

Senior Class of 1934

# THESIS

THE INFLUENCE OF AIRCRAFT

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ON  
NAVAL STRATEGY AND TACTICS.

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Submitted by

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Room No. C-16

DEPARTMENT OF INTELLIGENCE

Naval War College

Newport, R. I.

7 May, 1934

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To venture into the realm of this subject is to undertake the part of a real explorer and to enter an uncharted area of naval literary domain. An investigation of libraries and archives indicates that, while a few venturesome spirits have started out into that intriguing wilderness, they have without exception turned back before progressing any considerable distance beyond the beaten path. The reason is, basically, that air power is so new and is developing so rapidly that any consideration of its effect upon strategy and tactics is necessarily speculative. The past affords little guidance for the future. History abounds with records of naval wars and innumerable naval engagements, and libraries are plentifully stocked with studies of those wars and the conclusions of many eminent students of naval warfare, such conclusions being based upon accepted principles and previous lessons, augmented by, in most cases, a short and speculative journey into the future. It might be said that a historical curve has been plotted, progressively up through the ages, introducing the new elements as they appear. Successively, as History definitely establishes a further point in the curve, the earlier projection to the future is modified to pass through that point, and from the general trend, a slight projection beyond is made, to remain until subsequent History furnished the data upon which to establish another point.

To day, there are many differences of opinion as to how the projection into the future should trend. The principal causes of those differences are the introduction

of aircraft into Navies, and the almost complete lack of war experience with this new arm, coupled with a wide divergence of opinion as to the possible development in the construction and use of that arm. There is nothing really unique about that situation. History is replete with similar instances. A fairly modern one was upon the introduction of the torpedo boat. One author says: "People were intoxicated when they saw little vessels that cost scarcely a few hundred thousands of francs carry with them sufficient power to sink an ironclad, costing thirty millions." (1) Many eminent naval authorities advocated the abandonment of large armored ships, they failed to appreciate that the torpedo boat was a "special cases" ship, not particularly seaworthy, necessarily of short radius of action, able to attack with any probability of success only under cover of darkness or thick weather, and due to the nature of attack and the inaccuracy of the torpedoes, requiring a considerable number of torpedo boats to afford expectation of success. Counter measures of a defensive nature naturally developed, and reduced the torpedo boat almost to a state of impotency. Another case of the recent past is the introduction of the submarine. The earlier ideas as to its revolutionary effect have been very much modified in the light of recent experience, especially as relates to its use against vessels with armament. To attack such a vessel, it must operate submerged; its submerged speed is necessarily slow, and its radius of action while submerged is short. That it became a dangerous weapon against merchant vessels during the World War is not denied, but most of its victims were slow vessels without armament. The current trend in merchant vessels is distinctly towards increased speed, beyond the possible submarine submerged speed, and there is every reason to

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expect that in the future, all important merchant vessels will be given adequate armament to repel a submarine operating on the surface.

Without quoting further instances to support the opinion, it is submitted that History shows in practically every case that the anticipated value of the new development - be it material itself or in the new use of that material - has far exceeded the results of actual practice. There are some exceptions, but the vast preponderance of the evidence supports the opinion.

Therefore, it is believed that, in the case of aircraft, one should in the beginning of his study definitely eliminate from his mind the idea that aircraft will revolutionize naval warfare, make a thorough exploration of the subject, then and only then, with the subject silhouetted against the back drop curtain of History, determine if the new species is different, wherein those differences lie, and what is their significance.

Before starting upon our exploration, perhaps it would be well to define Strategy and Tactics, to establish their relationship and to determine upon what they rest. Naval Strategy is defined by one authority as " the proper use of means to attain ends ". Evidently, " means " is (2) intended to include all the facilities at the disposal of the Navy. Those facilities are determined by Naval Policy; obviously therefore we should have a Navy commensurate with our National Policy, or else a National Policy commensurate with our Navy. By " ends " is meant the objective of Naval Strategy, designed to support the National Policy. The lines to be followed by Naval Strategy would be comparatively clear if we had a Navy adequate to support the Policy; unfortunately, however, we have not. A study of our National

Policy indicates clearly that its support demands a Navy adequate to take the offensive far from our shores. At one time, such a Naval Policy existed, and such a Navy was in sight. However, with what now appears to have been the false hope of promoting world peace, and in what was then believed to be the interests of economy, a new Naval Policy was embarked upon. The basis of that policy was relative strength of the floating Navies. It was not accompanied by any real adjustment of relative strength of foreign policies. We have emerged from a series of conferences and consequent treaties with a greatly reduced Navy. In other words, our "means", under treaty limitations, are now inadequate to attain the ends. This fact must be recognized in any planning or discussing of Naval Strategy, and should be impressed most emphatically upon those of our Government who are responsible for the conduct of our foreign relations. Since both the National Policy and the Naval Policy presumably are shaped to represent the will of the people, it is evident that they - the people - must be brought to a realization of the situation if the danger is to be removed.

