This article was downloaded by: [134.117.10.200]

On: 27 December 2014, At: 03:32

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954

Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK

Royal United Services Institution. Journal

Publication details, including instructions for
authors and subscription information:

<http://www.tandfonline.com/loi/rusi19>

Battle Tactics of the Single Line

Lieutenant A. C. Dewar R.N.

Published online: 11 Sep 2009.

To cite this article: Lieutenant A. C. Dewar R.N. (1909) Battle Tactics of the
Single Line, Royal United Services Institution. Journal, 53:371, 11-38, DOI:

[10.1080/03071840909418938](https://doi.org/10.1080/03071840909418938)

To link to this article: <http://dx.doi.org/10.1080/03071840909418938>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan,

sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

BATTLE TACTICS OF THE SINGLE LINE.

By Lieutenant A. C. DEWAR, R.N.

On Wednesday, 11th November, 1908.

Vice-Admiral Sir C. CAMPBELL, K.C.M.G., C.B., D.S.O.,
in the Chair.

THE subject of this lecture is not new. It is our old friend the Single Line. It is part of a larger paper dealing with—

The Tactics of Approach;

The Tactics of the Single Line;

The Tactics of Group Systems (such as Admiral Fournier);

The Tactics of Support Systems (such as Captain Borresens).

The object of the paper, however, is not to specially advocate any particular formation but to emphasise the principles to which every formation must conform and to apply them more particularly to Single Line. What is the main object of all Tactical formations? To use a certain weapon with maximum effect on the enemy. In this case the weapon is the gun; and that gun should always be pointing at the enemy. The primary object of Battle Tactics is the utilisation of all available gunfire to the highest possible degree. Any movement which, without a definite and distinct objective interferes with or hinders the gunfire is tactically faulty.

FIRE ARC PRINCIPLE.

The first and fundamental principle, then, of Tactics is :—

All guns possible pointing at the enemy.

This is the Maximum Arc Principle—all maximum arcs or an equal proportion of maximum arcs directed on the enemy.

RANGE PRINCIPLE.

The next principle to be laid down is the Range Principle. All ships must take an equal part in the action; the gunfire

must be distributed between all—not one ship firing at 10,000 yards and another at 7,000 yards. All ships should be as nearly as possible at the same range, and the direction of the column must be adjusted accordingly.

These two Principles, the Maximum Arc Principle and the Range Principle, apply to all formations, and contain in themselves all the Law and the Prophets of Tactics.

A formation which conforms to them can never be radically bad.

A formation which does not conform to them can never be really good.

THREE POSITIONS.

The following terms require a short explanation. By a Position of Equality will be meant that fleets are exerting an equal percentage of their fire arcs under similar range conditions. By the expression, a Position of Advantage (or Disadvantage), will be meant that a fleet's Maximum Arc is operating in the enemy's minor arc. By a Position of Fire Arc or Range Superiority (or Inferiority), will be meant that the Fire Arc or Range Conditions are superior or inferior.

FORMATION REQUIREMENTS.

So long as the formation at any particular moment permits of both Fire Arc and Range principles being followed, it is a satisfactory one; but there are certain qualities which will enable such conditions to be more easily attained or maintained.

These are :—

Elasticity, giving the greatest liberty of movement to all vessels.

Flexibility, giving the power of rapidly changing the direction and course.

and perhaps most important of all

Simplicity, ability to keep station safely and easily under battle conditions.

Single Line formations certainly fulfil these requirements to a very great extent, and Single Line Tactics are, therefore, particularly worthy of investigation.

BATTLE APPROACH.

This lecture does not deal with the subject of approach; but I must ask you to accept a proposition with regard to that phase, viz. :

A fleet when it has reached a suitable range can turn its Maximum Arcs on the enemy and can enter battle in a Position of Equality.

By Equality is meant an equality of Fire Arc and Range Conditions only. There is no doubt that a potential superi-

DIAGRAM APPROACH.

OBJECT—To show superior speed cannot prevent slower fleet bringing maximum arcs to bear in approach.

Downloaded by [134.117.10.200] at 03:32 27 December 2014

ority is gained by coming into action ahead of the enemy, as his movements are thereby circumscribed and can be calculated; but this does not give a superiority in gunfire.

However slow a fleet is, it has it in its power to bring the enemy on the beam, for the simple reason that a fleet's maximum arcs can be swung through 90 degrees, far faster than an opponent can alter the bearing by steaming. (Diagram I.)

If one fleet maximates¹ on another at effective range, the other will be forced either to turn parallel or approximately parallel into a position of Equality or contravene the Fire Arc and Range Principles, which it can only afford to do if its opponent's shooting is very bad or its own ships especially well protected.

This parallelism, or tendency to turn parallel, is not a mere matter of deduction. It is shown by experience to be a characteristic of battle exercises, and is the natural effect of fleets within gunrange endeavouring to reciprocally exert on one another their maximum gunfire.

Accordingly we can assume the battle to originate on a parallel course or in a Position of Equality. If it does not, then one or other of the combatants has presented the other with a Position of Advantage, the attainment of which from a Position of Equality I am now going to discuss.

BATTLE MOVEMENTS.

Let us assume the two fleets to be parallel or approximately parallel.

