PHASE II

DISCUSSION OF DOCTRINE

G-5	Lt Col C.R. Kutz
G-2	Lt Col H.M. Zeller Lt Col Bell Burton (British)
Naval	Cmdr E.B. Strauss USN
Air	Brig Gen R.C. Candee Col J.T. Dalbey
Tanks	Maj Gen P.C.S. Hobart (British) Lt Col C.R. Kutz
Fortifications	Col E.P. Lock
Artillery	Col M.W. Brewster Col H.F.G. Langley (British)
Infantry	Brig Gen N.D. Cota
Signal	Col H.H. Cleaves Col H.W. Grant
Chemical Warfare	Col H.W. Rowan
Supply	Major A.G. Pixton
Medical	Col C.B. Spruit Col M.C. Grow
Combined Arms	Lt Col R. Adams Lt Col A.T. Mason USMC

G-5

G-5

ASSAULT TRAINING CENTER
CONFERENCE
HQ. ETOUSA

ADDRESS BY
LT. COL. C. R. KUTZ
G-5 SECTION, ETOUSA

G-5 INTRODUCTION

24 May 1943

I have been asked, as the G-5 representative, to present to this group of officers the picture we have at present of how a large scale cross-channel assault might be staged.

At present, there is no finally approvedplan and therefore, it is necessary to make certain basic assumptions.

ASSUMPTIONS.

1. That the attack will be made against a heavily fortified coast defended by a strong German army.

2. For the purpose of broad planning, it is assumed that the assault will take place on a front of 4 divisions (2 U.S, 2 British).

3. In order to defeat the German rate of reinforcement in the area selected for the assault, it will be necessary to follow up the assault divisions with six more divisions (3 U.S, 3 British).

4. This gives a total force, which must be afloat in proper types of landing craft, of 10 divisions (5 U.S, 5 British).

5. That the average distance between the near shore and the far shore is 100 miles.

After many months of study a joint British-U.S. planning group set forth the basic factors concerning an opposed landing in France and the Low Countries.

AIR FORCES.

There must be sufficient air forces available to ensure air superiority within the area of operations. They must be capable of providing the Army with the necessary air support, including the transportation of airborne troops.

AIRBORNE TROOPS.

Airborne troops and transport aircraft must be available on a scale sufficient to undertake a major role in:

a. Neutralizing coast defenses covering sea approaches.
b. Reducing beach defenses by taking them in the rear.
c. Slowing down the rate of arrival of enemy reserves, to enable our rate of build-up through the beaches to compete with it successfully.
d. Capturing airfields.

NAVAL FORCES.

There must be sufficient naval forces for escort and cover

of the seaborne expedition against submarines and surface vessels, for minesweeping, and for defence against such close-range air attacks as cannot be prevented by fighter cover.

PRELIMINARY BOMBING.

Preliminary air bombing of the land communications serving the area of assault will be required. In addition, preliminary softening of the areas of assault may also be necessary.

FIRE SUPPORT DURING LANDING PHASE.

It is essential that the fire from beach defenses be effectively dominated while attacking troops are approaching and crossing the beaches. Among many possible means of doing this, adequate numbers of close support vessels and support aircraft are essential.

LANDING CRAFT.

Landing craft of suitable types must be available in sufficient numbers to:

a. Enable the initial assault to be made in adequate strength.
b. Provide an adequate floating reserve.
c. Enable the rate of build-up, subsequent to the initial landing to, compete successfully with that of the enemy.
d. Stage any feints or diversions necessary to the plan.

PORTS AND BEACH MAINTENANCE.

It is essential at an early stage to capture a major port that can be opened quickly and put in working order. This must be followed by the capture of additional ports as soon afterwards as possible. But even in the best case, maintenance over beaches for a long period will play an essential part in the maintenance plan; and the beaches must be selected and equipment provided to make this possible.

AIRFIELDS.

Area selected must be suitable for airfields to be made available at a very early stage, so that fighters can be operated economically and air support provided quickly.