There is one matter in connection with "means" over which the Navy can exercise some control. Within the tonnage limits prescribed by treaty, some latitude in detailed uses of that tonnage is permitted. It is reasonable to assume that Congress will lend an attentive ear to the recommendation of the Navy on the subject, and the Navy should be sure that the types of ships selected are such as to promise to add the greatest possible strength to the Fleet.

Naval tactics may be defined as the technique of the use of Naval Forces in battle. Obviously, Strategy and Tactics must support each other; a study of one must be accompanied by a study of the other; each influences the other, each is subject to changes due to various changing influences. To quote a well-known writer: "The principles of

War are immutable,... methods of application of principles vary constantly/. . . Surely, if experience is any guide, the one thing that is reasonably certain is that if another great struggle between great powers take place, it will produce as many surprises as did the last one. The one safe conclusion to draw from the lessons of History is that those who may have to make war must prepare their minds to deal with the unexpected.. " (3) We do not know how wide the field of the unexpected may be, but forewarned as we are to aircraft, we would be foolish indeed not to scrutinize carefully the present situation, speculate, perhaps rather extravagantly, for safety's sake, upon what the future may have in store, then consider what revisions are necessary to safeguard the future.

A complete investigation of the influence of aircraft upon Naval Strategy would consist of considerations of the influence in general terms upon each of the principles of war, followed by consideration of the extent to which these influences should affect the strategy of the several world powers. Such a study would be so lengthy and so complicated as to defeat the purpose of this paper. Further, although it was intended, when this study was undertaken, to keep separate the discussion of influence on Strategy from that upon Tactics, it soon developed that due to the fact that the division line between those subjects is never a sharp one, the introduction of such rapidly moving element as aircraft completely shattered that line. Therefore, this study covers the broader aspects applicable to all countries, with specific consideration of the influence on our own country, and makes little attempt to separate Strategy from Tactics, but brings special emphasis upon those points which, in the opinion of the writer, have not in the past received sufficient attention.

It has been stated previously that there has been little naval war experience with aircraft. During the World War, they were introduced in considerable numbers by both sides, but most of the aircraft were shore based and all had very limited radius, rather low speed and possessed little offensive power. Since the War all powers, and to a marked degree, the three major naval powers, have built up the naval air arm. Carriers have been introduced, battleships have been equipped with aircraft for spotting, cruisers with aircraft for scouting, and large units of heavy shore based patrol and bombing seaplanes have been established at localities of strategical importance. There does not appear to have been much in the way of study and plans upon which this very considerable increase of the navies was begun. It might almost have been termed a fad. Those officers associated with aircraft were convinced of the potentialities of air power. The public were intensely enthusiastic, wishfully thinking that a new and cheap replacement of the costly fighting ships was in sight. The high commands were skeptical, and begrudged the money spent for carriers and aircraft as money which might better be spent for more battleships or cruisers. The fact, however, that other navies were taking up aircraft was a sufficient influence, in most cases to obtain their acquiescence. In brief, within a comparatively short period, the three major navies found themselves with naval air forces of considerable sizes. Apparently then and only then did officers of our Navy, outside of those of the new arm begin to study seriously the effect of the new weapon. The reason for this was due largely to the primitive state of development of Naval aircraft themselves, coupled with inadequate facilities on carriers and other ships for handling them. The general introduction of the catapult solved in a satisfactory manner the problem, for battleships and cruisers.

The simplification of arresting gear on carriers, and practical experience in the use of those ships speeded up the operation of the planes to a point where large numbers could be put into the air or landed on board in a very short space of time, thus giving carriers with their aircraft a real offensive-defensive value to the Fleet. During the period of this development, the military qualities of aircraft were constantly and rapidly improving.

It may be said that a situation had then been arrived at, where the high command realized that they had a new arm of the Fleet, which was undoubtedly useful, and forthwith, they investigated step by step, to determine just how it could be used most effectively. As this investigation proceeded, interesting and important discoveries were made as to the effect of the new arm upon both Strategy and Tactics, not only with regard to its own direct use, but also with regard to its effects upon the use of other elements of the Fleet. The idea that aircraft would merely supplement those elements soon had to be abandoned, and a modification of the then accepted method of strategical and tactical employment of all forces began. That modification has been proceeding rapidly. It is not yet complete, nor will it ever be complete, for History has shown us that Naval Strategy and Tactics are never in a static state. It will slow down only when aircraft developments slow down, and when our and the two major naval fleets have been built up to the total allowable tonnage, equipped with aircraft to the maximum capacity, and have become experienced in the employment of the new Fleet. Some of the changes yet to come are obvious, some can be predicted with a fair degree of accuracy; undoubtedly there will be others which cannot at the present time be more than an interesting subject for speculation.