The dominant objectives of further battle movements will then be:—

- I. Range movements, *i.e.*, to alter or maintain the range.
- II. Position movements, to gain a Position of Advantage or maintain a Position of Equality.

These will generally be carried out by means of what may be called Primary Movements:—

1. Turning together.
2. Turning in succession.
3. Altering bearing of column in line ahead by direct movements.
4. Altering bearing of column in line abreast by direct movements or wheeling.

There is nothing new in these Primary Movements, but it is by means of them that the fleet will manipulate its Fire Arc and Range Conditions, and the first test to be applied to any suggested formation is the time taken in these Primary Movements.

It is by the ease with which they can be carried out that the elasticity and flexibility of a formation will be chiefly measured.

¹*i.e.*, bring its maximum arcs to bear.

II. REPLIES TO T. MOVEMENTS.

I am not going further into these Primary Movements, as it is easy to investigate the time taken to carry them out, and thus obtain an important indication of the value of any particular formation.

These Primary Movements form with station keeping the preliminary drill of Tactics.

RANGE MOVEMENTS.

What part are Range Movements going to take in a modern action? This is a difficult question to answer, but the one-gun-big-battle-ship has been built on the principle that it can lie at long range and hammer the two-gun-not-so-big-battle-ship.

If it is to do this it will have to select and maintain its range. This means Range Movements.

Now, if a fleet's hitting ability is greater than that of the enemy, it will endeavour to keep at long range; if inferior, it will try to close.

But if one's firing is superior at long ranges, it will presumably be superior at medium ranges, and the only *raison d'être* of long-range firing will be a preliminary demoralisation of the enemy, to get in three or four 12-inch hits, and then close and complete what one has begun. But this preliminary demoralisation may itself decide the action. The effect of five or six 12-inch shell descending from a height on to the upper deck, may be almost conclusive, for ships are not built to resist this kind of attack.

The disadvantage, of course, of long ranges, is the far smaller percentage of hits and the accompanying uneconomical expenditure of ammunition. The principal difficulty is to get the range and rate of change. If this can be obtained, the action may be decided at long ranges, and the whole course of an action may depend upon one fleet possessing the means of ascertaining accurately the course and speed of the enemy at long ranges.

It is doubtful, however, whether the hitting ability of a superior system of control would increase in direct proportion to the decrease in range. If not, then it will be to the advantage of the inferior combatant to close to a range at which the effect of his inferiority in skill or material will be less pronounced.

To carry the argument to extremes, at 2,000 yards an inferior system of control will be working under a less heavy handicap than at 8,000, and a 6-inch gun will be making as accurate shooting as a 12-inch.

The inferior antagonist, then, will make an effort to decrease the range, which will result in a range tug-of-war between the two fleets.

At the same time, to remain at long ranges it is pretty clear that a ship must be able to hit at long ranges. What percentage of hits made against a fixed target at long range will be made against a moving target, and what percentage

III. SKETCH OF TYPICAL PURSUIT AND RETREAT TACTICS.

DIAGRAM
ILLUSTRATION OF PURSUIT AND RETREAT TACTICS
with Yawing Movements.

PATENT OFFICE LIBRARY.

of hits made on a moving target will reach the enemy's fleet? It may be said with confidence, not a great number.

Long range does not necessarily mean 8,000, 9,000, or 10,000 yards; it means a range at which you can hope to obtain a definite return on ammunition expended, and will vary with different fleets and with different conditions of sea and visibility. On a misty day in the North Sea, 4,000 yards will be a long range, for a cut will not be obtained with the range-finder any further off.

But all this talk of Range Movements will be words and nothing else, if we do not remember that at present the co-ordination between the control station and the conning tower, which is essential to their performance, is too often non-existent. Tactics and Gunnery are a divorced couple, if, indeed, they have ever been united.

Granted, however, that Range Movements will form part of Battle Tactics, they will be carried out either:—

1. With Maximum Arcs bearing;
2. With Minor Arcs bearing.

If a fleet is endeavouring to alter the range, it is clear it is not at a satisfactory range, and the artillerist will not be so insistent on the Maximum Arcs bearing; but if it is endeavouring to maintain the range, the range is evidently satisfactory, and it is important to keep the Maximum Arcs bearing if possible. The principal factors in Range Movements will be Speed and Fire Arc, and it is easy to calculate for any relative positions, the theoretical extent to which either of these factors will affect Range Movements.

Under what special circumstances in an action will Range Movements be chiefly in evidence? Not when in a Position of Advantage or Disadvantage. If there is danger of an enemy crossing his T, an admiral will not worry about the range.

We may assume, then, that Range Movements will be *subsidiary to Position Movements*, and will appertain rather to Positions of Equality, and, therefore, to the typical parallel positions of parallel line abreast, parallel quarter-line, and parallel line ahead.

Range movements may be extended to embrace another class of movement, which may be called Range Variation Movements, that is, altering or varying the range in order to confuse the enemy, and not for the purpose of reaching or maintaining a particular range. This would be to the advantage of the fleet possessing the better method of ascertaining the enemy's course and speed.

Range movements require experimental investigation rather than theoretical treatment, and their investigations must run parallel with that of such little exploited subjects as the combined firing of two ships or more.