COMMUNICATIONS.

Efficient communications are of particular importance if the necessary control of troops, ships, craft, aircraft and support in this complicated operation is to be achieved.

Special requirements include combined headquarters, headquarters' ships, navigational aids, beach communications and support communications. A particularly high degree of combined training is necessary to produce satisfactory communications in such an operation.

TRAINING.

The assault force requires special training with special

equipment over a long period. It needs, in particular, landing craft for this training, which must continue until the small mixed parties of all three Services which work together learn to do so as one team. Rehearsals are also necessary when this initial training has been completed. In addition, air forces employed in close support of the assault must have special training.

Force Commanders and staffs of all three Services require special training in planning.

CONCLUSIONS.

To ensure success in any offensive operations, it is necessary to gain at the outset, and subsequently to maintain, superiority of force in the area where the issue will be decided. This entails, in combined operations, an adequate allotment not only of troops and aircraft of normal types, but also of landing craft and special equipment, and of airborne troops and special troop-carrying aircraft, and careful consideration of special maintenance factors.

The preparation for, and mounting of, a combined operation is far more complex than that of a land battle, and requires considerably greater time. This time cannot be reduced, if serious opposition is to be encountered, without accepting grave risks of failure.

ASSAULT TRAINING CENTER

CONFERENCE ON LANDING ASSAULT DOCTRINE

G-5 Phase Plan (Tentative)

(This plan is unofficial, is not fixed, and is to be considered only as a basis of discussion for the Conference).

1 Phase	2 Type of Div	3 Scale	4 Tide	5 Transp.	6 Objective	7 Yards	8 Forces ashore at end
Assault	Special Assault	Assault (Lightest)	1st	a Ship-Shore b Shore-shore	Eliminate S.A.Fire & ground obstruc-tions from beaches	6,000 to 10,000	4 assault divisions
Follow up	Inter-mediate	Light (inter-med)	2nd 3rd 4th	a Shore-shore b Ship-shore	Eliminate all Art. fire from beaches	20,000	10 Assault and follow up Divs.
Build up	Normal	Full T.B.A.	5th & there-after	Shore-shore Ship-Shore	(Strat-egic) build up	20,000 & eventual break out	Strategic Force (size un-known)

[redacted]

G-2

[redacted]

ASSAULT TRAINING CENTER
CONFERENCE
HQ ETOUSA

25 May 1943
KM

ADDRESS BY: Lt Col H. M. ZELLER, GSC
(Chief, Order of Battle Section, G-2, ETOUSA)

NOTE: As his address before the Assault Training Center Conference, Col Zeller read the paper "THE DEFENSE OF FRANCE AND THE LOW COUNTRIES", which follows on pages 5 to 15 inclusive. The "Special Report Number 28", pages 1 to 4 inclusive, was distributed to members of the Conference.

Assisting Col Zeller, Capt T. B. Dustin, talked on the subject "A DIVISION SECTOR, PAS DE CALAIS", and 1st Lt R. C. Fitzgibbons talked on the subject "A BATTALION SECTOR, PAS DE CALAIS".

[redacted]

Col Zeller 1

SECRET
By authority of
A. C. of S., G-2
Initials:
Date : 1 April 1943

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HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
Office of the Assistant Chief of Staff, G-2

1 April 1943

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SPECIAL REPORT)
)
NUMBER .....28)

DISPOSITION OF THE GARRISON AND
RATE OF REINFORCEMENT (German Army):
FRANCE AND THE LOW COUNTRIES

1. INTRODUCTION - Section I of this report discusses the probable disposition of German divisions in FRANCE and THE LOW COUNTRIES under the assumptions that the garrison consists of 20, 30, 40 and 50 divisions. Section II takes up the rate of reinforcement under the various assumed strengths of the garrison, to the AVRANCHES-CHERBOURG-CAEN, the SEINE-SOMME, and the PAS DE CALAIS sectors, were a single one of these to be attacked in force. The Annex consists of Maps I to IV, which show the disposition of divisions. (To save words FRANCE and THE LOW COUNTRIES are referred to simply as "FRANCE" throughout the remainder of this report).

