of position and then the CC's could elude and join in the raid on the Convoy.

Course II.

To fight defensively means that BLUE would maintain a strong defensive disposition close to his Convoy and wait for the attack to come to him, keeping interposed between the attacking forces and his Convoy. BLUE would endeavor to defeat attacking forces and to counter attack at favorable opportunities.

Course I is discarded and Course II is adopted.

Further examination of Course II.

Strength.

At point where defense is most needed.

On interior lines, which compensates for BLUE's lower speed.

Mutual support of combatant forces.

Can keep interposed between Convoy and attacking forces.

Analysis.

BLUE's slow Battle Line speed and inferior gun range as compared to ours is his most serious handicap. If ORANGE can maintain gun fire outside of 23,000 yards, BLUE will suffer damage without ability to return, and may be faced with destruction. Should BLUE be able to deny ORANGE plane spot, the effect of ORANGE gunfire will be decreased. BLUE can lay smoke screens to cover his force when in unfavorable range bands and can be expected to do so to deny us the benefits of long range fire and to conceal the movements of his Convoy. By use of smoke BLUE may force us to close the range to avoid a stalemate. The superior speed of ORANGE CC's is the factor that subjects BLUE to having long ranges imposed on him, and it is important to BLUE to slow them down. One torpedo hit in a CC would destroy its speed superiority over a BB, and BLUE must realize the desirability of effecting this if possible, with his light forces or submarines.

Enemy's Probable Intention.

We conclude that BLUE's principal concern is the safety of his Convoy and that his most probable Course of Action is:

To fight defensively, on interior lines near his Convoy keeping interposed between his Convoy and attacking forces, and with mutual support between combatant units, by driving off attacks and counter attacking at favorable opportunities, by using smoke liberally to off set our gunnery advantage and to create opportunities to strike our forces in detail and by using delaying and evasive tactics. If faced with certain defeat he will disperse his Convoy to seek safety in flight.

SECTION IV

COURSES OF ACTION OPEN TO ME

Appreciation of Own Mission.

Our Tactical Mission is:

"To destroy BLUE reinforcements last reported off SATAWAN ISLAND in daylight action with all surface forces in order to prevent their reaching the PHILIPPINES prior to the capture of MANILA BAY".

The task is explicit, to destroy BLUE reinforcements, no distinction is made between the combatant types and the vessels of the Convoy.

The purpose is to prevent the reinforcements from reaching the PHILIPPINES prior to the capture of MANILA BAY.

Prompt action is necessary, our main fleet is weakened by our absence and delays favor BLUE.

Time will give BLUE an opportunity to send additional units to strengthen BLUE reinforcements resistance.

Delay on our part offers opportunity to BLUE for escape.

To accomplish our task we have the following factors of strength:

The presence of some submarines in close proximity to the enemy.

Opportunity for initiative and surprise.

Superior Battle Line speed and gun range.

Superiority of cruisers.

Our tactical attitude is offensive.

Courses of Action Open to Me.

To accomplish the destruction of BLUE reinforcements we have the following courses of action:

Course I. To attack BLUE combatant ships first and the convoy later.

Course II. To attack BLUE combatant ships and convoy simultaneously.

Examination of Course I.

It has the advantage of employing all of our forces against his escort, and then all of our remaining forces against the convoy. This employs the tactical principle of maximum force at the point^{of}/combat. Avoids the difficult operation of tactically concentrating divided forces, and of coordinating the activities of divided units. Does not subject my force to isolation of a part and defeat in detail.

The disadvantages are - that while engaging the escort, the convoy is left unmolested, and may endeavor to escape. Should the action be prolonged approaching darkness may give convoy or a part a good opportunity to effect their escape.

Course II.

Provides for striking the convoy at the same time as the escort which would inflict damage on convoy while the Battle Lines were engaged, and lessen the chance of escape of convoy units during the engagement.

Provides for a division of strength, and requires close coordination to prevent my forces being defeated in detail. This division of my forces, however, would force BLUE to divide his forces also to oppose these attacks.

Failure to destroy BLUE combatant ships would not be so serious as failure to destroy the convoy. Damaged ships would impose further handicaps on BLUE, and the materiel and personnel of the convoy are urgently needed.