One thing is certain, that they are a class of movement which will require exhaustive practice and a great deal of co-operation between the artillerist and the tactician, if they are going to influence the modern battle.

IV. TIME IN P. AND R. TACTICS TO BRING MAXIMUM ARCS TO BEAR.

DIAGRAM
PURSUIT TACTICS
STERN CHASE

POSITION MOVEMENTS.

We have dealt with Parallel Tactics and Range Movements, and now come to Position Movements. The object of Position Movements is to obtain a Position of Advantage relative to some vulnerable point of the enemy's line.

By this Position of Advantage is meant the exploitation of a fleet's Maximum Arc within the enemy's Minimum Arc, or, in other words, a concentration of fleet fire on a limited number of ships. But here again we find that the geometric or tactical point of view does not coincide with that of the artillerist. Have we reached the stage where we can at will concentrate the fire of a fleet on a limited number of ships? Would such an attempt at concentration merely mean much troubling of the face of the waters without any corresponding concussion of rending iron? In other words, would four ships get any more hits on the enemy than one ship?

This question shows very conspicuously the mental gap between the tactician and the artillerist, which requires to be bridged over.

If ships at long range cannot combine their fire, then Position Movements must be restricted to ranges at which they can.

At ranges beyond this, we must be content to pound along parallel to the enemy, each ship firing at its opposite member in the enemy's line.

But let us suppose that we can concentrate our fire. Then the vulnerable points of a single line are its extremities, which may be the van, rear, or flanks, according to circumstances, and give rise to three species of Tactical Movements directed against them:—

- I. T. Movements endeavouring to gain a position of advantage relative to the enemy's van.
- II. Rear-Crossing Movements, endeavouring to gain a position of advantage relative to the rear.
- III. Flanking Movements, endeavouring to gain a position of advantage relative to the flanks. These may also be called Pursuit and Retreat Tactics, as they are likely to occur under such circumstances.

Speed is essential to T. Tactics, which consist in drawing a fleet's Maximum Arc ahead into the Minor Arc of its opponent.

Starting from a parallel position in the case of a slower fleet of 18 knots, a speed inferiority of 2 knots and 5 knots will alter the bearing as follows:—

ALTERATION OF BEARING PARALLEL AND T TACTICS.

Speed inferiority.	Minutes.									
Knots.	3	6	9	12	15	18	21	24	27	30
2	2°	4°	5½°	7½°	9½°	11°	13½°	15°	17½°	19½°
5	4°	9°	13°	18½°	22½°	25½°	29°	33°	35°	38°

V. TYPICAL POSITIONS RESULTANT FROM T., REAR CROSS, P. AND R. TACTICS.

TYPICAL POSITIONS

RESULTANT FROM T., REAR AND P. AND R. TACTICS

(Taken from the Tactical Board)

SPEED DIFFERENCE

F. Fast S. Slow

2 knots →

5 knots →

An advantage of T. Tactics is that Fire Arc and Range conditions remain the same, while the distance decreases, and thus the superiority is progressive and gradually culminating. There are three replies to T Tactics (Diagram II., page 15) :—

- I. Paralleling, *i.e.*, turning gradually, so as to maintain Maximum Arcs on the enemy. To do this effectually the slow fleet should always keep bearing away at an angle of 5° from the parallel course, and should never allow the faster to get very far ahead before it starts to parallel.
- II. If there is no room to parallel, the slow fleet may adopt Rear-Crossing Tactics, *i.e.*, turn 16 points together and attack the rear of the fast fleet. This will lead to counter circling, in which the advantage of speed is not so pronounced.
- III. Slow can adopt Pursuit and Retreat Tactics by turning away with maximum arcs bearing, though by adopting this course it will have its wing ship exposed to fire.

REAR-CROSSING MOVEMENTS.

With regard to Rear-Crossing Tactics from similar courses, it is clear that the first turn into or away from the enemy as obscuring Maximum Arcs will be disadvantageous.

The natural counter-movement is a similar turn in succession towards the opponent's rear, and then counter-circling begins. This movement, if carried out at medium ranges, will tend to approximate to parallel courses in opposite directions, and any attempt to move out of the circle at a tangent will oppose minor to maximum arcs for a time.

The best method of breaking the circle will be a turn together away from the enemy, with maximum arcs bearing.

FLANKING MOVEMENTS.

We now come to Flanking or Pursuit and Retreat Tactics. These spring in their simplest form from one fleet pursuing another. Both fleets will tend to take up the formation of single line abreast, where they can bring as heavy a gun-fire to bear as possible without prejudicing their course. If either the pursuer or pursued were to remain in line ahead, he would place himself in a position of grave disadvantage. P. and R. Tactics, then, will usually commence with both fleets in an approximate line abreast, one astern of the other. If the Slow Fleet elects to continue its retreat, Fast will gradually creep up to medium range then turn into line ahead and yaw to one side, opening fire for a short period with maximum arcs on Slow's retreating flank. If when Fast yaws, Slow turns parallel, parallel tactics will ensue; if Slow continues its course, the range will increase during the yaw and Fast will turn together again in a line of bearing on Slow's flank and continue the pursuit with minor arcs till medium range is again reached and another yaw can be made. These yaws will become less and

less divergent till finally Fast creeps up so far on one flank that maximum arcs will bear.. (Diagrams III. and IV., pages 17, 19.)

