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ASSAULT TRAINING CENTER
CONFERENCE
HQ. ETOUSA

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SIGNAL COMMUNICATIONS FOR A LANDING ASSAULT.

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The communications of amphibious operations are much more complicated than those of land operations as most of the things are that we have been discussing.

The element of water introduces into the situation new wrinkles that you have not had to conjure with before. The resultant planning to make sure that nothing is left undone is a very deep and intricate subject. I first got mixed up in the game two years ago, along with General Cota when the 1st Division was doing landing operations with the 1st Marine Division in North Carolina. We accepted FTP 167 word for word as our doctrine at the outset. That document still stands although in process of revision, and we found some things about it which did not seem to work so well. Since that time we have tried to find the answer for those situations. The thoughts that I shall present here this morning are what those of us who have been consistently engaged in this business for two years now I think, and we believe that we are in a position to know at least as well as anyone else whether or not what we are doing is workable.

My present job is with the Amphibious Force Atlantic Fleet at Norfolk. The set-up in the States is not quite as happy as it is over here, where there is definitely a Combined Operations Headquarters, the Chief of which has an equal seat in the War Council, as I understand it, with the head of the Admiralty and the head of the War Ministry. That is not so in our country. I wish it were as it would be much easier on the people engaged on amphibious matters. At present in the States amphibious affairs come under the Joint Chiefs of Staff, thence subdivided, the Pacific Fleet and the Atlantic Fleet. There is not too much interchange of information between those two organizations at present. The Amphibious Force Atlantic Fleet is made up of Army and Navy; the Amphibious Force Pacific Fleet, Marine Corps and Navy. There is little liaison between the two, although Washington is endeavouring to achieve a closer relationship and get out a joint doctrine. In March, before coming over here, I sat in Washington for some two and a half weeks, or more, with representatives of the Navy Department, Marine Corps and Air Forces representatives from every office affected, to whittle out a joint US Air Amphibian Doctrine. That was brought out and, as I understand it, has pretty much complete approval on our side. I was then a member of a Committee of six officers that came over here in March to work for six weeks with Combined Operations Headquarters to marry up our document with their joint document, and to get out of those two documents the maximum number of completely agreeable points. On those points where we saw it was not necessary to agree in detail, nor possible, we tried to place in the Combined document the necessary information

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so that either service can know of the way the other operates; in particular, a set of diagrams, maps, organizations and teams. We took the result back to Washington and that document has had the complete approval of the British office, I understand and, so far as I know, it does on the U.S.side.

I mention all that just to lay the ground work for what I go on to say, and so that you will be aware of the fact that we have liaison with the British on the matter - we worked closely with them on it.

When we come to plan for any amphibious training exercises and operations, leading up to operations, of course, one of the first things that comes to our attention is where and in what sort of an installation the various headquarters are to be located. The British early used combatant ships for command and control, including the Madagascar landing, the Vaagso raid, and certain others. It was always found that their command ship, or headquarters ship, eventually found itself embroiled in a hot gunfight and communications for the time being went by the board. A year and a half ago roughly they came around to considering fitting out a non-combatant ship as a headquarters ship, installing the necessary radio sets, putting on a permanent complement to handle these communications of the headquarters. Just about a year ago now, the first of those ships, the H.M.S."Bulolo" was finished, a complement put aboard for training. This ship and another, the H.M.S."Largs", were actually used in the Mediterranean for the landings. We were rather slow in the United States on this thing. I wrote a report a year ago on this British headquarters ship, giving the reasons for and against, and describing the installation. When General Somervell was over here, I took his assistant out to see it, General Gross. General Chaney saw it and also General Olmstead, the Chief Signal Officer. But those ideas develop slowly of course, and it was actually December before the Navy Department got to thinking seriously about the proposition. Then they really did go to town; there was no question about it, and one of our ships is now actually in the Mediterranean, the U.S.S. "Ancon". Originally, the "Ancon" belonged to the Panama Railroad Line, one of the three new ships built in the last few years. That has been fitted out, and when I was in Washington a few weeks ago, I talked by telephone with my Signal Assistant down in Norfolk. He had just come in from a week's trial on the "Ancon" and said that they had achieved considerable success. They had as many as 20 radio sets going at one time and they worked well; no interference, which is always a serious problem.

Last year the British, in making up the "Bulolo" had some 26 wireless sets aboard originally and there was trepidation in all circles as to whether they would work. But when our people got busy in January, the last chart I saw had some 56 sets aboard the U.S.S."Ancon". Lord only knows how that has turned out! I do not know. They seem to think it was going to work all right.

One of the worries of staff people about headquarters ships was their distinctive appearance, fearing a concentration of enemy attention. But the "Bulolo" and the "Largs" survived. Of course, there was not the opposition, it is granted, but you have got to have control. It has to be given from a ship; a combatant ship will get embroiled in a gunfight and you lose control there. So the answer seems to be to put the headquarters in a non-combatant ship. Have it look as much like the others in the convoy as

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possible, so that it can immerse itself in the fleet of ships present. The staff control will center there.

On the headquarters ship of course, there are many things to think of. I will not go too much into detail. The size of the headquarters that is going to be on it: if a divisional headquarters, the installation has to be much more in detail and much more coverage of circuits than for regimental headquarters, or even battalion headquarters. As a rule of thumb for the "Torch" operation, for transports on which regimental headquarters were to be embarked, we specified there would be three special wireless sets installed for the exclusive use of the Army. The battalion headquarters ships have two such sets. Those figures, of course, are always subject to revision, and as we have said from the start of this conference, when you come to any specific operation, particularly one like a landing operation where beaches are at varying distances and different conditions are encountered, then you have to make yourarrangements to the plan in hand. That condition will be so, no matter how much preplanning is done as to headquarters ship or other similar installations, organizations and their equipment. Special equipment and special people will have to be had when you know exactly what you have to do.

Under my next heading of special units: early in the game, two years ago, we were landing over the beach and we had a logistical problem there - to get the supplies from the boats up the beach, prepare runways, exits from the beach and a number of other details. We originally used our tactical troops for that purpose. We found ourselves with no-one to unload the freight transports, so we had to take squads and sections from rifle companies for this purpose. We had to use the same sort of people on the beach and break up tactical organizations. As far as beach communications are concerned, we found ourselves having to use people from the tactical combat division signal company. Then, they would not be available for their tactical use later on, as the division proceeded inland. By the time we went on with further landing operations in January of 1942, for the beach logistical organization we had a special engineer shore regiment broken up into parties by beaches and an organization thus made to free the combat troops of any responsibility therefor. At that time, we still used make-up teams of the division signal company for the beach communications. It was just to be a two-day affair, and we were to proceed not over a half mile or mile inland, so a jump of the division command post was not involved. I felt we could do that, as we did for a short time and for a short distance, but it was apparent for any extended operation; that would not do. The division signal company has to be completely free to go along with the tactical plan, and the beach organization is definitely tied to the region of the beach. By last summer, there had been approved a table of organization and equipment of a Signal Company Special, that was originally made up, I would say, by July when I got back to the States, on the basis of six teams; that is, three teams each for the two assault regiments, and none provided for the reserve regiment. Early in the game, that was changed to nine teams, so that there was one team with each infantry battalion of the infantry division. The reason for that was to provide 100% flexibility in the tactical plan and 100% flexibility in case of casualty to the transport or troops. Or if some eventuality came up that

had not been foreseen, a battalion might have to be thrown in unexpectedly. Complete independence seemed a definite requirement So a Signal Company, Special, of nine teams was thereupon made up and approved. Its table of organization is 11-517S and its table of equipment, with two changes, has been approved by the Army Ground Forces. The make-up of that company bears a relationship to the Engineer Shore Regiment.

When I speak of that, many of you, particularly Engineers, will have heard more about a Far Shore Regiment. The Far Shore regiment of the engineer amphibian brigade and the Engineer Shore regiment perform the same function. They are slightly different in organization, but they are for exactly the same purpose. In the shore-to-shore picture, the engineer amphibian brigade has to have a near shore organization. In ship-to-shore, we start from a port where the near shore organization is, of course in the permanent port facilities. The engineer shore regiment made up for that purpose has a third battalion which the ordinary combat engineers do not have; a third battalion of three companies gives you an engineer shore regiment of nine companies; one engineer shore company to each infantry battalion and a team of the signal company special linked with that engineer shore company. It is on the nine basis, and gives you complete flexibility. It has been observed that that seems a little free and generous with personnel and equipment. In any operation, I believe, no-one ever complains that there have been too many communication personnel or too many radio sets. In fact, the standard complaint is too few, so we stick by our guns, and that is the basis on which the Amphibious Force Atlantic Fleet organizes and trains.

The Signal Company Special amounts to 214 enlisted men and 11 officers; two officers in the company headquarters and one for each of the nine teams. The teams themselves consist of nineteen men each. There is a small message center, radio section and wire section. The visual section is handled by the Navy. We have, with each of those nine teams, Navy complements of eight sailors; they are radio men and visual signalmen. There are two more who are in the traffic control boat off shore, operating the voice radio set. We take those teams from the very first of the training at the Joint Communication School, Little Creek, Virginia, and the soldiers and the sailors sit elbow to elbow in the same classroom getting their instruction from the same instructors. They are regarded as a joint team from the very first. Differences of uniform and branch of service are forgotten, insofar as we can make it, and it seems to work out. There has been a little apprehension here, that it cannot be done, but in cases where it has failed, I believe it is only because a program has not been started early enough and has not been carried out fully. As has been remarked here, and it is entirely true, in some cases, people who weresupposed to work together have actually had no joint training and the results of course, have not been happy. But you can overcome that with a sound program of joint training. It has been reasonably well borne out.

Under the heading of special units, I will mention briefly shore fire control parties. I will take that up in detail a little later. Shore fire control parties are the army artillery parties that come down to the joint communications school to receive definite shooling in the means for the army on shore to obtain naval gunfire support in the early stages of the assault.

There is a naval officer attached to each of those team from the very first during the schooling, and later in the training, where they conduct actual shoots. He is the one who goes on shore with the fire observing party. His post is near that of the infantry battalion commander to which he is attached. If the infantry battalion commander wants fire, he tells his naval gunnery officer and the message is sent direct back, on our present system, to the fire support ship, which is allotted to that particular battalion on that particular beach. That is in order to have that fire support just as immediate as possible. The quickest way of course, is the way we do it, - from the infantry battalion commander to the fire support ship on a direct circuit. Another way of doing it would be to follow from the infantry battalion commander thru regiment to the division headquarters ship where the gunnery officer would notify the gunnery ship to give them the support. By the time that is done, the necessity for the support may be well evaporated and the battalion along with it. So we set up, and it actually worked, with the African operation, a close naval gunfire support by means of our fire shore control parties.

Air support parties are the same way, and I will leave the discussion of that until later, when Colonel Grant carries on, but the same idea is there, to get air support as immediately as you can. The Amphibious Force trains air support parties. The air support parties for the African operation consisted of a jeep, SCR 193 with a special tuning unit that would enable it to talk in the proper band to the planes, with one army air officer, one navy air officer, one army enlisted man, and one navy enlisted man. Both of those enlisted men were operators, and doubled as drivers of the vehicle. That was air support, or air liaison parties as we call them. They were furnished on the basis of one per infantry regiment, with the understanding that an assaulting battalion going ashore could, if the regimental commander saw fit, have an air support party or air liaison party go ashore with or quickly after an infantry battalion commander, in order that he could get first hand on shore that support he desired. That particular scheme worked very well, as a matter of fact, and a rather happy report came back.