Discussion of relative merits of Courses I and II.

The outstanding advantage of Course I is the employment of full and superior strength against his combatant force. The outstanding possible weakness factor is that the convoy, equally if not more valuable than the BLUE combatant ships are for a time unmolested offering a possible opportunity for escape.

The strength factor of Course #2 - is that both combatant units and convoy are attacked simultaneously. Less chance of an opportunity for the convoy to escape.

Weakness factors.

Division of forces. Difficulty of coordination of activities.
Chance of isolation of a part of my force and defeat in detail.
Does not insure superior strength at point of action.

In order to give convoy attack units a chance of success, the battleships must be effectively engaged by the CC's and they are not so engaged until the BB guns are employed on the CC's. While the BB batteries are not engaged they are a serious menace to raiding light forces, and when the CC's are within range, the BB's have greatly superior fire effect.

Course I has one source of weakness, which if employed must be guarded against. It has a powerful strength factor, concentrated, employed superior strength.

Course II has one merit, and several weakness as outlined above. Discarded.

Course I is adopted.

Analysis of Course I.

Any course of action available to us calls for a decisive engagement. To accomplish our mission Course I will ensure a decisive engagement, victory in this engagement will insure the accomplishment of the task and the purpose of our mission.

Our problem now is how best to attack, when and where. The when has been decided. We are to attack promptly, on earliest date and during daylight. The number and type of ships assigned, were in accordance with an estimate that indicated this. Therefore there is no point for a deliberation as to the date, nor to the merits of a night vs a day engagement. The time element also answers the question as to where. The where, however, would be subject to revision by virtue of tactical considerations, of proximity of land, shoals, etc. The How to attack is within our hands and must be decided on .

At this point we again review own forces and comparison of forces; to the end that our strength factors be utilized to their

best advantage and our weakness factors guarded against. A study of Annex A and our comparison curves show us that - the CC's have a seven thousand yard range advantage and have a $5\frac{1}{2}$ knot speed advantage, on the other hand the life of the CC's is 36 as against 46 for BLUE BB's and inside of 22,000 yards BLUE BB fire effect is about double that of CC's at 90° target angles. So long as the CC speed superiority is retained, they can choose the range. From 30,000 to 23,000 yards the CC's may deliver damage without return. This range band then might appear to be the answer. However, at long ranges plane spot is valuable - we may and we may not have it. While damage is delivered when the CC's have a target the damage mounts slowly and the ammunition expenditure is large, and it cannot be expected that BLUE will accept this damage without effort to avoid. We have arrived at the conclusion that BLUE will use smoke liberally to off set this advantage. If smoke screens could be maintained continuously, (this is not accepted) the CC range advantage would be of no value, if smoke screens can be effective part of the time, part of our range advantage is lost, and time is lost, it is indecisive. Yet some damage can be done, possibly a considerable amount. A decisive engagement is desired, it now appears that unaided the CC's cannot be expected to provide this with success to ORANGE.

Fortunately we have other forces, these are cruisers, destroyers, submarines and aircraft. The submarines are a part of our force but will be operating independently, though offensively. We hope for assistance from them, but we can not count on it. We will depend on our airplanes for plane spot for long range firing. Let's consider cruisers; we have 8 CA against 3 for BLUE and 5 CL against 4 for BLUE. Here is a real superiority for ORANGE. How can we capitalize it to accomplish our mission, under the selected course of action. The life of our CA is 37.6 as against 14.1 for BLUE CA's and of our CL's 14 against 14.8

for BLUE CL's or cruiser life in our favor of 51.6 against 28.9. The operation of the N^2 law under concentration gives ORANGE cruisers a far greater fire effect than the life ratio. By consulting the fire effect diagrams it is found that the BLUE cruisers are all destroyed during the run in from 30,000 to 10,000 yards. This under the assumed conditions of visibility of targets and plane spot for ORANGE CA's.