VI. EFFECTIVE FIRE DIAGRAM IN T. TACTICS, SPEED DIFFERENCE, 2 KNOTS.

Slow meanwhile pushes his flank further and further ahead, till fleets are approximately on parallel lines of bearing.

I am now going to put before you some diagrams illustrating the effect that these movements have on effective gunfire in the case of fleets of unequal speeds, but in all other respects

equal. Each fleet consisted of eight vessels of the *Cæsar* class, starting from a parallel Position of Equality, manœuvring to gain a Position of Advantage, and employing:—

- I. T. Movements. II. Rear-Crossing Movements.
III. Flanking Movements.

Fire was measured according to a table of hitting percentages and lbs. hitting per minute which it is not necessary to reproduce.

Each movement was considered with a speed difference first of two and then of five knots. The diagrams thus represent tactical games in terms of effective gun fire.

EFFECTIVE FIRE DIAGRAMS.

In the first case Fast steaming 16 knots endeavours to carry out T. Tactics, and steers to pass 5,500 yards ahead of Slow.

The Fire Arc and Range Conditions are as follows:—

	Fast.	Mean Range.	Slow.	Mean Range
15 ^m	All max. arcs bearing	4,920	All max.	5,050
30 ^m	„	4,100	„	4,150
36 ^m	„	3,650	„	3,800

At 33 minutes the Fire Arcs of Slow are beginning to obscure; Slow turns parallel, and is parallel again at 36 minutes. The Fire Advantage is nil, unless S. is unable to turn from hydrographical reasons; but Fast possesses a latent tactical advantage in being able to circumscribe Slow's movements. These movements have not been calculated for more than 39 minutes, but further calculations would be on much the same lines, for the final are very much the same as the initial positions. (Diagram VI., page 23.)

Considering the same Tactics with a speed superiority of 5 knots, the Fast Fleet at 19 knots, the Slow at 14.

In this case the fire effect curve shows that Fast obtained some advantage, because Slow did not start to turn parallel soon enough. (Diagram VII.)

In the case of Rear Crossing Movements (Diagram VIII., page 28), no advantage seems to be gained, and the first turn is disadvantageous. In the case of Pursuit and Retreat Movements (Diagrams IX., X., pages 29, 31), Fast gains some advantage in fire effect by yawing, but if Slow turned parallel to the yaw instead of continuing its course, this would vanish.

In none of the Fire Effect Curves depicted in the diagrams is the advantage in fire effect obtained by any tactical movement such that it would not be counteracted by a 15 per cent. superiority in hitting ability. In fact, Single Line is so flexible a formation that unless the speed superiority is something like one-quarter of the speed, very little tactical fire advantage can be obtained.

These various Tactical movements—Parallel, Range Movements, T., Rear-Crossing and Pursuit and Retreat, cover almost the whole field of single line tactics. (Diagram V., page 21.)

Downloaded by [134.117.10.200] at 03:32 27 December 2014

Space has only permitted a cursory analysis of the principal characteristics of single line, but the same method of investigation applies in a modified form to other Tactical systems.

An investigation of any system or formation should commence *with a careful analysis of its Primary movements*, in respect to time and simplicity, and then discuss the varieties of *Range and Position movements*.

The chief difficulty that assails us at present is the fact that the geometric tactics of the table are not in touch with fire tactics. The tactician proper is at variance with the artillerist. What is the use of discussing Position Movements when artillerists assert that if two ships fire simultaneously at the same target, they will get a smaller number of hits than if one fired singly? If this be the case, a modern action must restrict itself at long ranges to parallel tactics, each ship hammering its opposite member in the enemy's line. The problem of Fire Concentration is not yet solved. To control the fire of a fleet as the fire of a ship is controlled, has not yet been attempted. If spotting is essential to long-range firing, and it is not possible to spot with two ships firing at the same target, either one ship must do the spotting and give the others the range—a very centralised method, which would require a greatly improved signal system, or ships will have to fire salvos in succession. Failing this the fleet must close to a range where the range-finder and gun trajectory can be relied on to hit without the necessity of spotting. In any case, one thing is certain, and that is that it is very little use pretending that the fire of a fleet or division can be concentrated on certain ships as we do at P.Z. exercises and in tactical games, if artillerists consider it at present impracticable.

INSTRUCTION.

What machinery have we at present for tactical instruction? P.Z. exercises at sea and tactical games at the War College. P.Z. exercises give valuable practice in handling ships, but that is about all. They start without any laid down principles, and end up where they start. Piles of P.Z. diagrams accumulate, but little progress seems to be made.

Our ideas on Tactics are no further advanced than they were ten years ago. We have had a modern steam navy for twenty years, and ten of these were spent in ploughing the sands of equal speed manœuvres, quadrilles, gridirons, and similar quaint movements, which had no earthly relationship with gun fire tactics. P.Z. exercises are a step in advance, but they are dying from inanition. They possess no foundation of tactical principle. The want of preliminary study results in a deplorable lack of interest. They do not follow any line of investigation. There is no skilled analysis of their results, and accordingly they tend to degenerate into a promiscuous curvetting about, almost as useless as the old equal speeds. They lack interest and reality. In fact, they are tiresome, and are only useful as ship-handling exercises.