As to training, we have there at Norfolk a well integrated and progressive schedule. We start off, of course, in a normal training cycle with the basic, and progress to the higher team or section training, and finally to the full dress rehearsal with combat troops. When an infatry division is assigned to us for amphibious training, the first thing that happens is that the division commander and his staff, regimental infantry commanders, artillery commander and sometimes battalion commanders are given a four and half or five day orientation course in amphibious affairs, similar to a conference of this kind. Here each staff officer in turn gives the picture, such as I am giving you here, so that the division staff will have some idea what it is all about. That has not always been so. In the 1st Division, we just took it as it came, as there was no such course of training set up. Then, after the general story is given to all staff officers, details are gone over in private conferences between amphibious force staff officers and their division staff pairs. The first thing we do, as far as signalmen are concerned, is to emphasize joint Army and Navy procedure, since many operations and exercises have fallen down because the Navy wants to hang on to its own little tricks of the trade; the Army likewise, and they just do not get together. All signalmen know that they can train from the same book three thousand miles apart and be just about three thousand miles apart when they try to talk on the key. Each outfit seems to acquire its own little ways of

doing things, despite the text they are studying from, so these lads get together and get their joint Army-Navy procedure from one source. Every time there has been an exercise, there is the comment that people do not know joint Army and Navy procedure. So we try to stress that from the first. In addition, we train in all basic techniques such as preparing radio sets for lowering over the side of a ship, how to keep them from getting wet, climbing nets, planning, loading, embarkation; all the details that go with it. We usually find time in the program to teach most army signallers a little about flags and lamps, as those things always come in handy. As a matter of fact, in the First Division Signal Company, we gave semaphore flags in the physical training period. After a session at the code table and message center, we take them out in the fresh air for an hour and give them flags. They like it. We found our signalmen quite keen, most of them on being with the Navy. When we were with the Navy two years ago this summer, on the U.S.S. "Mount Vernon", nothing suited Army signallers better than to get up on the signal bridge, which was just about the highest and the coolest place on ship. We were off North Carolina, in August, and the ship was like a bake oven down inside. My signalmen were the only ones who really got up top to enjoy the fresh breeze. They got quite a kick out of playing around with flags and lamps, first assisting on watches and copying where someone else would read off. But they finally got so that they could handle those visual circuits themselves. From the basic, where they learned the technique and mechanics of amphibious operations, we proceed to team training with the engineer shore company where they embark on landing craft, go off-shore a little bit and actually make landings.

The engineers will set up their installations and the signal companies special will go on with their business of opening up the beach and shore circuits. The communications people of the combat units,(that is the divisional signal company, and the infantry and artillery communicators) meanwhile have to be learning these same things stressing particularly joint Army and Navy procedure. Every signalman really has to be familiar with this procedure because you never can tell, even down to an infantry battalion, or possibly artillery, when due to the failure of some circuit, they may have to break in on another in order to transmit their traffic. As we organize our communications, if our direct circuits fail, we plan to have duplicate channels to the beach where messages can be relayed out by visual, boat messenger or shorter range radio from the beach to the ships off shore. There is always the chance an army signalman will have to tie in with the navy signalman.

From the team training of our communication teams on the beach with the engineer shore companies, we go on to full scale training with the division which has been proceeding likewise. For an operation a full scale rehearsal is indispensable. Prior to "TORCH" it did not get done, because we did not have the landing areas to do it in. The best we could do was to take each one of the landing outfits in turn and give them a little practise up at Solomon Island. In this conference, we have heard repeated from the first that those things were not done well. We went to Africa insufficiently prepared. There is no question about it. But the War Department, the Navy Department and the joint Chiefs of Staff said the operation had to be done at a certain time. The people had to be gotten together with their equipment, and it had to be accomplished as best they could. Those

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most intimately connected with it were those who, ahead of time, were least happy about it, and the unhappy aspects of the results were not surprising to anyone. I am grateful that it was no worse, but it was a situation which was forced on us. We feel we did the best we could with the time and material that we had at our disposal. I repeat the full scale rehearsal is absolutely necessary.

Planning: I get in at this point my usual squawk - General Cota has heard me before - that the signal officer has to know, as far ahead as possible, every detail of the tactical plan, in order that he can keep step in the communication planning. Even as late as early October, a signal officer of my own branch asked me, out of a clear sky in Washington, how soon I would have my communication plans for the ground troops for the landing. I replied that I could do nothing until I knew the tactical plan; what troops were going to be used? How many ships? Where was the landing to be made? That was not firm at the time, but here was a signal officer asking me for my communication plan. The signal officer has to know the tactical plan. The way I like to think of it is that the communication plan for a tactical operation can be likened to the decorations you put on a Christmas tree. You would not be told for instance on 23 December: "I have planned on putting a Christmas tree over in that corner there. Will you put the decorations up in that corner; tomorrow, I'll bring the tree in and we'll jack the tree up under the decorations". But that is about the way the signal officer is expected to perform. The signal officer has to have the tactical people put the Christmas tree in the corner. Then he can properly decorate it. But the Christmas tree must be there first!

There are a thousand and one more details that figure in the planning. I will just skip over the high spots. One of the things that we come to, in this part of the world which actually has had to be put into effect for the African operation and others, are signal intelligence plans. These include the preparation of so-called deception plans. When the thing starts to boil up, that tremendous, unprecedented and unusual volume of radio traffic would be an indication that something hot was stirring. So it is necessary to pre-plan, months in advance, the gradual build-up of an artificial traffic level so that, when the actual operational traffic gets under way, there will be no change in the volume. One of our biggest headaches in planning is frequency allocation. There was a lot of travelling across the ocean last August and September on the subject of frequency allocation. Actually, officer messengers had to come across; the first allocation chart brought over was sized up in Washington and Norfolk and was found to be insufficient for the need. There had to be quite an exchange of views in adjusting it. The thing that has to be appreciated is this: that present day radio sets take just about so much of a bite of the radio spectrum, and you can get just so many bites out of a certain measure. You cannot get any more until sometime in the future when better sets are built and the bite that any one frequency, or set, takes out of the spectrum is narrowed down; then you will be able to get that many more in. But your spectrum is like a yardstick, you have 36 inches or you have seventy two half-inches, or 144 quarter-inches. If your set takes a full inch out of that yardstick then you have only 35 inches left at your disposal. If it takes only a half inch out of that yardstick you have 71 others at your disposal. As a result we find ourselves just tremendously short-

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changed for frequencies, at times. Of course, in your low power sets where the emanation goes only a mile or two, you can repeat those frequencies outside that actual range of propagation. For operations like the African affair, we find there are certain times of day when certain frequencies work all right, and certain hours of the day when you have to change to another frequency band entirely, because the one you have been using does not work. It requires the most careful and detailed study, and causes a good deal of headache.

In our planning, one unusual thing from the Army point of view for which we find ourselves catering, is proper loading, or proper embarkation. Down in North Carolina, making landings sometimes we found ourselves with a SCR 193 in a command car down in the bottom of the ship, with about three layers of kitchen trucks, tractors and trailers on the succeeding hatch covers above. We could not get it out at the time needed.

We found that equipment wanted on a personnel transport would often be buried in a freight transport. We were under a severe time limit at the Army Base where we loaded. We had to sail on the Saturday and all this loading had to be done from about Tuesday onwards. The mission was to get everything aboard somewhere. When we got down off North Carolina, we had to unload and reload with messenger boats shuttling backwards and forwards between ships until we had the thing sorted out the way we wanted it. It is particularly critical in the matter of signal equipment and radio sets. We were no better off the following January. We found ourselves, on a Sunday, down in Chesapeake Bay doing the same desperate reshuffling.

Debarkation from the transport and loading into landing craft is a similar problem. One of the earliest things we found out, and it is just as sound sense as can be, was that your signal teams and communications teams complete must not be embarked complete in one landing craft. You must divide up your loads so that, in case of casualty to landing craft on the way to the beach, your eggs are not all in one basket. You must have something remaining to set up with on shore under emergency conditions. That was so in the African landings and despite this dispersion of loading people found themselves short-changed. One thing that we found from the very first was that our communications were failing due to the fact that equipment was getting wet on the way to the beach. We never landed in mill-pond conditions. It was always choppy. We were always several thousand yards off shore. There was a great deal of splash and sets would get wet. As early as July 1941 almost two years ago, we were procuring waterproof canvas bags to put that signal equipment. That program has continued and has been reasonably successful. I still think that an insufficient amount of care and attention is sometimes given by communicators to equipment. If the equipment is properly stowed in these waterproof bags, with the top flap turned in, the top drawn together and then the top rolled over until it fits down close to the equipment, it is not going to be submersion proof but it is certainly going to be splashproof to a high degree. We have had trouble all along with people complaining that sets will not work because they are wet. They will not work if they are wet, and the only thing to do is to keep them dry. I do admit this, that the Signal Corps should design a few type sets that are waterproof in the construction of the set itself, and not depend on the canvas bag. I made that recommendation to the Chief Signal Officer himself, in November, when I received the first two reports from the African landing. There was story after story to the effect that the SCR 284 had not

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worked because it was wet. I believe it is incumbent on us, the Signal Corps, to construct sets that will not get wet on the way to the beach.

It is tragic to plan, organize, train, equip these troops, put them on board a transport and carry them across thousands of miles of ocean, get them into their boats when they are within half a mile say of their objective (the reason for all that training and all the money that has been spent on it) and then right at the very threshold of what they are supposed to do, their sets fail because they have got wet. That is not sound. The last I heard in Washington was that the laboratories were definitely working on that problem of waterproofing.

As far as the sets were concerned, there again in trying to organize and equip these people, the Navy, for the boat control outfit, ordinarily uses what they call a TBY set. But they needed them in such quantities for the African operation that the procurement program of the Navy communication people was not geared to produce that number of sets in such a short space of time. They turned to us in desperation to ask what we could do, and we furnished them a number of SCR-511's. Early in the training we began to get reports that the SCR-511's were no good. They were not working properly; they had been getting wet. I pointed out that this set was designed for cavalry and was only an emergency set for this particular purpose. If they would not work when they were wet, we would have to take every precaution to see that they did not get wet. In those cases where they did not get wet they worked well.

Another problem into which we ran there was the interference from the engines driving the boat. Those sets worked reasonably well in diesel-driven boats, but did not work so well in gasoline-driven boats. I asked a question here, the day Commander Strauss spoke, as to the construction of the boats now. He was under the impression that it was definitely a part of the requirement in the construction of the boats, that they be shielded and bonded so that they would not interfere with radio operations. Radio operation in the boats is an important thing and we will have to make the necessary arrangements that it is carried on successfully.

One of the great bugaboos of landing operations that has been mentioned almost every day since we started this conference is the problem of trying to hit the proper beaches at the proper time. Often we have not. Theoretically, the trained coxswain has a good compass in his boat and could be given a bearing from the transport area where he starts and could hit the proper beach. But, what with current, darkness, smoke, aberration of compasses due to magnetic attraction of rifles and other steel equipment in the boat, that has not been satisfactory. Even in the African operation, we found that one or two boatloads of people supposed to land at Fedala got completely bewildered and found themselves off a piece of coast they had never seen before, going up beside a French destroyer to ask the way. There was quite a bit of gunfire and the boats were sunk. They were a distance of some 18 miles from where they should have been. So better navigational aids have engaged our attention for some time. Actually, it is a Navy problem although the Chief Signal Officer has been interested in it, and has been in close liaison with the Navy. There are many thoughts on navigational aids. For the African

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operation, the "Augusta" used its normal radar equipment. They constructed, ahead of time, a drawing of what they expected to find on the P.P.I when they were off the place they should be, that is, in the vicinity of Cape Fedala. This scheme worked to perfection and a first class fix was obtained.

For the landing craft, the problem is to get from the transport area, off-shore, to the proper beach, and the compass has not been enough. There have been many thoughts suggested, such as small rubber boats with scouts getting in the night before and dropping a buoy; airplanes dropping buoys of some kind near the coast, with a timing arrangement, that the buoys will sink initially; surface by clockwork at a certain time and upon release, will start emanating signals on which the landing craft can home, or the navigational leader can home, for the beach. The difficulties of that, of course, or the disadvantages largely, are tactical, giving away what you intend to do. The enemy might apprehend the buoys and learn the spot where the landing is about to occur. There is also the uncertainty of it working. They are trying out new things on this problem in the States all the time. One of the best present thoughts (or one they consider most favorably at the moment, until something better comes along) is to have larger ships keep check as to the course of the landing craft, by means of radar, as they proceed from the ship to the shore.