2. ASSUMPTIONS - This report is based on the following assumptions:

a. The RUSSIAN FRONT contains the bulk of the German Army, and consequently the Germans have not been able to build up a strategic reserve in GERMANY.

b. In the MEDITERRANEAN it is assumed that the Allied threat to the southern coast of EUROPE has grown, but that this threat is secondary to the threat based in the UNITED KINGDOM.

c. German intelligence has given warning of a major threat of offensive action against the WESTERN FRONT, based in the UNITED KINGDOM.

d. To simplify this report Italian divisions are not considered, although they will probably continue to garrison a portion of the MEDITERRANEAN COAST of FRANCE. It is assumed that one German division is equivalent in combat effectiveness to two Italian divisions, and therefore that section of the coast which would probably be held by six Italian divisions is here shown as being held by three German.

I. GERMAN TROOP DISPOSITIONS IN FRANCE

3. TENDENCIES - During the past six months, in spite of considerable fluctuation in the number of German divisions in FRANCE, the number of divisions on the coast has changed remarkably little. Divisions for the RUSSIAN FRONT have either been drawn from the reserve pool in the center of FRANCE, or where they were drawn from the coast the coastal sector was usually immediately reoccupied by a division from the reserve pool. It is therefore believed that the Germans regard the figure of sixteen divisions on the northwest coast (NANTES to DEN HELDER, both inclusive) as the minimum consistent with safety, while about twenty divisions would be their optimum in the conditions under consideration in this report. It is therefore considered that any surplus divisions which will reach FRANCE will tend to be allotted to reserves, first to what is here loosely considered as Army Reserves for the two main CHANNEL COAST sectors (see maps), secondly to an Army Group Reserve, and thirdly, to an Army Reserve in the South. This policy is in accordance with the past distribution of German troops in FRANCE and also follows the German tactical doctrine of

[redacted]

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committing minimum forces until the main effort (schwerpunkt) has been discovered. Moreover, if there is any threat at all of Allied action against South FRANCE, the importance of an Army Group Reserve in central FRANCE, capable of action against either the North, West or South coasts will have increased. The disposition of divisions is plotted on Maps I to IV, according to whether there be 20, 30, 40 or 50 enemy divisions in FRANCE.. Under the assumption stated in paragraph 2, the Germans would probably not consider it necessary to commit more than nine divisions to the immediate defense of the west coast of FRANCE (south of NANTES), and the MEDITERRANEAN coast. Types and nationality of divisions are not here discussed, but in general it may be assumed that the coastal divisions will tend to be defensive types, the Army Reserve divisions will tend to be offensive types, while any Panzer Divisions will be in either Army or Army Group Reserve. An effort will undoubtedly be made to have as high a proportion of panzer and motorized divisions as possible in the reserves and the weaker the reserves the higher the proportion that will be panzer or motorized.

II. RATE OF REINFORCEMENT

4. GENERAL - The following is an estimate which should not be regarded as in any way exact. No estimate can be made of the condition and quantity of rolling stock which will be available to the enemy at the time of a hypothetical operation, nor can any idea be had as to the amount of damage to road and rail communications which will be carried out by saboteurs, or by our own air action. In this paper the Germans are given maximum efficiency and transport ability. Owing to the fact that the situation in RUSSIA is imponderable, the number of divisions that could reinforce the WESTERN FRONT from RUSSIA is not here discussed. It is estimated, however, that the rail net would permit the transfer of 7 divisions from RUSSIA to FRANCE in two weeks.

5. IF THERE ARE TWENTY DIVISIONS IN FRANCE (Map I) - It is considered unlikely that the garrison will ever fall as low as this. The Germans would more likely weaken the strength of each division rather than reduce reserves to the total of three divisions, with only ten on the West and Northwest coasts. It is not thought that this situation merits further discussion.