VIII. EFFECTIVE FIRE DIAGRAM IN REAR CROSS TACTICS.

PATENT OFFICE LIBRARY.

WAR COLLEGE.

Now let us consider the War College. The principal instrument of instruction there is the tactical game. In these games the actual handling of ships is carefully reproduced, and with the aid of set rules an attempt is made to reproduce the naval action.

The game is an excellent one, but has certain limitations. It assists greatly in teaching players the gunnery characteristics of their own ships and foreign Powers, but it permits certain make-believe ideas to creep in such as the concentration of divisional fire on single ships, which is not coincident with our present gunnery level. The tactical game runs ahead of gunnery. What the game practically investigates is this : given equal hitting ability, compare the value of the gunnery material of two fleets.

Now this is only one path of investigation. By tying itself down to rigid tables of lbs. hitting, shell points, piercing points, damage points per minute, it places limitations on itself.

In the endeavour to be realistic, the game becomes imaginative.

For purely tactical investigation, the system of marking is too elaborate. A purely tactical investigation does not concern itself with armour, piercing points, and shell fire points. Its object is to keep the maximum arcs bearing on the enemy at such a range as the artillerist may desire.

The game method tends to be faulty, for the very reason that instead of varying different factors in turn, it adopts a rigid table for factors, such as hitting ability, which will vary very greatly. Then neglecting strictly tactical enquiries, it neglects the thorough investigation of certain phases, such as approach, and particular gauges of sea and wind.

The War College has done a great deal of sound work, and a great deal of credit is due to it and its directors ; but the tactical game is only a link in a chain of tactical instruction. It is not tactical instruction.

THE SCIENCE OF TACTICS.

We want to raise tactics to the level of a science, and to attain this aim we require a wider circumferential view, a higher level of interest, a greater number of patient, plodding workers. The harvest is plenteous but the labourers are few. If the study of tactics is to be evolved into a science out of its present nebulous state, it must be launched as a synthetic system.

We require a triple synthesis of investigation, instruction and practice.

Before tactics can call itself a science it must be equipped with scientific garments. It must possess :—

1. An intellectual basis of careful analytical investigation, a body of principles submitted to experiment and investigation, a nucleus of knowledge con-

IX. EFFECTIVE FIRE DIAGRAM IN P. AND R. TACTICS,
SPEED DIFFERENCE, 2 KNOTS.

stantly engaged in the exploration of further spheres of knowledge. This is Investigation.

2. It must possess a sound system of Instruction and Training.
3. Its aim is Practice. To pass schemes through the crucible of investigation and trial and to hand them over to admirals at sea for further investigation, or to practise repeatedly and untiringly.

It is because we have no synthesis of this sort that Tactics is drifting into the position of a *Grand Peut-être*.

There is no separate investigatory department in the War College. Investigation is not sufficiently differentiated from instruction. The staff employ their afternoons calculating shell points. The result is there is no time for investigation, and investigation is the foundation and cornerstone of anything that calls itself a science.

There seems to be no definite system of co-ordination between the War College and investigatory committees at sea. We must have an investigatory department at the War College with a staff of investigators, possessing a clear vision as to the best line of investigation, armed and equipped with facts and experience culled from the field of practice, and in close touch with observers working in that field, *i.e.*, with our fleets at sea.

We now come to Instruction. Instruction evolves itself from and feeds on Investigation. At the War College investigation is subordinate to instruction. It should be the other way about.

A system of instruction requires :—

First, a basis of knowledge founded on scientific investigation.

Second, a level of practical knowledge in the instructed.

Third, Instructors.

Fourth, Instructional equipment.

Fifth, a syllabus or course of systematic instruction.

Sixth, a manual kept up to date

Seventh, suitable time, place, and continuity of routine.

And, above all, in a sound system of instruction, the instructors must have the power of conjuring up interest in those instructed.

At present we have no investigatory centre to supply us with knowledge; our instructors are tactical game markers, there is no syllabus or course of systematic instruction, there is no manual, and what instruction there is, does not make much headway, because it is not sufficiently widespread. There is a central department at the War College, but it has no good agencies. We require instructory centres and lecturers in all our fleets at sea.

To complete the Synthesis we require Practice. It is for this that investigation and instruction exist, but practice alone is not the field of progress. It is where German industry is

X. EFFECTIVE FIRE DIAGRAM IN P. AND R. TACTICS,
SPEED DIFFERENCE, 5 KNOTS.

supported by organised investigation and instruction that it outstrips England, which neglects the other two paths.

Practice must be supplemented by careful analytical and inductive investigation, and resolves itself into:—

Preliminary and instructional exercises.

Tactical exercises.

Investigatory exercises.

The first would consist of simple exercises, such as Station-keeping and Primary Movements. The second would practise methods accepted as sound, and constantly endeavour to perfect them. The third would test problems and methods supplied to them from the investigatory centre.

We are deficient in investigatory work, firstly, perhaps, because it is difficult to set a system of this sort in motion, and secondly, because so much talent is switched off into inventive and other channels.