BLUE is superior in number of destroyers by twenty-one to sixteen. It may well be that a part of BLUE destroyers will be assigned as anti-submarine screen for the convoy, and not initially available for defense of own Battle Line. Should, however, ORANGE find all DD's opposed we find that BLUE life is 27.5 against 20.8 for ORANGE. However the BLUE 4"-50 caliber gun is only from 75 to 80 percent as effective as the ORANGE 4"7-45 calibre gun, which in fighting effect brings the forces almost on a parity. This is without consideration of the employment of the secondary battery of the cruisers, nor their entire availability at about a range of 12,000 yards on the run in.

It now seems that a powerful light force attack can be launched on BLUE BB's with an indicated damage from BLUE light force defense of about 15%. With consideration of the fact that ~~ORANGE~~ light forces carry 288 torpedoes in the CA's, 108 in the CL's, and 192 in the DD's or a total of 588 torpedoes, and except for BB main battery fire can get them to the firing point, here is a serious threat for BLUE, and a powerful weapon for ORANGE. The BB main battery is a menace to this attack if free to be used against it. What can be done about this? The BB's will be under fire of the CC's, but unless the CC's are within gun range of the BB's, 22,000 and under the BB fire will be directed against this attack. By closing the range with the CC's the BB's will be forced to employ their batteries against them or absorb the punishment without return. BLUE will be faced with the problem of accepting the fire of the CC's without return, or

of accepting the light force attack and maneuvering to avoid. What may we expect and what will be its effect on ORANGE?

By consulting the Fire Effect Diagrams, it is found that with both forces presenting a 90° target angle (improbable while closing except head on) from 22,000 to 16,000 BLUE averages about 1.5 fourteen inch hit per 3 minute move more than ORANGE, or ORANGE pays a relative penalty of .5 hit per ship. However, if ORANGE presents a 45° target angle and BLUE a 90° target angle the picture changes and ORANGE has an advantage of .5 of a hit or .166 hit per ship. Again if both forces present a 45° target angle BLUE has the advantage of .53 hit per 3 minute move or .176 per ship. But to 17,000 yards this advantage is only .23 hit or .08 hit per ship. ORANGE must not present a 90° target angle to BLUE's 45° target angle, this would be fatal. Assuming ORANGE presents a 45° target angle, the worst conditions would result in a small disadvantage of fire effect to ORANGE, and under good conditions in an advantage. This estimate does not consider the accumulated damage on BB's from previous long range fire.

Then ORANGE CC's must fight at seventeen to eighteen thousand yards for maximum advantage. Analysis shows that by this time, ORANGE Light Forces should have secured the ascendancy over the BLUE Light Force. Computation shows that ORANGE cruisers with plane spot for CA's can render BLUE cruisers ineffective on the run in from 30,000 to 12,000 yards with only about 15% damage to ORANGE.

ORANGE light forces are now in position to make a determined attack on the BLUE Battle Line driving the attack well home. Should the BLUE BB's shift main battery fire to this force, it can lay a smoke screen for protection, it is contemplated making the attack from windward. During this time ORANGE Battle Line could pile up a tremendous fire superiority. Having visualized the growing plan to this point we are ready to move on to the next

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phase. ORANGE light forces have defeated and destroyed most of BLUE light forces, and have delivered a strong torpedo attack. The Battle Lines are heavily engaged. The remaining ORANGE light forces, by computation should be considerable, can now stand on to attack the Convoy. Should the successive blows delivered on the battleships i.e., CC long range attack 30,000 to 26,000 yards, the approach firing to seventeen to eighteen thousand yards, the firing in this favorable band, and the results of the light force torpedo attack, have resulted in reducing the BB strength below that of the CC's, then they may be left to the CC's while the light forces go about the work of destruction of the Convoy.

Plane spot is important to us.

Our speed advantage must be preserved.

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SECTION V

DECISION

To engage enemy decisively from windward in a three phase action; first at long ranges, own light forces defending battle line; second at decisive ranges, own light forces destroying enemy light forces and delivering torpedo attack on enemy battle line; third, attack by all forces on enemy convoy and remaining escort, in order to destroy BLUE reinforcements.

SECTION VI

SUPPORTING MEASURES

(a) Operations to be inaugurated.

In formulating the operations to be included in the battle plan we shall assume that:-

Our scouting force has a definite contact with BLUE reinforcements and has reported his position, course and speed;

Our surface forces have effected tactical concentration;

Our tactical scouting and air reconnaissance has given us BLUE's strength, disposition and the escort's position relative to his escort.