If the landing craft deviate from the course corrections will be given from the ship by voice radio to the navigational leader. This is regarded as one of the better ways. Then there is some idea of what you might call "reverse-homing". By some sort of IR beacon on the ship, the landing craft, in drawing away from it, will try to keep in that beam. The craft will be on a diverging beam instead of going on a converging beam. But that is a matter which is still very much engaging the attention of the technical people and is not completely solved at the present moment, to my knowledge.

Considerations affecting means of communications: we have a few wrinkles in the amphibious game where we have to lay down a few ground rules, as a measuring stick as to how we plan to use our means. Wire, our old reliable of the days before motor transportation, and mobility had increased so markedly has had to be deemphasized, with radio assuming the larger share of the burden. In the amphibious game, that is even more so. Wire is completely impossible in the early stages of the assault and its later use will depend entirely on the development of the situation. There is great confusion at the beach line. People are trampling back and forth. Tractors and tanks are trying to get off the beach. It is a terrific muddle. So, wire in the early stages is completely impossible. We can proceed with this general formula (I think this principle is unchanged) that wire is desirable to relieve the radio channels and should be installed at the earliest moment that the tactical situation will permit.

Its proper use depends on keen observation and good judgement on the part of the signal and communication officers, as to when that wire can safely and profitably go in. There is no point in putting it in early, having it work about 3% of the time and the rest of the time having your men, who are over extended anyway, spend all their time maintaining it, in a rather hopeless cause.

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So we find ourselves having to rely on radio, pretty much, for the tactical picture. At the beach line, from beach to boats, and possibly from beach to ship, lamps and flags can be used. But we have to plan on insuring as well as we can that radio will work. One excellent means is to provide alternate channels between command posts. The British go in for duplication of channels to a larger extent than we do, having two frequencies between battalions and brigades, and between brigades and divisions. We do not, or rather, we have not so far quite done that, although it is well worth considering and might depend on the individual operation planned. I will show you from my charts later our present methods.

The question of radio silence has been mentioned. Radio silence has to be had as long as there is any idea that security has not been lost. If when we go in, there has been air bombardment and a general melee going on, radio silence is significant no longer. The question will depend on the exact situation.

The use of codes and ciphers is one which always comes up. If you have complicated codes, it takes a long time to decode. There is also a chance of error on the way and it takes a long time to decode. The desirable thing, from the time point of view only is to use plain language. Of course, if it is understood by ourselves it will likewise be understood by the enemy. The only reasons for codes and ciphers at any time are security and secrecy. Those factors have to be weighed against the situation. Simple voice codes, prearranged message codes, are reasonably secure and are easily made up for each operation.

Panels: there has been a great deal of discussion and thought on the matter of panels. Most people who have played around with it are now agreed that they are very little use. They can be used possibly for the marking of a front line of troops. But the former idea, that you could have a great dictionary of meanings; have a plane come over and get the first part of the sentence, circle and get the next group, and then another group to finish the paragraph is completely out. Another thing that looks good on paper is indicating the direction of the target where the ground troops want support by having so many bars across the bottom of the indicating arrow to show how many increments of 400 to 500 yards from the point of the arrow the target is. The planes that are going to give the support come across at low altitude at about 300 miles an hour. The chances are that they will not see the panels, but if they do, it will be too late to do anything about it. They will have been from the panel to the target, even of several hundred yards range, before they have been able to accomplish anything, so the idea of indicating target by panels (I think the air people are most insistent) is completely out. There is some idea of working towards a simplified panel code, in which you would have just about as few meanings as you have in the ordinary pyrotechnic code, that is seven or eight distinctive shapes and meanings attached to them; there could be a V, a cross, or straight bar, or two parallel bars, and could be put on a very short code card. I think that when the troops went to Africa, General Doolittle used a code made up by Colonel Wallace of the Marine Corps. It contained 25 meanings which required that number of simple lay-outs. The present thought is to cut it down still further.

Lamps and flags for amphibious operations I think, will be extremely valuable. We found them so, and our men have

[redacted]

been consistently trained in them, particularly the beach signal people. I know that it helps the people who are going in shore to have every possible means that they could employ to get signals through, because they are going to be in a tough spot; things are going to fail that should work and they must be able to use, with some degree of confidence any possible means at their disposal. So the presence of flags and lamps, and the knowledge of their use are indispensible.

The use of pyrotechnics, in my personal view, and it is supported by many others, is extremely dubious. In my experience with communications over a number of years with combat organizations I say very truthfully that I have yet to know of any important piece of business ever transmitted by pyrotechnics. We set up pyrotechnic codes for landing operations. I know that General Cota has ridden my shoulders for hours on end asking me - "Have you seen the signal from the beach that means that our troops have landed?" "No sir, I have not", I had to answer. "I have three men up on the bridge, looking until they are blind". It is one of those things you have to look constantly for. If you stop to blow your nose or to sneeze or to light a cigarette, you might miss the all essential signal. And you have to figure on visibility. If you land in daylight the sun will interfere or there will be smoke and you might miss the signal. That should be only an emergency means. If you have something important to transmit, transmit it by all means possible. Use pyrotechnic as your 78th method. Do not place it any higher on the scale than that.

Messenger boats are one way of transferring traffic. They would be used between ships at anchorage and between the beach and ships. Those must be figured on. They are of great value. Boats are always returning from the ships to the beach and some messages can be sent by those means in order to insure its getting to its destination.

I will explain our nets without going into details of sets or frequencies. I will simply leave with you the picture of how control can be maintained. The diagrams are intended to illustrate one solution of the problem. Variations undoubtedly will be made for each specific exercise or operation.

Before taking up the approach to the beaches, I should mention briefly the communications during the voyage; that is, from the embarkation and departure from near shore or home port, as you might call it, on the way to the place where the troops are off the transport and in landing craft. On land, if an Army officer wants to talk with Jones, he gets on the telephone and talks with Jones. If Jones is not near the telephone a messenger is sent on a motor cycle to Jones. The Army officer is accustomed to doing business that way. The situation is much different once the voyage is under way and it was one of the toughest lessons our staff officers had to learn.

The Navy, during the voyage, will not open up with wireless so the only means of communication are visual - flags and lamps. Briefest messages of high priority only are to be handled, and those messages have to be confined primarily to the Navy business of running the convoy. There is little facility left over for the use of the Army. My classic example of that particular situation

[redacted]

occurred down off New River, on a Sunday afternoon, before we were to make our big coordinated landing exercise with the --- division. There was a fleet of about 40 ships lying off New River, including battleships, cruisers, hospital ships, destroyers, corvettes, freight transports, tankers, mine sweepers. The air was simply full of flags and lamps. The "Wyoming" was the Task Force Commander's ship. General Smith was aboard her. About 2 o'clock on Sunday afternoon, a dispatch boat came over from the "Wyoming" with a series of messages for General Cubbison and his staff on the U.S.S. "Mount Vernon", the former liner "Washington". However, the dispatch boat left without waiting for the replies which had to be formulated. An hour and a half later, the Chief of Staff came to me with about six messages which had to go to the "Wyoming". The captain of the ship could not, and quite rightly so, lower a boat at that time to send over to the "Wyoming". They had to be passed on by visual means. So I went up to the signal bridge, to arrange for their transmission. Things were abolsutely wild. Every lamp and set of flags were in full operation, and it took quite a little bit of talking before they would agree to pass these messages on. I had just finished that piece of business when a breathless messenger came on the bridge with a message to the Lieutenant of the M.P's over on the "Hunter Liggett". The message was from a senior Army Commander, asking this lieutenant to make sure that this particular officer's canvas bucket and gasoline store were put on the first boat in the morning. The messenger by-passed me with the message and handed it to the Navy communicator. He waved the thing in my face and asked - "How do you justify this?" I replied - "I can't and don't. Personally I don't give a damn if this officer never gets it" We had been on the ship a week and that matter could have been handled before at any time. We have to anticipate everything. I reiterate the statement that facilities do not exist for passing non-priority traffic.

Upon arrival in the transport area for the initiation of the assault, the combat troops are debarked over the side into the landing craft and eventually are organized into boat groups, at the proper time heading for the shore. This diagram (see diagram) of the approach to the beaches illustrates the formation for one battalion landing team. This organization calls for four LSI's (landing ships infantry), one AKA (combat-loaded freight transport) attached. The diagram shows two infantry battalion landing teams, loaded in small craft. The actual number of craft is not significant. These diagrams are drawn simply to show the organization. The number of waves and the number of craft in the waves will vary according to each individual battalion commander's landing plans. The reserve battalion of the combat team is still embarked on one LSI. The headquarters of the regiment, plus any regimental spare parts, attachments, engineers etc. will be on the fourth LSI. To start in with the naval control, we have the Transport Division Commander's control circuit to his ships (W). The commanding officer of each battalion is in the boat (2) with the Boat Group Commander in each case, and have their radio sets on the regular Army regimental circuit (E). We have tried, in developing and planning these things, to leave the Army normal command circuits as undisturbed as possible. On circuit E we see the reserve landing team still on the LSI; also the Scout Boat (1), if any and the guide plane, if used. On listening watch are the Battalion Executive Officer in the boat (3) of the Asst Boat Group Commander, and the control vessel (4).

Circuits K and L are identical and each is the Boat Control Circuit for its transport division and area. Net Control Station (NCS) is the Boat Group Commander in No.2 Boat. Members of the net primarily are the Wave Commanders in the No. 5 boats. On the net for informational and possible assistance purposes are the Transport Division Commanders, No.6, and the Scout Boats, No. 1.

In boats No. 10 and No. 11, we have the Shore Fire Control Parties and Air Liaison, or more correctly, Air Support Parties. The Wave in which these parties are embarked is not rigidly laid down but should be early, in order that these valuable supports may be called for. The same considerations largely govern the position in the waves of the Joint Shore Party Communication Team (Boat 12). It is appreciated that a Tactical Commander would like to have everything he possesses on the beach at H-hour, but since this is patently impossible, it then becomes necessary for each staff to study carefully the boat loading and wave formation schedule.

The Second diagram represents the set-up with assault landing teams established ashore. To establish continuity with the previous diagram, may I first direct your attention to the left half of the picture and the Circuit W, linking up the ships of the transport divisions. This is the same Circuit W of diagram 1. It is duplicated in the right side of the chart in Circuit X.

Likewise, Circuit E, the regimental command net, is the same as before; the only change is that the Landing Teams have progressed from craft to shore. For the right CT, this circuit is labelled "F".

Circuits K and L are the same as before except that one terminus is now on the beach with the Beachmaster. They are still the Boat Control Circuits and used to direct the movement of craft after the origianl waves have landed. These same circuits can be seen in the right half of the Chart, M and N. The Boat Group Commander of the first chart is now the TCB (Traffic Control Boat). The Control Vessel of Diagram 1 is now the Salvage Vessel.

Circuits G and H, linking to assault landing teams in each Combat Team sector and their corresponding Shore Parties provide an alternate means of getting traffic, by relay, to CT Hq. still afloat in case Circuit E fails. It provides also a lane to the beach for any business with the Shore Parties.

Circuits I and J, termed the Ship-Shore Administrative Nets, link the Shore Parties with the Trans. Div. Comdr. and his ships, to provide means for a flow of information and instructions between these points, to facilitate movement of supplies and support troops to the beach. Shore ends of these nets are manned normally by the Naval section of the Joint Shore Party Communication team.

The small triangular nets, Q, R, S, and T, are for the convenience of the Shore Party Comdr., the Beachmaster and the Shore Party Message Center. An ultra-portable voice set, such as the SCR-536, is used for this net.

The circuit "V" is the Landing Force Commander's (Military) control to his combat teams. Special sets are installed on the LSI's for the purpose but will ordinarily be manned by Army operators. Circuit "Z" is the Naval Force Commander's control circuit to his Trans Div. Comdrs.