But what is it, above all, that any such system, as has been sketched, requires? Interest and intelligence. We may build up the finest system in the world, but without interest it will be like a great battle-ship on a slip without water to launch it. Do naval officers take sufficient interest in tactics? I leave the tactical exercise room lying dark and deserted, evening after evening, at the War College in our principal naval port, with several hundreds of naval officers not more than ten minutes off to answer.

Either our officers do not take much interest in tactics, or they have very little faith in the instructional capabilities of the tactical game. Every effort, then, must be made to excite interest. When, where, and how is interest excited? It is excited chiefly in the young, in the field of practice and reality, by encouragement and setting a premium on effort.

We can obtain anything by setting a premium on it. We have set a premium on fire control, and the result is that the system is constantly evolving and improving. Where fire control was 15 years ago, there tactics is now.

Officers at sea must be invited to write on tactical subjects. Officers at the War College should be invited to write, and good essays should receive prizes and commendation, and should be printed with the author's name.

There is no premium set on talent. In fact, we are almost afraid to hint that one officer may be more intelligent than another. The result is, that instead of a strong current of interest flowing through the channel of tactics, it has become a slack and almost stagnant backwater.

To rouse a revivifying stream of interest, we require a system of lectures, and encouragement in our principal fleets. On each station a course of lectures, issued by the Admiralty with lantern slides, should be given half-yearly, and a station prize for a tactical essay.

An Admiralty prize should be offered for the best station essays, which should be printed and circulated.

Each year a report should be issued, giving the progress made with an account of the questions still to be investigated.

If we were to set these four great fans of

Investigation,
Instruction,
Practice,
Encouragement,

all revolving at full blast in the sphere of tactics, in three or four years the whole subject would be raised to a very different level.

After all, there is no such thing as an uninteresting subject, the only thing that exists is uninterested persons.

The following, for instance, are all matters suitable for investigation :—

1. Tactics of Approach, and possibilities of obtaining the gauges of sea and wind.
2. Group formations.
3. The relative importance of Range Movements in battle, and their practical application.
4. The Tactics of an Extended Line.
5. Tactics of a Torpedo Craft supported line.
6. Tactics of Support, *i.e.*, fleets supporting one another but acting independently.
7. Conning tower and Signal Systems.

These problems should be issued with a short account of the bibliography of the subject, the present level of knowledge, and the line of most profitable investigation.

Without some such system as the above, we are left to fill up the gaps in our armour with the painted woodwork of make-believe.

Captain E. P. C. BACK, R.N.:—As nobody else rises to address the meeting, I should like to say a very few words. Many of us, I think, agree generally with what the lecturer has so well said this afternoon; but at the same time it seems to me that this lecture is rather one to study carefully when we see it in the *JOURNAL*, especially the diagrams, which it was difficult to fully comprehend when they were shown. I hope the technical nature of the lecture will not make officers lose sight of the more general remarks made in it. I do not know how many naval officers are here, but I think I speak for them when I say that generally we are very much in agreement with a great deal of what the lecturer said, at any rate I am personally. The Minister of Education said the other day that education teaches reticence. If that is the case, naval officers ought to be one of the best educated bodies of people in the world, because I am sure that they are very reticent; in fact, we do not write, lecture, or read, perhaps as much as we should.

Admiral The Hon. Sir EDMUND FREMANTLE, G.C.B., C.M.G. (Rear-Admiral of the United Kingdom):—I am afraid I am not in a position to directly criticise this lecture, which is very full of technicalities. The lecturer ran over the diagrams rather quickly, and we are not able—at all

events, I was not able—to realise exactly in all cases what they meant. I am quite sure that he knew what they meant, and that he has digested the subject and studied it very thoroughly; but when we see the paper in the *JOURNAL* we shall be much better fitted to judge of it than we possibly can be from merely hearing the lecture and seeing the diagrams which have been shown, which, if we could have studied them, would have probably told us a great deal more than the words of the lecture. But we can gather one thing, at all events, and that is that the lecturer represents that we must not only study the subject but study it scientifically. There is no doubt about it that we have a tendency in this country almost always to take hold of the practical part of the subject. For instance, with regard to the war game—I do not know much about it, because I have not been through the course myself; I have not had that advantage which younger men have had—but we nowadays have the war game, which we make a part of practical work, but we do not always care to make the analytical investigations of which Lieutenant Dewar spoke. The result is that we get more or less certain general rules, which have been put forward by those who have studied the subject most, and then we work on those general rules in a practical way. It is not altogether a bad thing, but it is not quite the highest standard. We know that in Germany, not only with regard to naval affairs, but other affairs generally, they begin by a deep study of the question theoretically, which leads to different lines, and something which is very much better than the comparatively rule-of-thumb way in which we generally succeed in treating the subjects. Perhaps they may sometimes fail in the practical part, in which I think as a rule Englishmen are strong, whether it is on the question of science or the question of trade, or the question of war. I should like myself to have had a little more detailed account of the single line as regards other lines. That is a question which has been very much debated. It has always been held theoretically that the single line, from its adaptability or its pliability, has a great advantage over everything else. This was ruled so decisively in the 18th century that there were fighting instructions issued that we were always to be in the single line, and as they took a long time to form into line it led to indecisive actions. Theoretically the single line is undoubtedly the right thing with a limited number of ships, but when you have to deal with a very large number of ships it is almost impossible to concentrate everything in a single line. If a commander has as many as 27 ships, such as Nelson had at Trafalgar—and we may in these days get twenty or thirty ships under one control—it is a great question whether you should not break up the line and sacrifice the advantages which there are undoubtedly theoretically in the single line. We know that the Battle of Trafalgar was advisably fought in two lines. The reason why is pretty clear. It was, as Nelson always said, to complete the business thoroughly. Though theoretically there is so much to be said in favour of a single line, practically when we come to tactics we find that it has its limitations, and that you may afford—in fact you ought to afford in a big fleet—to break up the line. I should like the lecturer to have shown more plainly than he has done what he would have recommended in such a case as this: Supposing you have twenty ships, should you take advantage of the single line and keep to that only, or is the line so long that you will gain an advantage by dividing it, say, into two squadrons? Then there is another question which I do not think Lieutenant Dewar went into very thoroughly. Suppose there are, we will say, two fleets in parallel line (as he pointed out, you never get parallel lines), is it a good thing to concentrate your fire on one or two