What changes have already taken place ?. About



this, there are undoubtedly certain differences of opinion. While the changes are factual, the reasons therefor may in some cases be attributed to different causes by different people. So far as can be ascertained, no one has yet attempted to array all the facts; therefore it is believed that the attempt on the part of the writer may serve some useful purpose by drawing out the opinions of any who spare the time to read this paper and whose ideas are not in accord with those therein expressed.

Many of the changes both in Strategy and in Tactics have been basic. The changes in Tactics have been more prompt, probably because the lessons in tactics are usually more obvious, and the authority for changing tactical methods rests with the Commander-in-Chief. Lessons in Strategy are hard to learn; there are few opportunities to engage in their practical study. Above all, Strategy is based largely upon Policy, and those responsible for Policy may or may not have an intimate knowledge of Strategy.

As to the changes in Strategy which have taken place, similar changes have taken place in foreign Navies. In other words, not only have we new weapons to use, but also we have new weapons to oppose. Shore based aircraft must not be overlooked, for their effect on both Strategy and Tactics has been pronounced. It has been said that the advent of the submarine and mine forced the abandonment of any further close blockade; the advent of large shore based aircraft has forced the abandonment on any real blockade of an enemy equipped with such aircraft. In fact, it can be said that the advent of large patrol aircraft has extended the area under control of a country to a distance seaward from its shores equal to one half the radius of such planes when armed. This does not mean absolute control, but it does mean control to an extent that hostile vessels enter that area with

considerable risk of loss or of heavy damage. The radius of patrol planes of to day, when loaded with one thousand pounds of bombs, is approximately fourteen hundred miles, therefore this danger zone extends out seven hundred miles from the coast or from island possessions. If one takes a chart of the PACIFIC OCEAN and hatches in such areas for the two principal powers in that Ocean, it will be seen that the area of what might be called " free water " has been vastly reduced.

The generally accepted object of Naval Strategy is to gain and maintain control of the sea. There may be qualifying phrases, such as " in the vital area ", or " in the theatre of operations ", etc. The purposes of gaining and maintaining control are: to stop enemy trade while your own trade has freedom of movement, to deny overseas operations to the enemy, and be able to conduct them yourselves. It has been considered heretofore that adequate control could be obtained by destroying or containing the main forces of the enemy. No longer is this the case, unless we include as part of the " main forces ", shore based aircraft. As long as those aircraft are in being in quantity, the enemy is in a strong position to dispute the control of any sea within striking distance of the aircraft, and destruction of the shore based aircraft is most difficult to accomplish. It is generally conceded that it can only be done by aircraft, but how are they to be brought into action ? Ships based aircraft are necessarily of much shorter range, because they must be fairly small to be handled from ships, therefore to oppose shore based aircraft operations by ship based aircraft, the ships themselves must venture well into the danger area, an operation fraught with peril to the ships, and one only to be undertaken when you have such an

overwhelming superiority in carriers and flight deck cruisers, compared to the enemy fleet, that you can afford to risk heavy losses without fear of losing superiority, a position that no large Navy holds to day over any other Navy of large size.

To use shore based aircraft of your own, you must have a base within the danger area. Admitting that such a base could be seized, it is doubtful if it could be retained, for it would offer a single target against which the enemy from several different positions could launch separated bombing attacks. Just as this situation begins to appear rather gloomy, be reminded that neither can the enemy venture into waters within striking distance of your shore based aircraft operating from your shores, nor could he if he seized an outlying island possession from which to operate retain his base in that island. In other words, what has been lost in an offensive way has been gained in a defensive way. Who will be the gainer finally depends upon the kind of war to be fought.

Now to consider the influence of aircraft in the sea going Fleet. These aircraft can be divided into four classes:

(1) those on battleships, (2) those on cruisers, (3) those on carriers, (4) airships.

The changes caused by aircraft on battleships are almost entirely tactical changes. These aircraft are used solely for spotting gunfire. Their use for this purpose has greatly increased the effective range of gunfire. This necessitates an earlier deployment, which in turn necessitates flexible approach dispositions and deployment evolutions, all of which are points recognized; but what is not so generally appreciated is that the difficulties of the light forces and submarines have been greatly increased, because usually approach dispositions are maintained for a

shorter time, and frequently the light forces and submarines have not attained approach positions before deployment is ordered; consequently it becomes difficult if not impossible for some of them to reach their proper battle disposition stations before the engagement is joined. Effective long range fire made possible by plane spotting has necessitated modernization of capital ships. Guns have had their angle of elevation increased in order to attain the long range and decks have received increased armor to keep out the resulting plunging fire.