An unlettered circuit is shown also from "Comsalvage" to the salvage craft in each Trans. Div. area.

The third diagram shows the next step, CT Hq. ashore. Circuits E and F, as well as V, are as before except that the CT CP's are on land instead of afloat.

The only other change is the transition of circuits G and H of Diagram 2 to circuit CC of Diagram 3. Look at the shore Parties in Diagram 2 on Beach Red 1 and Beach Red 2. When the CT Comdr. comes ashore, he will designate one of those beaches as the Main Shore Party for his area. The CT Cmdr. on the right will do likewise as to Beaches Blue 1 and 2. Now, look at Diagram 3 and at Beach Red 1, and Beach Blue 2. These are now designated as Main Shore Parties, the old G and H circuits fade from the scene, and are replaced by the new CC Circuit. It is the same idea as before, just moved up a notch to the CT in place of the LT level.

Now to the fourth chart, Division Headquarters Inland. Basically, the scheme remains the same. From regiment on down, no change whatsoever, so the details are not included in the picture.

A new circuit "H" comes in; a link between the Naval Comdr. afloat and the Landing Force Comdr. ashore.

The CC circuit of the previous chart has given way to the HH circuit of the present, which links Div. Hq., with Div. Main Shore Party with other Main Shore Parties of the Div. Sector.

The last chart, number 5, shows the set-up for naval gunfire and air support communications. These of course work right in with the tactical nets, but have been extracted in order to simplify explanation in this talk.

To coordinate naval gunfire support, a specially trained party of Army artillerymen and a Naval gunfire officer is attached to each assault landing team commander. Requests for fire are made by the LT Comdr. to the Naval officer who has this request transmitted direct to the naval ship assigned to give support to that particular unit. Corrections of the fire are transmitted by the same party. If possible, the fire will be observed by a spotting plane and corrections made to the firing ship. The present diagram shows separate frequencies (A and C, EE and DD, FF and GG, D and B) for these circuits, although in some cases it might be desirable to have each pair on a single frequency. The salvage vessel is shown on listening watch on the SFCP nets. This is for relay purposes in case the firing ship and the SFCP were out of range of each other.

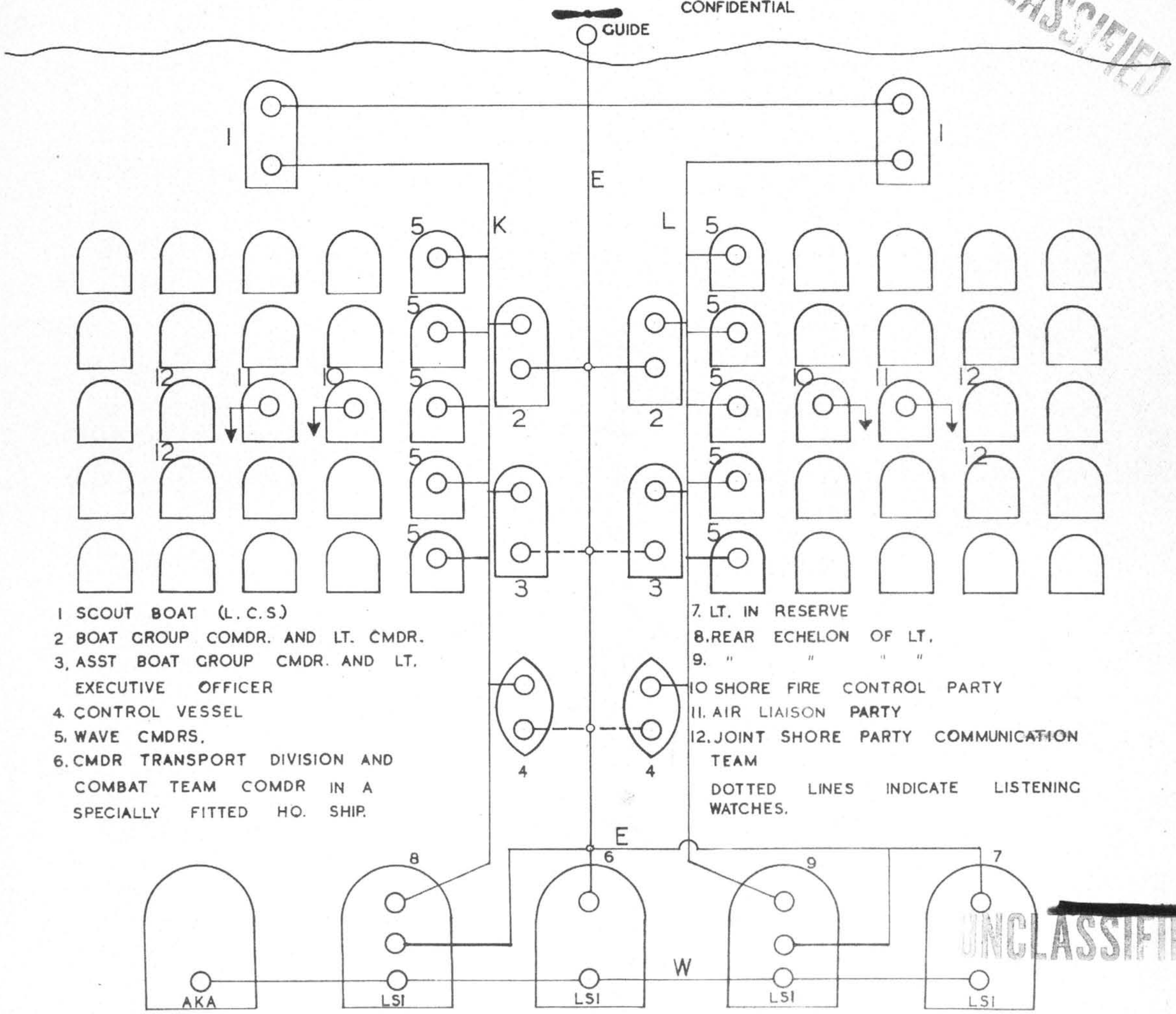
Direct Air Support is arranged for by furnishing an Air Liaison or Support Party, to each assault CT Cmdr. The Party, planes, and carrier (or land base) are on the same frequency with HQ ship on listening watch. The CT Cmdr. asks the Air Support Party for assistance. The request is transmitted by the ASP (ALP on the chart) to the carrier (P). The planes are listening in so as to be kept fully aware of the situation; Hq. Ship listens and has the power of veto over any request which it does not approve. The Com. Air. on the carrier, actually orders the mission flown; all on the same frequency (P) as the original request. So all parties to the transaction know exactly what is going on.

The system just explained is the result of a great deal of thought and study on the party of many signal officers, Army, Navy, and Marine Corps, and is believed sound. Where communications have failed, the most searching inquiry and examination has been made to locate the fault. In all cases, the failure has been equipment or

personal, and, in the case of equipment, better care on the part of personnel would have avoided failure of the equipment. So, we believe that sound training will go a long way toward ensuring dependable communications.

THE APPROACH TO THE BEACHES.