Our decision involves the following:

1. Security of plane spot to own battle line and during phase two to our CAs. Plane spot for us is the most important function for air.
2. Maintenance of speed superiority and strength of own battle line. This calls initially for defense of own Battle Line by light forces from torpedo damage. This menace is considered to lie chiefly from BLUE submarines. It is believed that BLUE's inferior light forces have but little chance of a successful attack through our superior light forces. In addition to this, in phase one, the CCs are not under fire, therefore are free to use main battery and to maneuver to avoid an attack.
3. Maintenance of visibility of targets during phase I. It is expected that BLUE will make liberal use of smoke to deny the CCs fire outside of twenty-two thousand yards. As we intend to attack from windward, any surface vessels laying smoke will be visible to our forces, we must destroy such units, and use our superior speed to maintain visibility. Our cruisers are effective for knocking out surface smokers and remain outside of BB fire.

4. Attack of our light forces on BLUE Light Force and BLUE Battle Line under supporting fire of own Battle Line. This is to be done in phase II when the CCs are engaging down to 17,000 yards drawing the BB fire. For destruction of BLUE light forces we have a tremendous cruiser superiority, allowing for a double concentration on all but one BLUE CL ; in this we gain the advantage in the ratio of 5 to 1. The path to the torpedo firing position should be cleared with relative ease. Our cruiser torpedoes have a range of 16,400 yards and those of our destroyers 13,500 yards. The enemy battle line of three BBs is short if closed up, if spread, then there are three targets. The attack must be driven well home to the point where accuracy of torpedo fire is assured.
5. Attack on convoy and remaining BLUE combatant ships. After torpedo attack is delivered, the light forces will stand on for the convoy and set about its destruction. This function is best performed by the cruisers. The DD may reload torpedoes and attack BBs again, or if not needed elsewhere go down on convoy and use the torpedoes there.
6. Defensive smoke if desired.
7. Pursuit. The convoy may disperse if it is seen that the battle is going against them. They must be caught and destroyed; our cruisers have the speed and strength to do this.

From the above considerations, the following tasks are formulated:

1. Secure plane spot for own Battle Line and CAs.
2. Defend Battle Line against torpedo attack by enemy light forces and submarines.
3. Maintain Battle Line gun range outside twenty-three thousand yards, preferably at about 26,000 yards during

1st phase. Close gun range to seventeen - eighteen thousand yard range band in 2nd phase.

4. Prevent smoke screens being laid by enemy to interfere with our gun fire.

5. Attack enemy light forces.

6. Attack enemy Battle Line with torpedoes.

7. Attack enemy Convoy.

8. Follow up Pursuit.

9. Furnish information.

Task Groups:

1. Battle Line

Batcrudiv One Assigned Tasks 3, 7, and 8.

Desdiv Four " " 2 and 6.

2. Light Forces Assigned Tasks 2, 4, 5, 6, 7, 8 and 9.

Crudiv Three

Crudiv Six

Crudiv Seven

Desron One

3. Aircraft Assigned Tasks 1 and 9.

All VO and VS planes

4. Submarines Assigned Tasks 6, 7, 8 and 9.

All submarines in
Battle Area.

(b) Command Organization

The Battle Line will be under the immediate command of Commander Eastern Detachment who will act as O.T.C.

The light forces will be under the general command of Vice Admiral OCA, in command of Crudiv Six. When deployment is ordered the Senior Officer of each flank force will have command in that area.

The command of aircraft is assigned to Commander AC, the senior aviator.

The command of submarines will be exercised by the senior submarine commander in the Battle Area.

(c) Coordinating Measures.

Information is vital to all groups. The O.T.C. will initiate the attack, and the start of each phase.

All units should know the location of the Convoy and take advantage of opportunities to damage it.

O.T.C. will order pursuit.

(d) Train.

Train will remain at PELEWS.

(e) Special Provisions.

O.T.C. in CC-3. Use minus nine time. Rendezvous Affirm, PELEWS; Baker, GUAM.

Battle Radio Frequency Plan.