Cruiser aircraft have a dual mission: scouting, and spotting gun fire. The first mission is primary. It must be appreciated that the effectiveness of aircraft scouting varies roughly as the square of the range of visibility. Generally speaking, its effects are to increase the area covered by scouting. It also affords protection to the scouting surface vessels, in that it assures detection of enemy forces in time to enable scouting vessels to concentrate, or to fall back for support. This does not apply, however, if enemy forces include carriers, but that will be discussed later. Since the theatre of operations cannot be predicted, and weather is most variable in different parts of the world and in different seasons, one would be guilty of a grave error in assuming that the advent of cruiser aircraft warrants a complete reestimate as to cruisers requirements. In good weather, aircraft render cruisers much more effective, they can cover the same area more effectively with aircraft than without, or they can cover a larger area, but a campaign plan must provide for the eventuality of bad weather and poor visibility.

Aircraft are of great assistance to cruisers on missions of trade interference in that a single cruiser, by the use of aircraft, can so extend its field of vision. The aircraft, by flying low, can to a certain extent determine the character of the vessel located and it is not unreasonable to

assume that, by dropping a bomb or firing a machine gun into the water close aboard, the average merchantmen can be brought to a stop to await the arrival of the cruiser.

Cruiser aircraft provide an effective means of making a reconnaissance of some isolated position, such as harbors in isolated islands. The cruiser can lie off over the horizon, and send its aircraft for observation and photography. If there is no enemy overseas patrol, the cruiser is reasonably secure, except where reconnaissance plane is detected and followed by hostile bombing aircraft.

Cruisers on escort duty are greatly assisted by aircraft. The approach of an enemy surface vessel or submarine can be detected earlier, and submarines once detected can be kept down during daylight, unless they elect to expose themselves to grave risk of damage from light bombs and machine gun attacks.

To summarize, cruiser aircraft have not changed the normally accepted missions of cruisers, they have increased the efficiency of the cruisers in performing those missions.

We now come to the discussion of aircraft carriers and their aircraft. This is a most complex subject, and one which neither from a strategical nor a tactical point of view has been sufficiently explored to warrant many definite conclusions. Carriers are a new breed, entirely untested in war. Our Navy, at present, has but two first class carriers, an insufficient number with which to advance beyond the most elementary stages in the development of their strategical and tactical value. In Fleet problems, they are usually assigned one to each side, and their security immediately becomes a matter of paramount importance to each Commander-in-Chief; also the destruction of the opposing

carrier is almost invariably the primary mission of each force. The same tendencies have been observed in the War College games, although larger number of carriers are used. This tendency can be attributed largely to the rules under which the games are played, rules which, in the opinion of the writer, overemphasize the vulnerability of carriers to bombing attack, in comparison with other combatant vessels.

Despite the limited number of carriers in the Fleet, their use during the past four years together with an appreciation of the fact that the other naval powers also have carriers, have exerted a very considerable influence on both Strategy and Tactics. Some modifications in conceptions and doctrines have been made, some deemed most important by many, have not yet been made.

The carrier is a powerful offensive unit. Like the heavy cruiser, it is weak defensively, but unlike the heavy cruiser, its offensive power can be applied against heavy ships. Its missions can and should be varied, dependent upon the character of the operations, but in the final battle, its primary mission should be support of the battle line.

Let us now consider some of the missions of the carrier, and study their effects. First consider distant scouting. It developed many years ago that cruisers alone could not develop contacts if such development was opposed vigorously, and the battle cruiser was brought upon the scene. The battle cruiser was given sufficient gun power and protection to be able to break through, and sufficient speed to escape from battleships. Naturally, battle cruisers were then built to oppose other battle cruisers, and more or less of a stalemate was the inevitable result, provided forces were approximately equal. Then came the carrier, simultaneously with the Heavy cruiser. The carrier was the logical, though at the time the unrealized successor to the battle cruiser.