CONFIDENTIAL

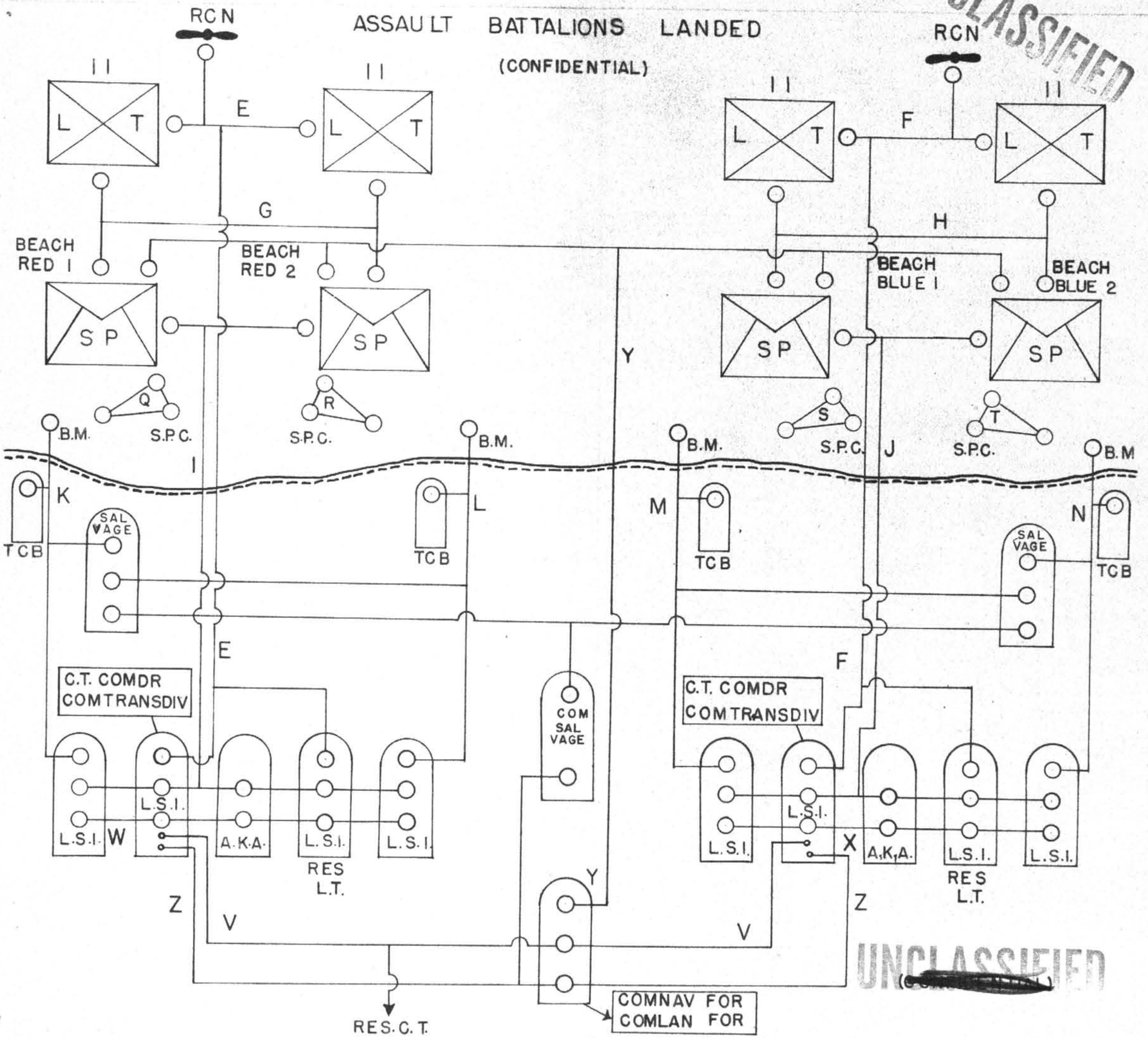


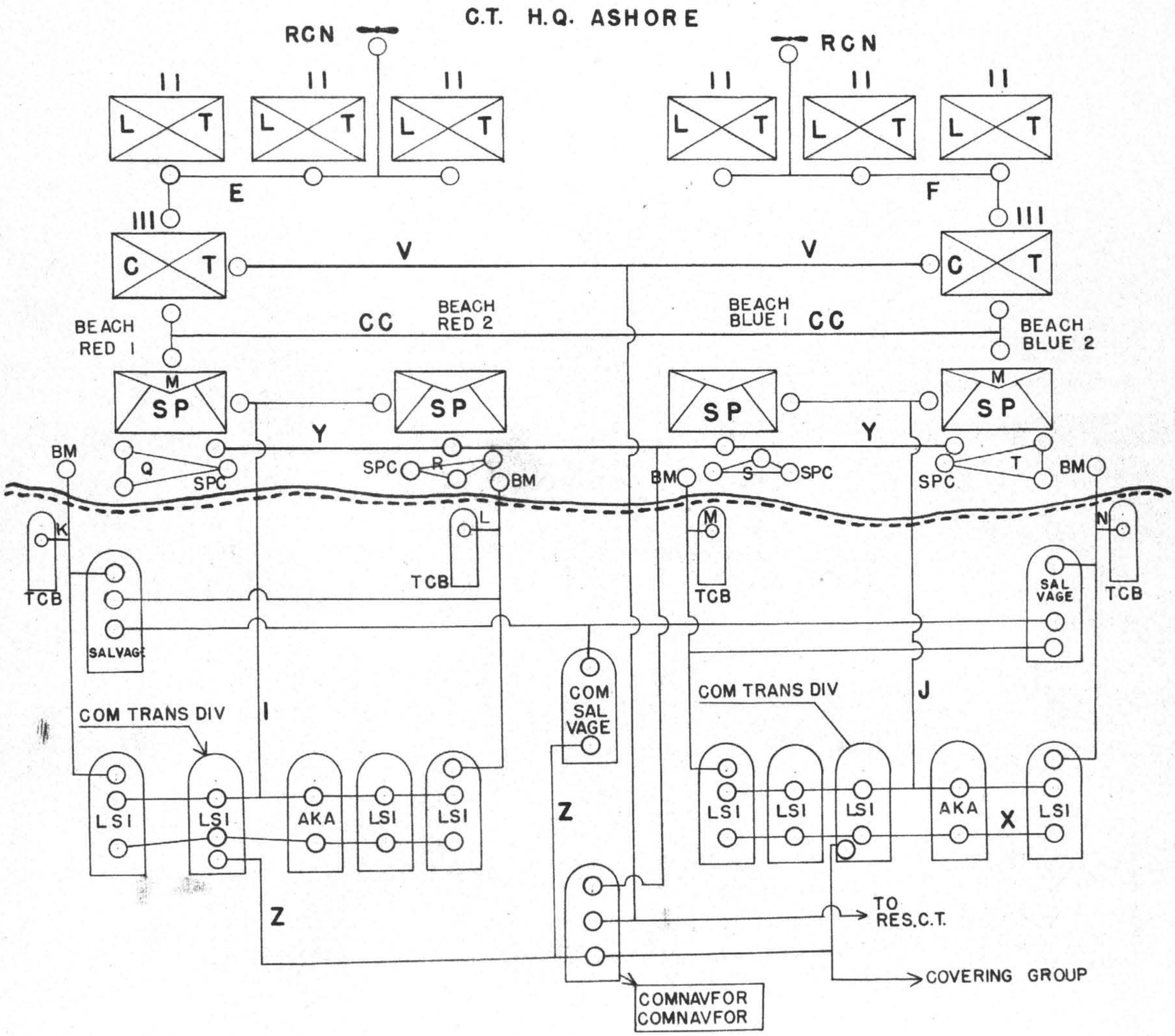
1 SCOUT BOAT (L.C.S.)
2 BOAT GROUP COMDR. AND LT. CMDR.
3, ASST BOAT GROUP CMDR. AND LT. EXECUTIVE OFFICER
4. CONTROL VESSEL
5. WAVE CMDRS.
6. CMDR TRANSPORT DIVISION AND COMBAT TEAM COMDR IN A SPECIALLY FITTED HQ. SHIP.
7. LT. IN RESERVE
8. REAR ECHELON OF LT.
9. " " " "
10 SHORE FIRE CONTROL PARTY
11. AIR LIAISON PARTY
12. JOINT SHORE PARTY COMMUNICATION TEAM

DOTTED LINES INDICATE LISTENING WATCHES.

ASSAULT BATTALIONS LANDED

(CONFIDENTIAL)




C.T. H.Q. ASHORE
RCN
RCN
L T
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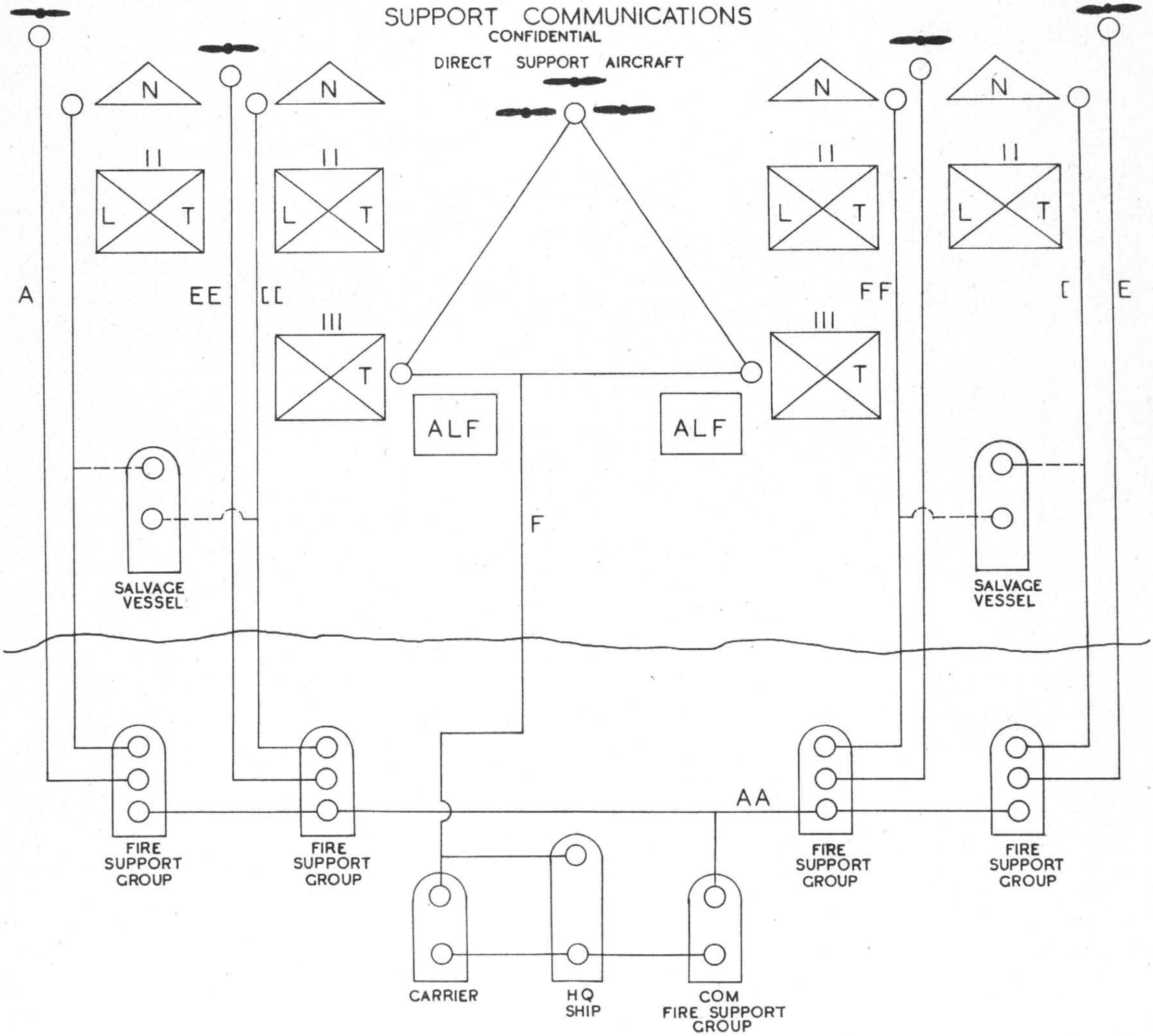
TO RES.C.T.
COVERING GROUP
COMNAVFOR
COMNAVFOR

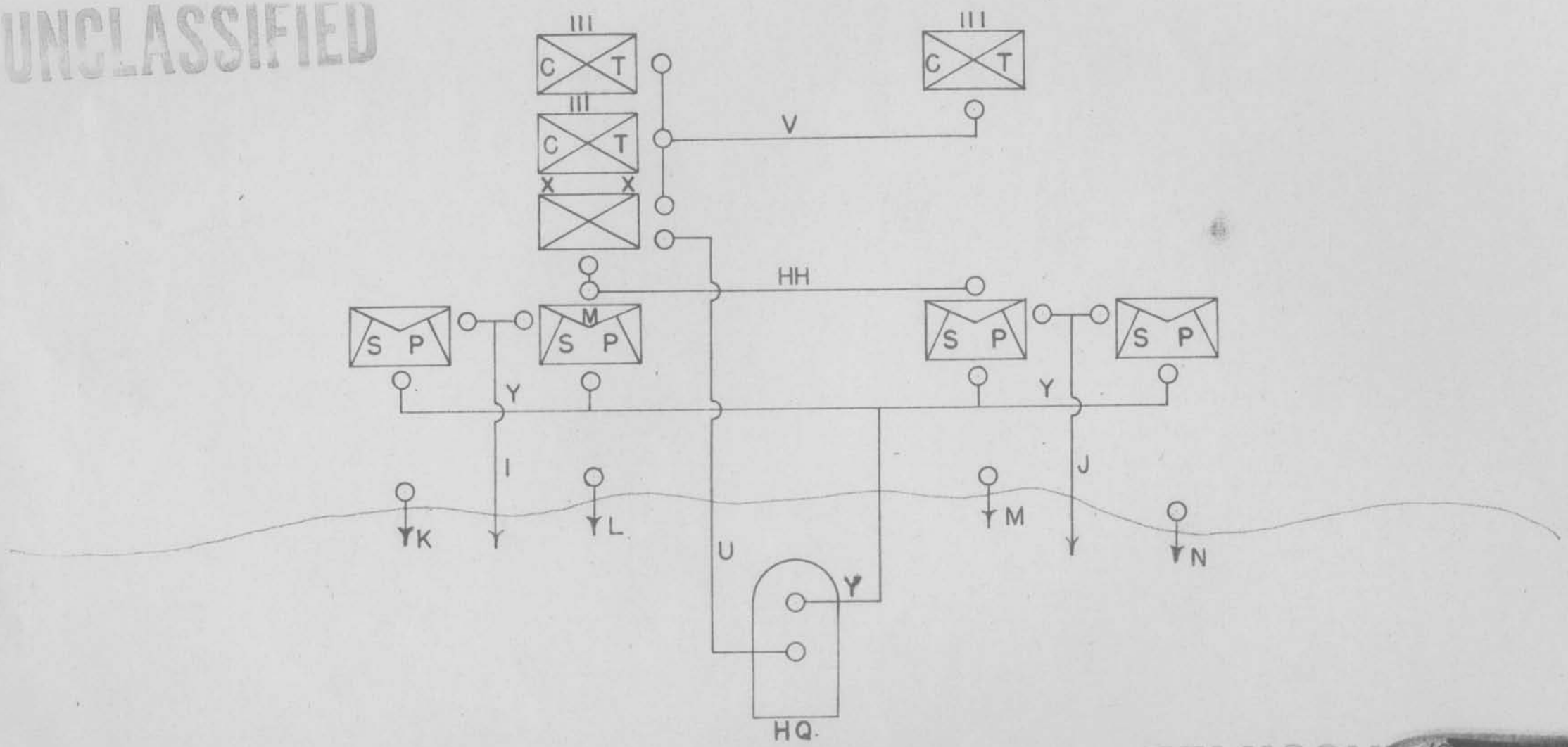
SUPPORT COMMUNICATIONS

CONFIDENTIAL

DIRECT SUPPORT AIRCRAFT



DIVISION HEADQUARTERS INLAND



ASSAULT TRAINING CENTER
CONFERENCE
HQ. ETOUSA

3 June 1943

ADDRESS BY
COLONEL H. W. GRANT, AC.
AIR SIGNAL OFFICER - COMBINED OPERATIONS

SIGNAL COMMUNICATIONS (air force) FOR A LANDING ASSAULT.

1. The general principles governing communications in air-amphibious operations also apply to the Air Force. However, I feel that the soldier and the sailor have a more difficult communications problem to solve than does the Air Force. For the most part, our communications are quite simple and straightforward and largely consist of the normal channels by which the Air Force commander exercises control of his forces, in other words, his chain of command.