Pursuit Plans I and II.

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TACTICAL PROBLEM I - 1934 - SENIOR

THE BATTLE PLAN

Battle Plan
No.1.

Latitude 12⁰-00' N.
Longitude 127⁰-00' E.
7 January, 193-.

TASK ORGANIZATION

- (a) Battle Line
 - Baterudiv One
 - Dosdiv Four
- (b) Light Forces, Vice Admiral OCA.
 - Crudivs Three, Six, Seven
 - Dosron One
- (c) Aircraft, Commander Top Flite.
 - All VO and VS planes
- (d) Submarines, Commander Deep Under.
 - All submarines in Battle Area.

1. Mission. To destroy BLUE reinforcements last reported off SATAWAN in daylight action with all surface forces in order to prevent their reaching the PHILIPPINES prior to the capture of MANILA BAY.
Information. As contained in my Operation Order No. 1.
No further information.
Assumptions. That the enemy will take up a strong defensive disposition and endeavor to destroy or drive off our attacking units; that he will counter attack at favorable opportunities; that he will use delaying and evasive tactics, in defense of his convoy. That he will employ smoke liberally to offset the superior gun range of our battle line. If the battle turns against him he will disperse his convoy to seek safety in flight. That visibility conditions will permit long range gun fire.
2. This force will engage enemy decisively from windward in a three phase action; first, at long ranges, own light forces defending Battle Line; second, at decisive ranges, own light forces destroying enemy light forces and delivering torpedo attack on enemy battle line; third, attack by all forces on enemy convoy and remaining escort, in order to destroy BLUE reinforcements.
3. (a) Battle Line. Phase I, attack enemy battle line outside of twenty-three thousand yards, preferably at twenty-six thousand yards. Phase II, close to decisive ranges, seventeen, eighteen thousand yard range band indicated. Phase III, continue attack on enemy battle line until destroyed or rendered ineffective, then attack escort and convoy.
(b) Light Forces. Phase I, defend own battle line. Deny enemy surface vessels laying smoke screens between battle lines. Phase II, attack and destroy enemy light forces, attack enemy battle line with torpedoes. Phase III, attack enemy convoy and remaining enemy escort.
(c) Aircraft. Phase I, secure and maintain plane spot for battle line, secure information of enemy movements. Phase II, secure plane spot for battle line and CAs, supply information. Phase III, supply information and plane spot as needed.
(d) Submarines. Phases I, II, III, attack enemy heavy ships and convoy at every opportunity. Battleships primary objective.
(x) Information vital to all units. O.T.C. will direct execution of this plan and of the start of each phase by signal. Pursuit will be initiated by O.T.C. who will direct the plan to be used. Use smoke as necessary but avoid interference with fire of own battle line.

4. Train remain at PELEWS.
5. Rendezvous Affirm, PELEWS; Baker, GUAM. Use minus nine time. Battle Radio Frequency Plan. O.T.C. in CC-3.

OC
Vice Admiral,
Commander, Eastern Detachment
and O.T.C.

Distribution:

By despatch to:
Task Force Commanders
Unit Commanders and
Commanding Officers.

A,
Lieutenant Commander
Flag Secretary.

2BB-34,35, 1BB-33
 3CA-36,34,32
 4CL-9,11,12,13
 20-DD-148-160 incl. 142-145 incl.
 241,244,248, 1DL-6

3CC-4,3,1.
 8CA-32-39 incl.
 4CL-21-24 incl. 1CL-18
 16DD-79-86 incl. 87-94 incl.
 12SS-17-23 incl. 1-5 incl.