ships, or is it advisable to distribute your fire? There is a good deal to be said on both sides. It has been held by many that if there are six ships acting against six ships, and that the six ships of one fleet are in the position that they can attack and concentrate their fire with some degree of completeness on one or two ships of the opposing fleet, presuming that no ship was more than about 7,000 yards off, that that would be the proper plan to adopt. I should like to ask the author whether in his opinion it would be the proper thing to attack those two ships and endeavour to sink them, and leave the other four ships entirely free, without any enemy to engage them, who would be firing at them; or, in his opinion, is it more desirable to divide your fire on the six ships, and so prevent any ship from feeling that she had no enemy to fight against? That is a point which I do not think the lecturer very much touched upon, and perhaps he will mention it in his reply. It seems to me that it would be a very practical question to work out what the probability of the damage is in those particular instances. It is theoretical of course, but we do endeavour to deal with these questions theoretically. Of course, what we always try to do is to get the T movement; but, as Lieutenant Dewar has pointed out, it is an extremely difficult thing to do. You get a great advantage over the enemy, but you have to presume when you are talking about the T movement that the enemy is going to allow you to take a great advantage of him. We do meet fools occasionally, but it is a very foolish thing to suppose that your enemy is going to act foolishly and that you are going to act wisely. It is far better to reverse that idea of things and to assume that you may act foolishly and that the enemy will get a little advantage over you. But what I want to ask Lieutenant Dewar is, what he would do then. How would he retrieve his position and make the best of a somewhat disadvantageous proceeding? I am afraid that most of us have failed to fully appreciate the value of this lecture, but I am sure that from the study which Lieutenant Dewar has given to the matter, from the diagrams which he gave us, and from the deep theoretical knowledge as well as practical knowledge which he evidently has of the subject, that when we read it in the JOURNAL we shall feel more indebted to him than we do now, and feel that he has done a great service in pointing out one or two things where he thinks we can make a further and deeper study of the subject which he has so well brought before us to-day.

Lieutenant A. C. DEWAR, in reply, said :—Admiral Fremantle mentioned a long single line, but that is not a question I touched on at all. That really comes into what I call the subject of tactics of support. If you are going to split the fleet up you will probably have two fleets. Either you would have what I call extended tactics—an extended single line with one fleet working ahead of the other—or you would have tactics of support—one fleet supporting the other, but both fleets acting independently. Tactics of support, as Admiral Fremantle pointed out, are naturally more important than tactics of single line. We know enough about single line tactics; we have learned a great deal about them practically; but tactics of support is a subject that must be investigated just in the same way as tactics of the single line have been. Admiral Fremantle has had a great deal of practical experience, and he knows the difficulty perhaps of working with a fleet of twenty ships in single line. I think myself it would be a very difficult thing to do; you would probably have to revert to tactics of support; but if you have got no tactics of support, then you cannot revert to them. Then Admiral

Fremantle asked whether you ought to distribute your fire, and each ship fire at its opposite number in the enemy's line, or whether, say, four ships ought to concentrate their fire on one ship, and so on. That is entirely a matter for the artillerist to decide. That is the kind of thing, if one was investigating the subject, I would turn over to the *Excellent*. I would say to them: "You must tell us all about this," and then they would carry out experiments and give us their results.

Admiral FREMANTLE :—It is related to tactics.

Lieutenant DEWAR :—Yes, it is very intimately related to tactics. I would not like to answer that question at all; in fact I cannot answer it. Should four ships concentrate their fire on one ship and allow themselves to be fired at by three other ships? So far as I have considered the matter, I would prefer each ship to fire at the ship which is nearest to it. You would then be expending your ammunition in the most economical fashion, for the shorter the range the more economical is the expenditure of the ammunition. If each ship fires at the ship nearest to it, I think that would probably be the best plan. If a ship was in difficulties, then I certainly think it would be an excellent plan to concentrate your fire on it, so that it would get knocked out of the water as soon as possible. In the case of a column altering course, the range of the altering course point ought to be very quickly picked up by the opposing fleet, and it would probably be a very advantageous thing to concentrate the fire on the altering course point. But there is no doubt that these things really require a great deal of practical experiment. I daresay that practical experiment is being made in our fleets, but naturally we are not going, as we may say, to "pipe" it here.