2. The specific tactical situation will, however, dictate what communication facilities are needed, where they are needed and at what time. Since any communications system involves the placement of personnel and equipment in the places where they can give effective service, it must be stressed that signal planning must proceed concurrently with the development of the tactical plan. This is especially true in the case of air-amphibious operations.

3. General Candee, in his talk on the employment of the Tactical Air Force, covered, for the most part, the Air Force communications requirements in an assault landing. The fact that he did so emphasize the inseparability of communications and the tactical plan. Therefore, much of what I have to say will be repetition, but, for the sake of emphasis, I will build up the Air Force requirements, bit by bit, which, when put together, will be the picture presented by General Candee's charts.

4. In the directive for these conferences, it has been presupposed that assault operations will be conducted within the radius of action of shorebased fighter aircraft. Aside from the tactical aspects, this greatly simplifies the Air Force communication plan since full Air Force communications facilities will already exist at Air Force headquarters and at Air Force Units based in the British Isles. This permanent network has been building up for several years and is expanded as new bases are established. Therefore, the Air Force Commander will most likely exercise control, initially, from an Air Force Headquarters, maintaining liaison with the military and naval commanders through a deputy in the Joint or Combined Headquarters and Headquarters Ship. Additional communications will, therefore, be required in order to provide for close co-operation with the military and naval forces engaged. (chart 1).

5. These schematic sketches of the channels required at different phases of the assault are quite general, as the transition from one phase to the next cannot be hide-bound but must be sufficiently flexible to allow for variations in the detailed planning for a specific operation and for changes in the tactical situation.

6. In all air-amphibious operations, certain Air Force channels will be required in Headquarters Ships for the control of direction of aircraft and to provide the necessary liaison between Assault Force Headquarters in the ship and Air Force Headquarters ashore, (chart 2) In addition it may be most desirable to arrange for the reception of Radar information broadcast from sources on the friendly shore, and later from the far shore, as well as from Radar guard ships. The use of fighter control ships may be desirable, although initially high and medium cover will probably be

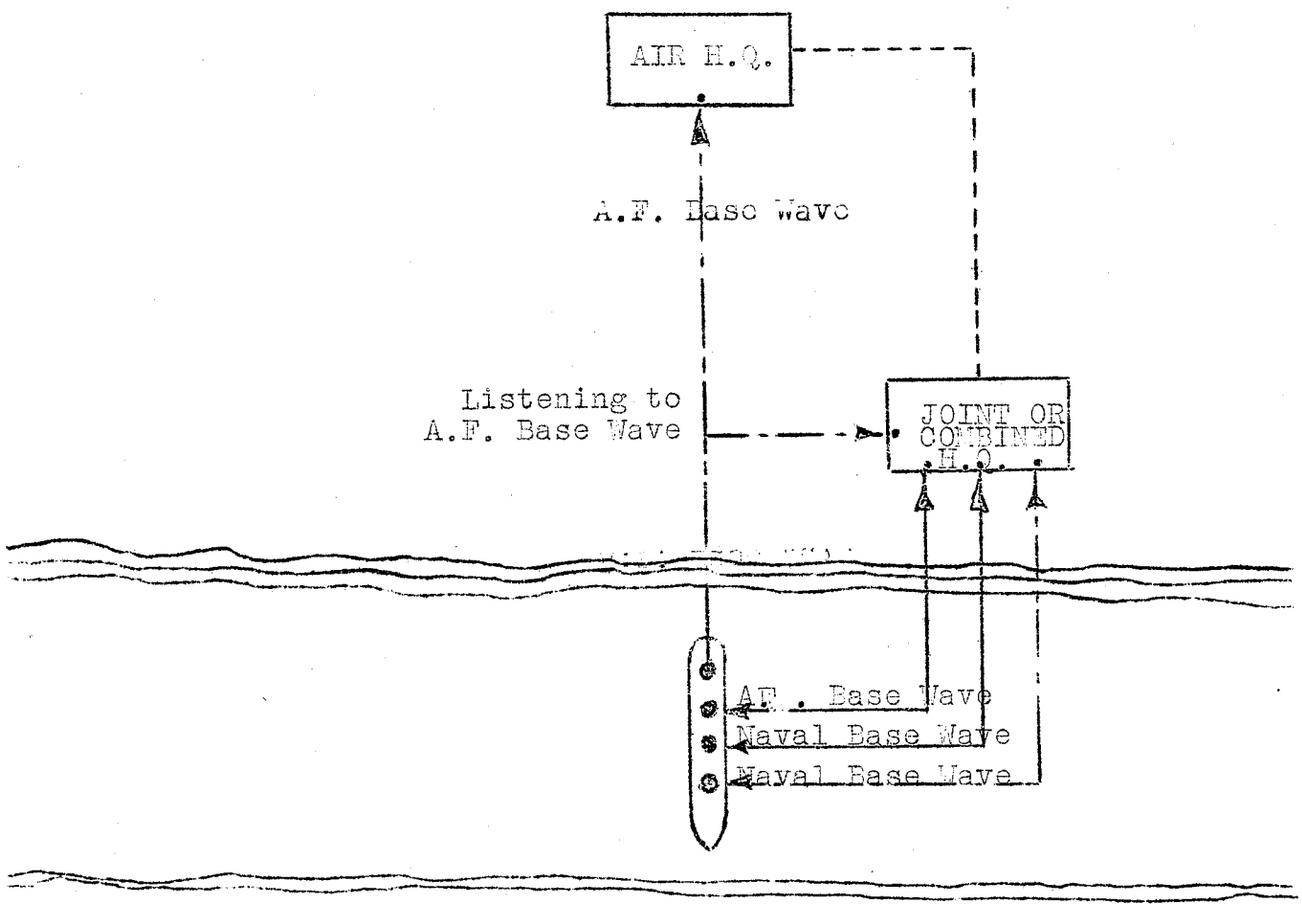
controlled from friendly shore and low cover over the convoy area may depend upon visual direction for which provision should be made. (chart 5.)

7. As soon as the Assault Force Headquarters has landed on the beachhead, the Air Force portion will require channels for communications with Air Headquarters on the friendly shore or to the Hq. ships, and communications with the local units and aircraft in the area. The build-up of the Radar network ashore should begin at this stage. Light warning Sets should be landed and sited to give the maximum cover to the landing area. G.C.I. must be landed as soon as possible, in order to establish nucleus fighter control. While the control of low cover fighters by day should be retained in the Hq. ship until a more efficient organization is available ashore, it will be advisable to land controllers with the Air Force Field Headquarters to take over part of the control, in case of congestion in the ship or damage to the ship. Control of high altitude fighters will probably be retained by the more permanent system on the friendly shore until an adequate sector control organization exists in the beachhead. (chart 3.)

8. When advanced landing grounds are established in the beachhead, they will require communications to aircraft and to Assault Force Headquarters. Air Force Field Headquarters will have to be equipped with additional communications to enable them to control aircraft based on these Advanced Landing Grounds. At this stage, the Radar network should be increased by the addition of further Light warning sets in the beachhead and arrangements made for Light Warning Sets to be pushed forward as far as possible to extend the cover provided. Ground observers should also be employed to supplement the Radar information. The lay-out of the additional Radar equipment and the Ground observers should be integrated with a view of their incorporation into the Sector Fighter Control organization. (chart 4.)

DIAGRAM 1

EXTRA COMMUNICATIONS REQUIRED AT SHORE BASES IN SHORT RANGE OPERATIONS



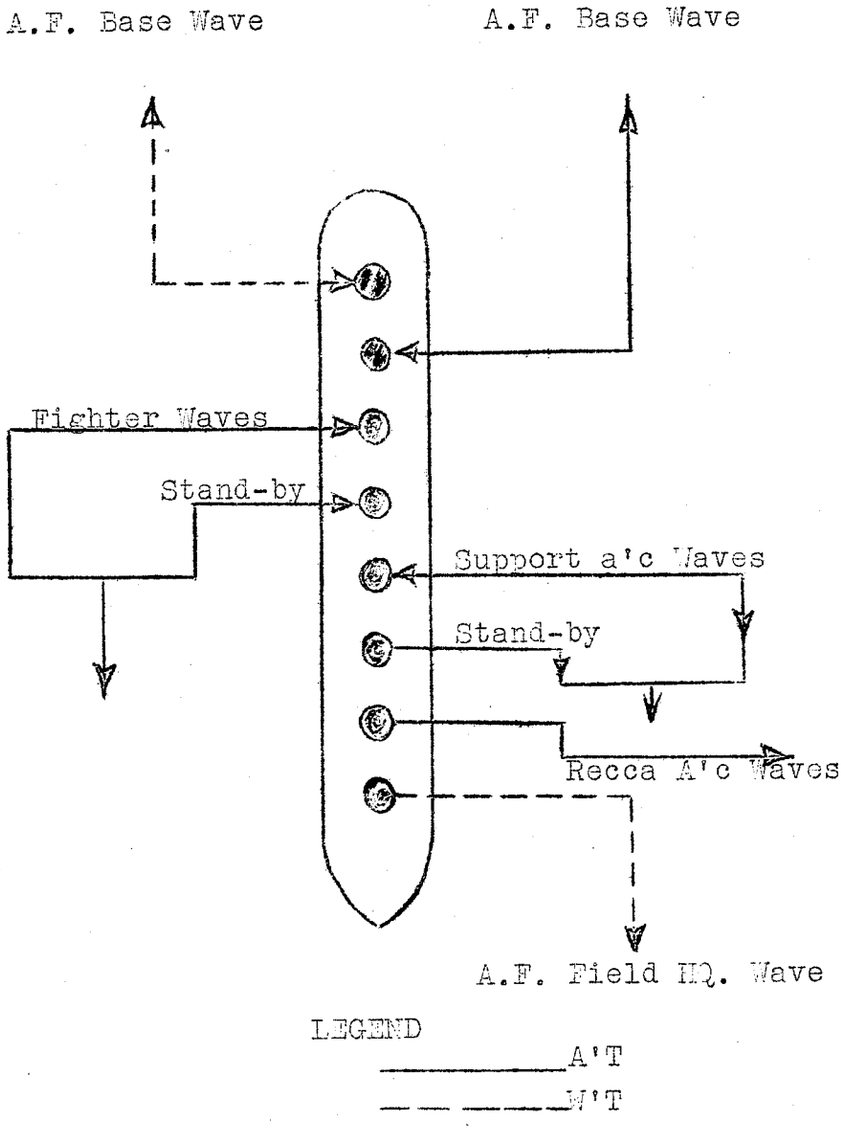
Note
Naval channels shown may by arrangement act as alternate routes for Air Force Traffic.