BLUE FORCES

Type	BB	BB	CA	CL	DD	DL	SS
Number	2	1	3	4	20	1	?
Speed	20.5	20.5	32.5	33	$\frac{35}{34}$	36.5	
Armor	Side	12"	11"	5"00	3"	0	0
	Deck	4"1	4"4	2"25	1"5	0	0
Life	31	15.2	14.1	14.8	26	1.5	
Main Battery	No./Cal.	$\frac{20}{14"/45}$	$\frac{12}{12"/50}$	$\frac{27}{8"/55}$	$\frac{40}{6"/53}$	$\frac{80}{4"/50}$	$\frac{6}{5"/40}$
	One Side	20	12	27	28	60	6
	Max Range	22	23	34	$\frac{22}{18}$	13	17
	Am. per G	100	100	100	235	125	125
Secondary Battery	No./Cal.	$\frac{32}{5"/51}$	$\frac{16}{5"/51}$				
	One Side	16	8				
	Max Range	15	15				
	Am. per G	235	235				
* Anti Air Battery	No./Cal.	$\frac{16}{3"/50h}$	$\frac{8}{3"/50h}$	$\frac{12}{5"/25h}$	$\frac{16}{3"/50h}$	$\frac{20}{3"/23h}$	
	Range	13	13	14	13	7	
Torpedoes	Total No	0	0	0	48 A	240 C	12 G
	Speed				26	27	27
	Range				17	13.5	15
Tubes	On Broadside				12	120	12
	Deck				24	240	12
	Submerged						
Mines							
Depth Charges					1000	50	
Aircraft	VO	4	2				
	VS			12	8		

ORANGE FORCES

Type	CC	CA	CL	CL	DD	SS	SS
Number	3	8	4	1	16	7	5
Speed	$\frac{26}{27.5}$	33	33	33	34	$\frac{19}{9}$	$\frac{17}{9}$
Armor	Side	8"	4"	2"5	2"	0	0
	Deck	$\frac{3"75}{4"}$	1"25	0	0	0	0
Life	36	37.6	12	2	20.8	4.8	4.5
Main Battery	No./Cal.	$\frac{24}{14"/45}$	$\frac{80}{8"/50}$	$\frac{28}{5.5/50}$	$\frac{6}{5.5/50}$	$\frac{64}{4.7/45}$	$\frac{6}{4.7/40}$
	One Side	24	80	24	6	64	
	Max Range	30	31	20	20	15	10
	Am. per G	100	100	235	235	125	100
Secondary Battery	No./Cal.	$\frac{48}{6"/50}$					
	One Side	24					
	Max Range	20					
	Am. per G	235					
* Anti Air Battery	No./Cal.	$\frac{12}{3"/40h}$	$\frac{32}{4.7/45h}$	$\frac{12}{3"/40h}$	$\frac{2}{3"/40h}$		
	Range	7	19	7	7		
Torpedoes	Total No.	36	288	96	12	192	84
	Speed	28	28	28	28	27	$\frac{27}{34}$ $\frac{46}{46}$
	Range	16.4	16.4	16.4	16.4	13.5	$\frac{15}{10}$ $\frac{6}{6}$
Tubes	On Broadside	6	48	16	4	96	
	Deck		96	32	4	96	
	Submerged	12					14 Stern +2 bow
Mines			320	40			10 Stern 20 bow
Depth Charges					800		
Aircraft	VO	6					
	VS		16	4			

NOTES:-

1. VO and VS planes have cruising radius of 457 miles at 107 Kts.

* 2. Allowances in 0.50 Cal. machine guns, BB's & CC's 8, CA's & CL's 8, DD's & DL's 4.

Total	Number of Type	Main Batt'y Guns	Secondary Batt'y Guns	Major Ships		Light Forces		Submarines		Mines Depth Charges	Aircraft		* Anti Aircraft Battery Guns
				Tubes One Side	Torpedoes Total	Tubes One Side	Torpedoes Total	Guns	Torps Total		VO	VS	
BLUE FORCES	3BB 3CA,4CL 20-DD,1DL	20-14"/45 12-12"/50 27-8"/55	54-5" 40-6" 80-4"	0	0	144	300	Unknown		1050 dc.	6	20	40-3"/50 12-5"/25 20-3"/23
ORANGE FORCES	3CC 8CA,5CL 16DD,12SS	24-14"/45 80-8"/50	64-4"7 48-6" 34-5"5 6-5"1	6	36	164	588	6-4"7/40 10-5"5/50 44-50 m.h.	134	360 m. 800 dc.	6	16	26-3"/40 32-4"7/45 192 m.h.

ANNEX A
 COMPARISON OF FORCES
 TACTICAL PROBLEM-I
 (STAFF SOLUTION)
 (1934)