The heavy cruiser, it might be said at this point, was a type developed for the sole reason that it appeared the most effective vessel which could be constructed under the restriction limits of the Washington treaty. It was frankly a fad design, which will be discussed later, in connection with carriers and flight deck cruisers. The distant scouting line is normally composed of cruisers with destroyers interspersed. Actually, present type destroyers are too short of radius for distant scouting. Unless the line is backed up by aircraft carriers, contact with an enemy advance force including even only one carrier is almost certain to result in failure to develop, and in heavy losses along the scouting line, for the enemy carrier, secure behind its line of cruisers, can attack in succession all vessels attempting to maintain contact, and open up a wide gap in the line. This has been proved innumerable times in games and Fleet problems.

Next, let us consider close scouting, or picket patrol. Before the advent of carriers, this was done principally by submarines. The earlier submarines were slow, and a larger faster type was built, but the fastest have a maximum speed less than that of the battle line. They require a long time to gain position, and any change of axis of formation so displaces them that a long time is required again to get them to their new position. The carrier has supplied means of close scouting during daylight. In addition it has supplied an anti-submarine patrol which in all but really bad weather is most effective. No longer can submarines trail a force if that force includes a carrier. A submarine, when sighted, is forced to submerge, and a close air patrol will either keep it submerged or sink it. Air patrol is utterly ineffective during darkness, but a submarine, if kept down all day, will have lost contact by nightfall.

Next, consider a special operation, namely raiding, say upon an enemy coast or upon some outlying base. If enemy shore based aircraft are in the general vicinity of the area to be raided, the operation is hazardous under any circumstances. For vessels to go in to where their guns can range the shore is to court almost certain destruction. Aircraft carriers can deliver attack from a distance dependent upon the range of their aircraft. We can be sure this range is less than that of shore based aircraft, but a certain amount of security is possible of attainment by surprise and evasion. Surprise can be effected by remaining beyond the probable scouting range from shore, until darkness, then by dashing in at full speed and launching the aircraft in time to reach their objective at daylight. If the objective is isolated, as for instance on a small island, the enemy offensive aircraft is probably possible to locate and destroy before they can take the air. It may be assumed that, if there is a considerable land area about the objective, the defending aircraft will be concealed insofar as possible. If defending aircraft are not destroyed, they will follow the attack group back to their carrier. Now, if the attack has been made by several carriers or groups of carriers, widely dispersed, the counter attack can hardly fall upon all or if it does the enemy will have made such a dispersal of forces that it will lack sufficient strength in any one group to be effective.

Another way of securing surprise is to make a wave attack, each wave going in from widely separated positions. This form of attack offers prospects of success if the assumption upon which it is based - that the enemy when attacked will launch the full strength of his counter attack against the carrier or carriers from which came the first wave - is correct. A second wave can then be launched



from a different position, deliver its attack, and no counter attack air forces will be available to follow it back to its carriers. Aircraft are single shot weapons, requiring an appreciable time to reload.

Another form of carrier attack against shore objective is the late afternoon attack. If the carrier can approach undetected to within range, and so time its attack that its aircraft return and land just before darkness, it can escape under cover of darkness if the carrier aircraft have a sufficient superiority of speed over the shore based aircraft to make up for the interval of time required to land them back aboard. Aircraft cannot be recovered by a carrier at night without the carrier showing lights, and there seems little probability of this difficulty being overcome. It should be understood that in such raids as described above, loss or serious damage to one or more carriers is probable, and the value of the raid must be great to warrant such loss or damage.

Another special type of operation for the carrier is protection of convoy. Here, it does not displace over other types of vessels, but augments them, particularly in an offensive way. It not only can exercise an extensive daylight patrol, but can strike at any hostile craft located. Menacing forces can be destroyed or materially reduced before they can close to gun range, except of course during darkness, when it is possible for them to close. However, if all trailing forces are destroyed or driven off before darkness, the convoy by a change of course at darkness should be able to escape a daylight contact.

We next come to the use of the carrier with the Fleet prior to and during a major engagement. The cruisers of the advanced scouting line or screen would normally be using aircraft to scout to cover the advance.

If, however, due to roughness of sea or to such extreme submarine menace as to render hazardous the stopping of cruisers to recover planes, the cruiser planes cannot be used, the scouting would be taken over by carrier scouts. The normal mission of carrier scouts is to locate and maintain contact with the force against which the carrier offensive planes are to strike. As has been said before, under current practice, this force is usually the enemy carriers, which probably are widely separated from the main body. The range of carrier offensive aircraft is too limited for them to be launched until at least the general position of the objective has been ascertained. It is highly desirable, in order to attain surprise to locate and attack the enemy carriers before they are aware of the near presence of opposition in force. Such surprise should result in considerable reduction in the enemy strength. The probable early contacts by means of airscouting require that the Commander-in-Chief make tactical decisions and dispositions much earlier. If he decided to force an engagement, he may be able by air attack upon important vessels to slow down the enemy Fleet speed. On the other hand, if he finds he is encountering a superior force and desires to avoid an engagement, he may suffer damage himself, and either be slowed down or compelled to abandon the crippled units. In other words, aircraft have made it much more difficult for opposing forces to avoid engagement once any kind of contact has been made.