The CHAIRMAN (Vice-Admiral Sir C. Campbell) :—I simply rise for the purpose of thanking Lieutenant Dewar for the very interesting lecture he has given us this afternoon. But before I do so I would like to make one or two observations on a few of the points that have been raised. Admiral Fremantle has referred to the diagrams which Lieutenant Dewar showed us. I also suffered with him owing to the quickness with which they were shown. They were naturally extremely difficult to follow, but the general tendency of them seemed to me to show the value of speed on the fire arc. They really did illustrate the difficult subject before us. They went to show that speed is a very important factor in tactics, which, after all, is what the lecture is about. I have been dealing with the question of the concentration of fire for a great many years, frequently in this Institution. It seems to me perfectly inconceivable as a tactician or a naval officer who has studied the subject for between twenty-five and thirty years, that anybody can argue that if you can concentrate the fire of three ships on one ship at any time that you are not going to have a crushing effect upon that ship and put her out of action altogether. The principle of concentration is, to my mind, definitely fixed, and you cannot get away from it. If you can by any means in your power concentrate the fire of two or three or four ships on one, and in that way wipe out seriatim three or four of the enemy's ships, you destroy that portion of the enemy's fleet and thus reduce his power. I am entirely in favour of the concentration of a large number of ships on a smaller, as far as you can carry it out, and thus destroy the enemy piecemeal. I do not think there is any doubt in anybody's mind, who is going to fight a fleet action that he will endeavour to fight it in a single line. If

you have a preponderating force you will put the fast ships to lead the line and while you are playing with the enemy on his quarters and flank, you will direct the fast ships to do all they can to get into the T position, which is the position which all tacticians would like to obtain. There are many differences of opinion now as to how you are going to work to get ahead of your adversary at right angles to his course; but I never found anybody who did not agree that if you can get into the T position that is the finest you can possibly take up in a naval action. You require to have a certain preponderance of force, and you must have some ships with a preponderance of speed. The main body keeps a flank of the enemy's line, while the best ships cut along and try to get across his line. If they can do that you get a raking fire, which is splendid so far as its elevation is concerned, because you can bring your full power to bear on the enemy's whole length of deck from ahead, while at the same time he is getting knocked about by the main body of the fleet abeam. That is an admitted fact in tactics. Those are all the remarks I have to make upon that point, because I do not want to take up your time. Lieutenant Dewar did not actually propose this movement, but I have thought a good deal about this particular tactic, and therefore I brought it into my remarks. I fully agree with him with regard to the lamentable deficiency there is in instruction in tactics. That has been the case ever since I have been in the Service. The matter is of very great and extreme importance, and I am very pleased to say that we have now got what a great many people in this Institution and elsewhere advocated for a number of years, namely, the establishment of a College. In my time there was no such thing as the war game; there was no instruction anywhere. We had to get all our instruction on the poop of the flag-ship, and that is the only place where any instruction was ever given so far as tactics are concerned. Systematic instruction has only been started lately, but, like a young boy, it is growing fast, and we hope that with suggestions such as we have had from the lecturer to-day it will grow very much faster. The interest taken in the subject in the highest quarters will very soon grow downwards into the lower quarters, and we shall find everybody taking an interest in the subject. Then, and not till then, we shall reach the acme of perfection. You want speed and gun power and a tactician, and you want to apply that speed and gun power when the moment comes when the country's honour may be entrusted to any one of the admirals who are so able to take care of it afloat. I end by moving a vote of thanks, which I am sure you will all accord most heartily, to the lecturer for the most able, though somewhat technical, lecture he has given us to-day. I am sure we shall go away with a great deal to think about, and I hope that the result of our deliberations will be for the welfare of our country.

Admiral The Hon. Sir EDMUND FREMANTLE:—Before we separate I should like to ask you to accord a hearty vote of thanks to the Chairman for presiding to-day, which I am sure you will be glad to do. I should like to add to what I have already said that a certain number of years ago I had the honour to win the Gold Medal of the United Service Institution—in the year of our Lord 1880—a long time ago. I then took as the motto of my Essay, "*Nil sine magno vita labore dedit mortalibus*"—"Nothing is given to mortals without a great deal of work." At that time nobody seemed to think this subject required any study at all. It was said by naval men: "All you have to do is to put your ship alongside the enemy—that is what Nelson said." That was a mistake, because it was not what Nelson said. What Nelson said was: "If you do not

understand this memorandum of mine, which is of a somewhat elaborate nature, no captain can go far wrong who places himself and his ship alongside the enemy." In my early days, when I first went to sea, and before I had read this memorandum, I always heard it said: "Nelson said all you have to do is to put your ship alongside the enemy," so that you need not bother yourself about manœuvres. An officer in a high position, when speaking the other day, spoke as if it was a very simple thing to put your ship alongside the enemy. Nelson did not tell us it was very easy, and other people in Nelson's time did not do it at all. I am sure you will all join with me in according a very hearty vote of thanks to the Chairman for his interesting speech on the extremely instructive lecture we have had.