LEGEND
R'T
V'T
L'L

CHANNELS	APPROX RANGE REQ.
AF BASE WAVE H'FW'T	UP TO 100 MILES
AF. BASE WAVE VHFR'T	UP TO 100 MILES

DIAGRAM 2

COMMUNICATIONS IN H.Q. SHIP FOR SHORT RANGE OPERATIONS (DESTROYER OR SIMILAR VESSEL)



LEGEND

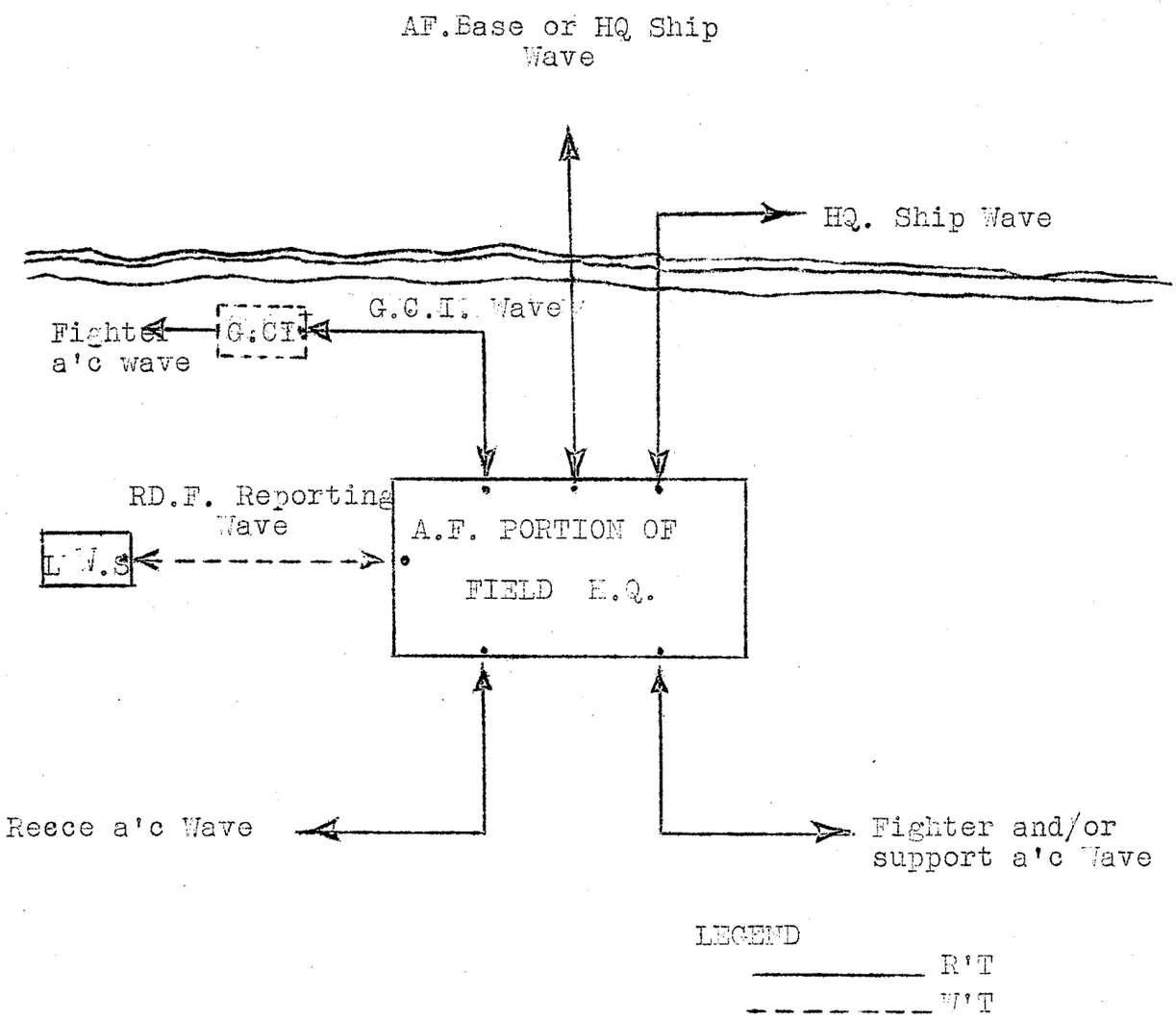
A'T

W'T

CHANNEL	APPROX RANGE REQ.
AF BASE WAVE H'F W'T	UP TO 100 MILES
AF BASE WAVE VHF W'T	UP TO 70 MILES
FIGHTER WAVES	STRONG SIGNAL
FIGHTER WAVES STAND BY	— —
SUPPORT A'C WAVES	
SUPPORT A'C WAVES STAND BY)	
RECCE A'C WAVE	UP TO 70 MILES
ASSAULT FORCE HQWAVE	UP TO 30 MILES

DIAGRAM 3.

SKELETON AIR FORCE COMMUNICATIONS REQUIRED BY AN A.F. FIELD H.Q.

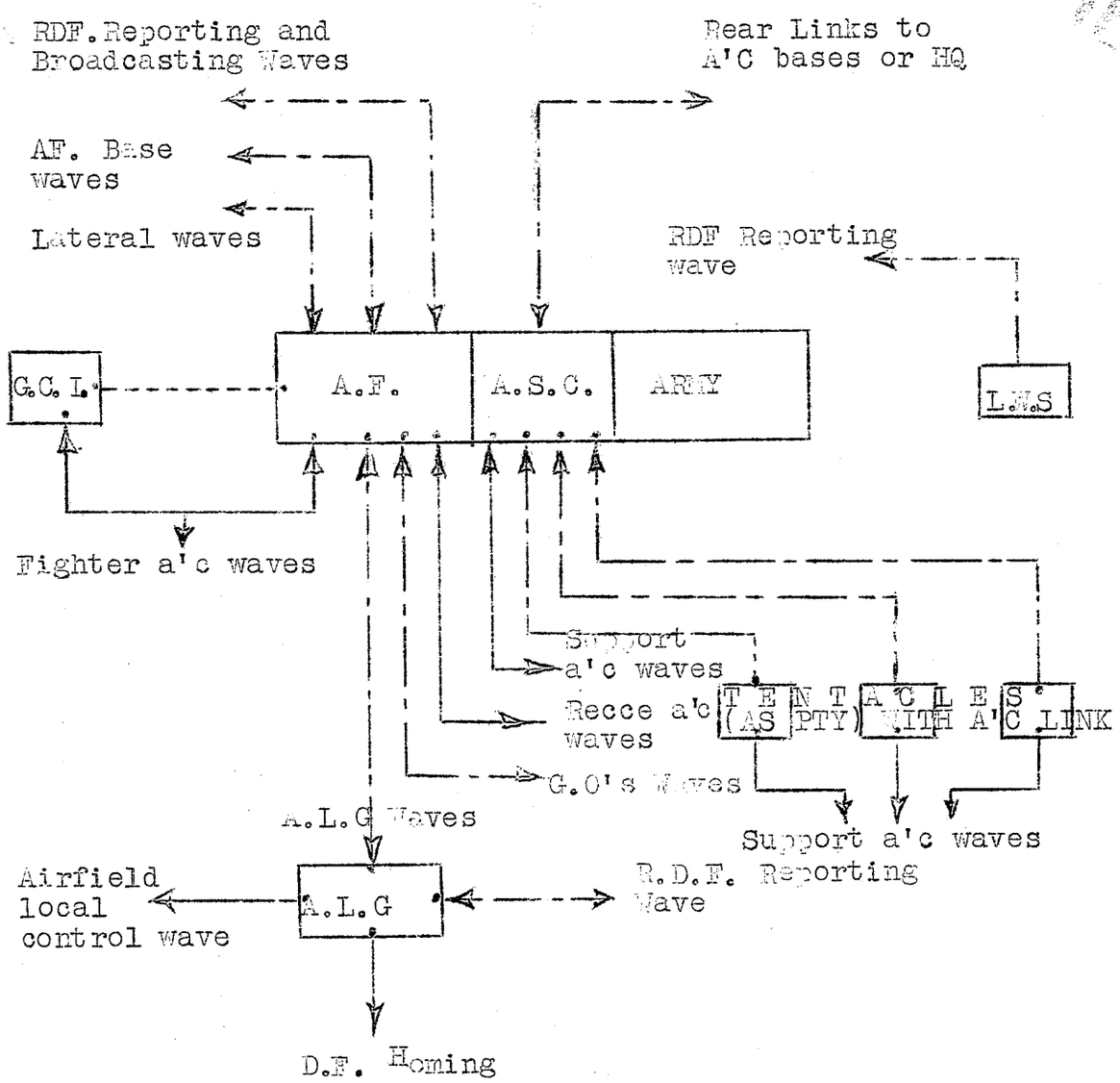


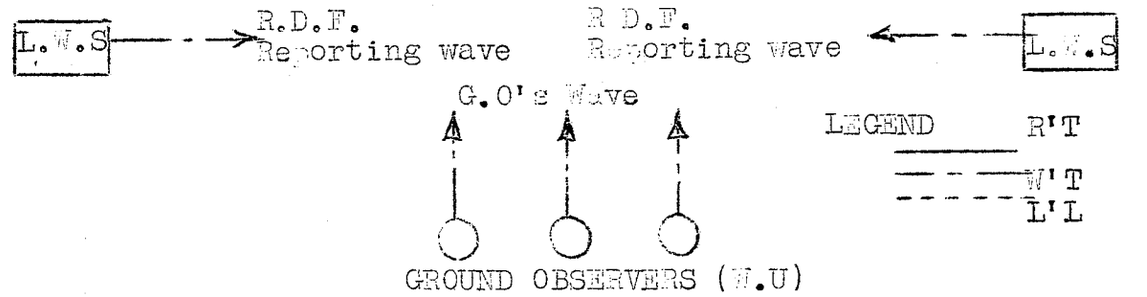
CHANNEL	APPROX RANGE REQ.
AF BASE OR HQ SHIP WAVE)	UP TO 500 MILES
AF BASE OR HQ SHIP WAVE)	UP TO 50 MILES
SUPPOLT a'c WAVE	---
RECCE a'c WAVE	
RDF REPORTING WAVE	50 TO 70 MILES
FIGHTER AND/OR SUPPORT a/c Wave)	
GCI. WAVE	UP TO 30 MILES

DIAGRAM 4

COMMUNICATIONS FOR AIR FORCE FIELD H.Q.

ASHORE - INITIAL A.L.G. COMMUNICATIONS BEFORE ESTABLISHMENT OF SOR'FR - - - -

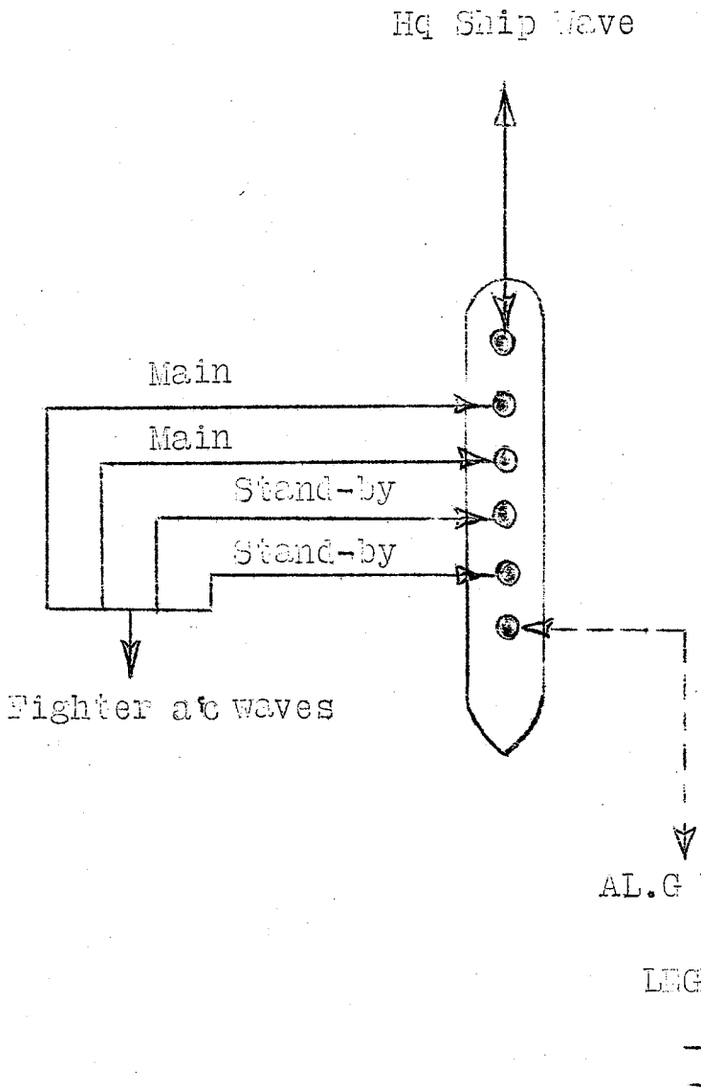




CHANNEL	Approx Range Required
Lateral Waves	Up to 40 miles
A.F. Base Waves	Up to 500 miles
R.D.F. Reporting-broadcasting wave	---
Fighter a'c waves	---
Rear links to a'c bases or HQ	Up to 100 miles
Air support waves	Up to 50 miles
Support a'c waves	---
Recce a'c waves	---
AL.G Waves	Up to 30 miles
Ground observers Wave	Up to 50 miles