Aircraft carriers, in the general engagement have the task of supporting and defending the battle line. If enemy carriers are about, the strongest support is undoubtedly to render those carriers incapable of delivering an attack. This is best done by bombing attack. If the planes from the carriers have been launched before the carriers are bombed, the carriers' usefulness as a refueling

and rearming base is destroyed. Their planes may be able to return to and re-arm from other carriers not damaged, but the closer carriers are to each other, the more liable they are to wholesale bombing, and the more they are separated, the greater the difficulties of supporting each other in re-fueling and re-arming services. This brings up the question as to the best disposition of carriers in the approach and in the engagement. Experience to date indicates that they should be well beyond sight range of an airplane observer over or near the main body, and well beyond such sight range from each other, and well out of the sea area between the two Fleets.

Exact positions would be affected by:

(1) the number of carriers, (2) the visibility, (3) the enemy carrier strength, (4) the forces available for defense of carriers from enemy light forces.

The carrier is powerful in offense and weak in defense. Its defense is by evasion, using its high speed as necessary to accomplish this. If carriers of both sides take extreme positions on the respective disengaged sides of the main bodies, we have a situation where offensive carriers cannot reach other to attack. Under such circumstances, the enemy battle line should be the target; under other circumstances, it may be the target. While the advantages of coordinated attack of light forces and aircraft are recognized, such coordination is costly in time and difficult to effect, and the doctrine of aircraft attack should be: "as early as possible, and as often as possible," coordinating the attack between aircraft units only.

Nothing has been said so far about air defense against air attack. This is a difficult matter. A superior fighting force must be interposed between the approaching aircraft and the target being defended, and this interposition

must be a sufficient distance from the target to allow time for a decisive air engagement. Considering the speed of approach of the enemy, and the three dimensional aspects of the situation, it seems - and practice has proved - that it is impossible to stop an attack unless vastly superior numbers of aircraft are available for defense purposes. The picture of a few fighting squadrons overhead, warding off a bombing attack in strength, and supported by protective fighters is an illusion. The strength of the attack may be reduced, but the attack cannot be stopped. It is not to be inferred from this that fighters are regarded as useless. They afford protection to their own bombers by escorting them to their targets, and by reducing anti-aircraft fire by a dive bombing and machine gun attack, just ahead of the bombers. They also afford some protection to their own surface vessels against enemy aircraft. In addition, they have a field of usefulness not generally realized, and that is opposing enemy light forces attacks by making machine gun attacks against the approaching light forces, a form of opposition which, if realistic experiments are any criterion, is going to have a most disorganizing influence on such light force attacks.

There is a special use for carriers which has not yet been mentioned, and that is: furnishing relief spotting aircraft for the battle line, refueling battle line aircraft and providing aircraft for tactical scouting and tactical smoking. These should comprise the tasks of one carrier, which it appears must necessarily operate under the cover of the battle line. The requirements do not demand a large carrier, nor do they demand the high speed required for offensive carriers.

The introduction of aircraft smoke-laying has had too great an influence upon tactics not to be discussed

in some detail. The uses are several. It may be used to cover a part of the enemy battle line in order to effect a concentration upon the remainder. It may be used to cover one's own movements, such as closing through an unfavorable range head, or opening range. It may be used to cover a destroyer or aircraft approach for torpedo attack. It is of no use, however to screen vessels against bombing attack. In the present organization, battle line carriers do not carry smokers. In order first that the full strength of offensive carriers be available for offensive use, and secondly that smokers be under direct control of the officer in Tactical Command of the Main Body, smoke laying should be provided by battle line carriers. In the opinion of the writer, they are of more value defensively than the squadron of fighters, and if there is no room for them in addition to the fighters, the fighters should be eliminated from the complement of the battle line carrier.

A few remarks should be made about tactical scouting. An observer in an airplane, under anything but low visibility, has a splendid picture of the dispositions of forces below and around him. He has the means of proceeding rapidly over the entire area. A Commander-in-Chief, about to enter into engagement, would be foolish indeed if he did not have in an airplane over the area of engagement a tactical officer to keep him advised constantly as to the dispositions and apparent intentions of the enemy. Smoke of the engagement would interfere very little; the chances of the observer plane being shot down are remote.