DIAGRAM 5

COMMUNICATIONS FIGHTER CONTROL SHIP
USED IN CONJUNCTION WITH HQ SHIP



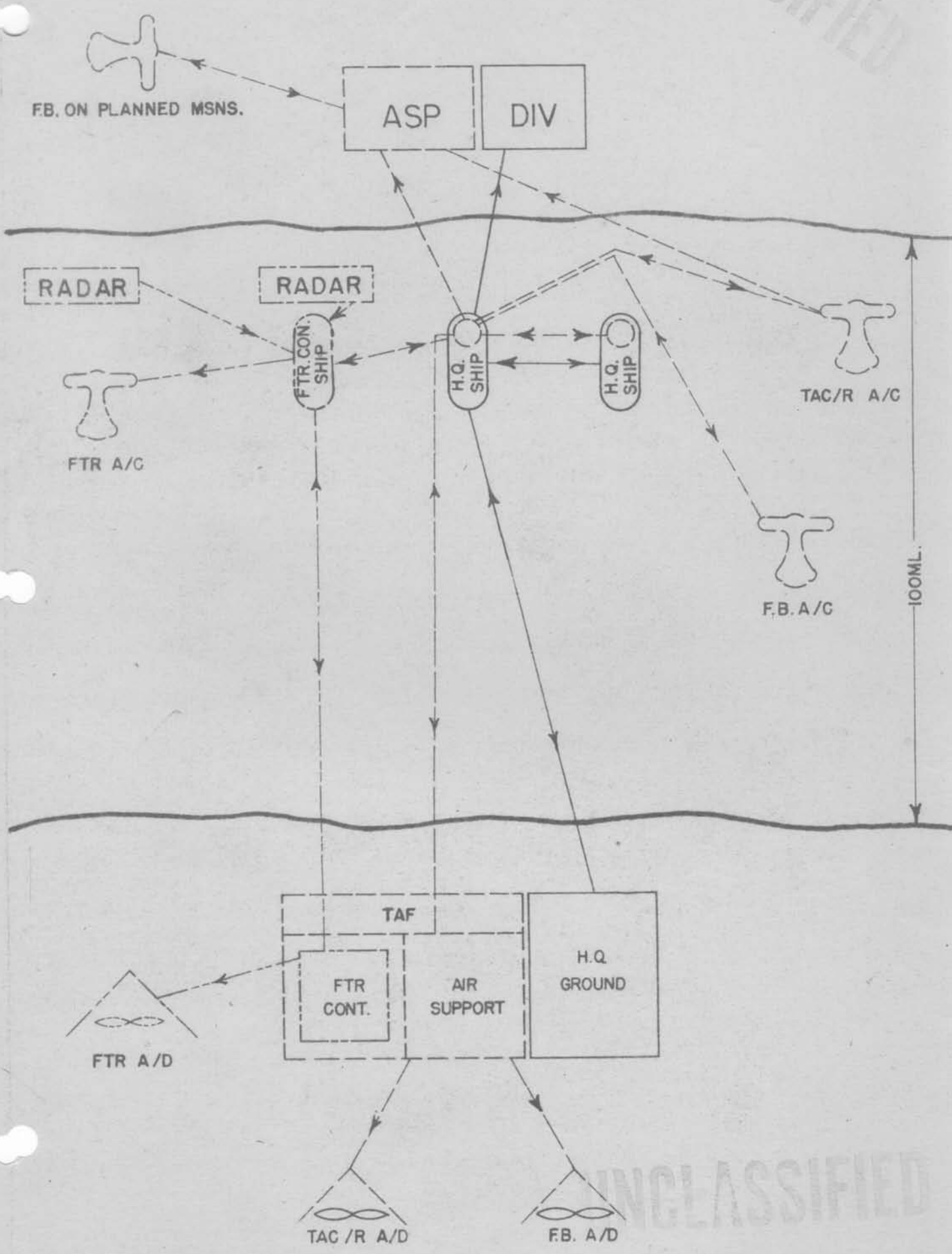
LEGEND

R'T

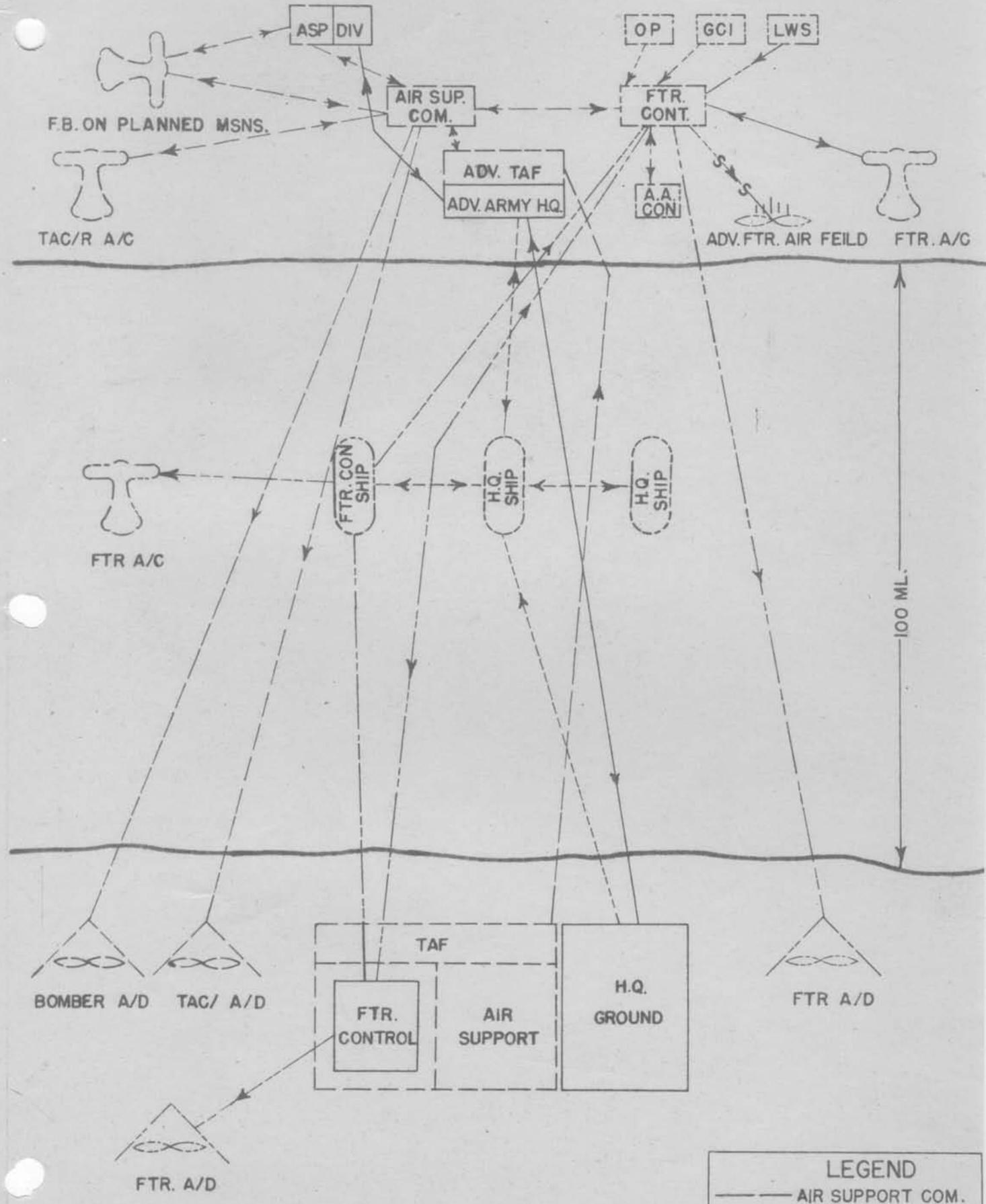
W'T

CHANNEL	APPROX RANGE REQ.
Inter-ship wave	Up to 30 miles
Fighter A/C waves	--
A.L. G Wave	Up to 50 miles

1ST PHASE (SIMPLIFIED)



2ND PHASE (SIMPLIFIED)



LEGEND

- AIR SUPPORT COM.
- ARMY
- FIGHTER
- ARMY
- FIGHTER

[redacted]

ASSAULT TRAINING CENTER
CONFERENCE
HQ ETOUSA

4 June 1943

REVIEW OF DISCUSSION FOLLOWING THE LECTURE "AMPHIBIOUS COMMUNICATIONS" BY COL. HASKELL H. CLEAVES AND COL. H. W. GRANT

1. What liaison have we with the British as to doctrine?

Conclusions reached: A combined document has been prepared and has the approval of the British and so far as is known is approved in the United States. This document was prepared by a committee of six United States Officers working with Combined Operations Headquarters in London. On those points where it was not necessary, nor possible, to agree in detail the necessary information was placed in the document so that services of each nation have information of the way the other service does things.

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2. Is a specially fitted command ship essential?

Conclusion reached: Yes.

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3. What special units and equipment is indicated?

Conclusion reached: A Signal Company Special, T/O 11-517S plus augmentation of the equipment of the tactical communication units.

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4. What special training of staffs and troops is necessary?

Conclusions reached: Staffs and troops must be trained as a joint team, that is soldiers and sailors and airmen must sit elbow to elbow in the same classroom and get their instruction from the same instructors. Training must be progressive and culminate in a full scale rehearsal of the operation.

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5. What particular points need emphasis in the planning stage?

Conclusions reached:

a. The signal officer has to know as far ahead as possible every detail of the tactical plan in order that he can keep the communication plan in step.

b. Signal intelligence requires the preparation of so called deception plans. It is necessary to create an artificial volume of traffic prior to an operation so that when the actual operational traffic gets under way there will be no change in the volume, and thus the enemy will not be warned that something is happening.

c. Frequency allocation is a difficult and complicated job and must be continuously considered.

[redacted]

[redacted]

6. How should troops and equipment be embarked? Be loaded?

Conclusion reached: Signal teams and communications teams must be embarked according to a carefully prepared plan so that men and their equipment will be kept together, and so that a minimum of confusion will obtain when time comes to load the landing craft. Signal teams and their equipment must be dispersed among the landing craft so that the destruction of one craft will not eliminate all signal equipment.

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7. What steps can be taken to prevent wetting of equipment?

Conclusions reached:

a. Sets can be properly packed in splash proof canvas bags.

b. It would be desirable to have sets that are waterproof in the construction of the set itself and not depend on the canvas bag. This recommendation was made to the Chief Signal Officer in November.

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8. What is the present status of navigational aids?

Conclusion reached: Navigational aids are being constantly improved.

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9. What considerations affect the employment of:

a. Radio
b. Wire
c. Panels
d. Lamps
e. Flags
f. Pyrotechnics
g. Messenger boats.

Conclusions reached:

a. & b. Wire is impossible in the early stages of an operation of this kind, therefore radio must be used. If security has not been lost and surprise is aimed at radio silence must be maintained.

c. Panels are of very little use due mainly to the high speeds at which aircraft operate and to the undesirability of having an aircraft circle several times around an area.

d. & e. Lamps and flags are extremely valuable particularly to the beach signal people.

f. Usefulness of pyrotechnics is extremely dubious, chiefly because it is too easy to miss and misconstrue the signal.

g. Messenger boats are indispensable and should be provided.

[redacted]

10. How much in the way of communications can be expected during the voyage phase?

Conclusions reached: Briefest messages of high priority only can be handled and these messages have to be confined primarily to the navy business of running the convoy. Radio is silent therefore only visual means of signals are available.

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11. How is control maintained by the Naval Commander during the assault phase?

12. What are the Army channels of control during the assault phase?

13. How are the communications for Naval Gunfire Support organized?

14. How are requests from ground commanders for Air Support translated into action?

These four questions were answered by diagrams, which will be presented with Col. Cleaves' speech.

The Conference accepts the air communications plan as presented by Colonel Grant.