Airships were one type of aircraft which were used quite extensively in conjunction with other Naval forces during the World War. The German Naval air arm had a considerable number of rigid airships. During the first two years of the war, these airships were used principally for bombing raids on England and central France; while the bomb of the

airships was not large, the raids did considerable damage, principally through fires produced by the thermit bombs and the indirect effect caused by turning out all lights and the consequent stoppage of all manufacture and transportation in the whole areas near which the airships were believed to be, was very great indeed. Some German airships were used from the beginning for scouting over the North Sea and this use was increased as the War went on. No very great results were achieved, but it must be borne in mind that the North Sea area is one in which bad weather and low visibility are frequently encountered, and the development of airships had not then progressed very far.

Smaller airships of the now rigid type were used extensively by the French, British and later by ourselves for off shore anti-submarine patrol. Their speed was low and their endurance small, but in spite of these handicaps, they proved of considerable value especially in such restricted areas as the Dover Straits and the Thames estuary. Towards the end of the War, large patrol planes came into general use, with an endurance greater than that of the small airships, a much higher speed and the ability to carry offensive armament, and they were rapidly replacing the small airships when the War ended.

As for to day, it is certain that the small airship has no place in the Navy. All its functions can be performed by the patrol plane in a quicker, more efficient and more economical manner. Regarding the large airship, there are widely divergent opinions. The use of helium has greatly reduced their vulnerability. Greater size has given greater radius and permits the carrying of a small number of airplanes of the fighter type, and a defensive armament. They could carry bombs as an alternative load. Rigid airships are expensive to build and require expensive ground establishments. However, the same can be said of

ships, and perhaps if the usefulness of airships to the Navy were definitely established, the items of their expense would not be viewed so critically. Tests of their usefulness to the Fleet have been hopelessly handicapped by their lack of numbers. For only brief intervals have we ever had more than one in commission at a time. With only one ship, is it any wonder that those who might be blamed for its loss or damage hesitate to risk it in extensive operations? Yet, it is only by such operations that the question of its usefulness can be settled. That usefulness seems to be limited to overseas scouting in areas where enemy aircraft forces are not expected to be encountered, for despite the fact that hydrogen has been eliminated, the airship is still vulnerable, and a few hits with small bombs will cripple if not wreck it.

In concluding the discussion of the airship as a general class, it can be said that, at present, it exercises no influence on Naval Strategy and Tactics. Future developments may change this, but such developments are at present too speculative to warrant discussion.

Discussion of the subject of influence of aircraft would not be complete without some discussion of defenses aboard vessels against aircraft attack. The sea attacks may be of three kinds: light strafing, torpedo, and high altitude and dive bombing. The strength of the defence varies roughly directly with the size of the ships, from destroyers with no armor protection ever against machine-gun bullets and no anti-aircraft guns, and little internal compartmentation, to battleships with deck armor believed sufficient to keep out the heaviest bombs, a heavy battery of anti-aircraft medium calibre and machine guns, and extensive internal compartmentation. The effectiveness of defense by evasion manoeuvres varies inversely as the size of ships.

Light strafing consisting of a fighting plane diving attack with light bombs and machine guns, is effective against all exposed personnel and against material of light ships. It is believed to be a particularly effective means of reducing anti-aircraft fire, and is normally made while heavy bombing or torpedo planes are making their approach. The medium calibre anti-aircraft batteries are of little value in opposing such an attack. The very nature of the attack precludes effective use of those weapons. The first warning of the attack is usually the appearance of the first plane, close over the ship. There is immediately a multiplicity of fast moving targets approaching from different directions, all delivering or about to deliver a bombing and machine-gun fire. There is no time for ranging or designation of targets, and individual fire is about the best that can be hoped for, with a very few shots for each gun. Machine gun fire must likewise be individual. It offers better prospects than medium calibre fire, but to be really effective there must be many more such guns than are now on board even the largest ships, and all these guns so mounted as to have a wide range of fire. This would require considerable modification in the present structural arrangements.

Defense against torpedo aircraft attack does not appear quite so gloomy. The torpedo, because of its length, requires a large plane to carry it approximately under the center of gravity of the plane. (\* See footnote.) This large plane is comparatively slow and offers a large target. Also

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\* (Note) : All droppable or usable loads on air planes must be located somewhere close to the perpendicular through the center of gravity of the plane, in order that the plane may be in approximate balance with or without the load.



the torpedo as constructed at present cannot withstand the shock of striking the water at high speed, or except when dropped from a very low altitude, consequently the present type of torpedo plane approach is rather slow, close to the water, and offers a big target when not behind a smoke curtain. The three dimensional difficulty of anti-aircraft fire is absent. But do not let us be lulled into too great a sense of security about defense against aircraft torpedo attack. A torpedo of at least the same explosive capacity yet shorter and capable of withstanding high speed drops from considerable altitude can, and will be produced. The method of attack will then be quite different and defense against it will offer most of the difficulties now present in defense against strafing and dive bombing attack. The reduction in size of torpedo planes will permit more of them to be carried on carriers.

Since the tactics of heavy dive bombing are identical with those of strafing, the difficulties of defense are the same. Defense against high altitude bombing attack appears to have made considerable progress. A single formation attack unsupported by an advance strafing attack may suffer severely from five-inch anti-aircraft fire. A multiple wave attack would be very difficult to break up, as the batteries firing on the leading wave would have little if any time to establish fire on the second wave. Radical change of course provides an effective defense if made at the right time and if the tactical situation permits such a change. But here again as in defense against torpedo attack, there should be a caution against a feeling of much security. Present naval high altitude bombers are dual purpose aircraft, they are designed for use either as a bomber <sup>or</sup> a torpedo plane. In addition to the compromise in design caused by the present type of torpedo, there is the further and absolutely unnecessary handicap of every

plane being designed to carry the very large and very heavy bombsight. The merit of salvo bombing has been established just as definitely as the merit of salvo gun fire, hence only one bombsight is essential for each bombing group. The near future will see each bombing flight led by a small sized plane with sight and no bomb, followed by other fast small sized dive bombing planes with thousand pounds bombs and no bombsight. Such formation will offer a much smaller target, will move at much higher speed and will be a double threat in that, at any time, the form of attack can be shifted to dive bombing if desired.

#### SUMMARY

Neither the development of aircraft themselves nor the exploitation of their uses in Naval Warfare have yet reached a point from which the future trend can be predicted with confidence. However, we can and should assure ourselves that our equipment, organization, plans and practices are modernized not only to meet the development to date, but also to anticipate the future insofar as practicable.

The number and character of the ships we may have is limited by treaty; within the treaty limitations, however, we have some latitude. For instance the remaining cruisers we may build may be normal six-inch cruisers, or they may be flight deck cruisers. It has already been stated - and general naval opinion seems to support the statement - that our Navy is inadequate to support the National Policy. The six-inch cruiser, under almost all conditions of modern naval warfare, is a defensive type. Would it not add very substantially to the offensive strength of the Fleet if flight deck cruisers were built instead?

Anti-aircraft defensive measures are far behind aircraft attack. This applies particularly to light

vessels. Improvements are difficult and expensive but should be undertaken immediately, lest the usefulness of those vessels be destroyed before they can strike a blow in battle.

Shore establishments, particularly outlying bases should be modernized to best meet the requirements of new conditions. Extensive rifle ranges, of doubtful utility, should be converted into flying fields, as such fields are essential for defense of the base and for use of carrier planes when at the base.

Ships which will operate together in war should practice together in peace. Heavy cruisers require carrier support, and carriers require heavy cruisers support. Type organization should give way to task organization. Team training is essential if good team work is to be attained.

No doubt, it is apparent to most students of naval warfare that the introduction of aircraft has affected Strategy tremendously. He who overlooks this fact in his plans courts disaster. The entire action of naval warfare has speeded up; there is less security, more surprise. Engagements develop more rapidly and are much more difficult to break off. Strategic areas, in terms of movement, have shrunk; outlying islands have renewed importance, the value of their possession is enhanced. He who plans a naval campaign must, now more than ever, be prepared to deal with the unexpected.

#### CONCLUSIONS.

The introduction of aircraft in naval warfare has not changed the principles of such warfare; it has however given different relative weights to those principles, and likewise changed relatively the efforts required to achieve them. It has made naval warfare, already a complex and

uncertain art, even more complex and decidedly more uncertain.

All Navies have introduced aircraft simultaneously. At first glance, one might say: "No nation has gained." But is such the case? A distinguished writer on naval warfare has said: "Whosoever writes on Strategy and Tactics ought not in his theories to neglect the point of view of his own people." (5) He might well have worded his statement: " ..point of view and peculiar qualifications of his own people." The English dominance of the sea throughout the past several centuries can be attributed largely to the fact that the English were and are a sea-going nation, experienced in building and in fighting ships. The American nation is rapidly becoming an air-going nation, excelling in building and in flying aircraft. Furthermore, aircraft warfare is individualistic, no other part of the Fleet is broken down into such small units. Blind obedience and fatalism, characteristic of certain foreign peoples, while possibly elements of strength in mass warfare on land or on sea have no place in the air.

It would seem that the American people by their national characteristics are particularly adapted to air warfare, and that the more we can carry naval warfare into the air, the greater the advantage to us. Should we not, therefore, shape our plans towards these ends ?..

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