6. IF THERE ARE THIRTY DIVISIONS IN FRANCE (Map II) a. The Army Reserve of two divisions in the area attacked would be the first to be committed. The arrival of these divisions in the battle area could be expected within 48 hours of the battle being joined, and they might possibly arrive within 24 hours if the enemy were fully prepared and were immediate confident through previous reconnaissance as to where the schwerpunkt of the Allied attack lay.

b. The next reserve available would be one of the two divisions in the other Army Reserve. The Commitment of this division would reduce the entire reserve in Northern FRANCE to one division, and it is therefore not to be expected unless the enemy were confident that the main Allied attack had been delivered. Should it be committed, it could probably reach the battle area within two days of being ordered to move.

c. Having committed these three divisions, it is highly improbable that the Germans would commit their one remaining reserve division in Northern FRANCE or their single reserve division in Southern FRANCE unless they were certain (1) that the presence of these divisions was essential to turn the battle decisively and quickly in their favor, and (2) that the Allies were incapable of launching another attack against any other part of the coast which could not with certainty be held by the coastal defense divisions.

d. If this condition (2) above were apparent, perhaps one or two of the coastal divisions not in the area attacked might be moved there, although this seems an unlikely contingency, for if the Allied attack were so strong as to necessitate the employment of further divisions, it will probably have been strong enough to have broken out inland, and these divisions will be needed by this time for holding a line further back to cover a general withdrawal. It is, however, possible that reserve elements from coast defense divisions might be detached and sent in to reinforce or counterattack in that sector which had been assaulted. This procedure is not likely to be adopted until all reserve divisions have been committed. In the tables that follow, by "an equivalent division from a coastal area" is meant a force equivalent in strength to a division and formed from the reserve elements of divisions holding coastal sectors.

e. It is therefore considered that reinforcements could reach the various areas under consideration as follows:

	AVRANCHES-CHERBOURG-CAEN	SEINE-SOMME	PAS DE CALAIS
1st & 2nd day*	2 divs from Army Res B	2 divs from Army Res A	As for SEINE-SOMME Area
3rd day	1 " " " " A	1 " " " Res B	
4th day or later	1 " " " " A	1 " " " Res B	
5th day or later	1 " " " " South	1 " " " South	
7th day or later	1 or 2 equiv.Divs.from Coastal Areas A or B	1 or 2 equiv.Divs from Coastal Areas A or B	
Maximum Reinforcement	7 divisions	7 divisions	7 divs.
Force already in Area	2 "	2 "	3 divs.
Total force committed	9 "	9 "	10 divs.

*The "day" referred to is the day on which the head of the divisional column reaches the battle area.

7. IF THERE ARE FORTY DIVISIONS IN FRANCE (Map III) - The flow of reinforcements would be similar, except that the whole of the Army Group Reserve would be committed before any divisions of the Army not attacked were moved in. The rate of reinforcement would therefore be as follows:

	AVRANCHES-CHERBOURG-CAEN	SEINE-SOMME	PAS DE CALAIS
1st & 2nd day	3 divs from Army Res B	4 divs from Army Res A	As for SEINE-SOMME
4th & 5th day	4 " " "Grp Res	4 " " " Grp Res	
6th day	1 " " " Res A	1 " " " Res B	
7th day or later	2 " " " Res A	1 " " " Res B	
8th day or later	1 " " " Res A	1 " " " Res B	
9th day or later	1 " " " Res South	1 " " " Res South	
11th day or later	1 or 2 equiv.Divs from Coastal Areas A or B	1 or 2 equiv.Divs from Coastal Areas A or B	
Maximum Reinforcement	14 divisions	14 divisions	14 divs
Forces already in area	2 divisions	3 divisions	4 divs
Total force committed	16 divisions	17 divisions	18 divs

8. IF THERE ARE FIFTY DIVISIONS IN FRANCE (Map IV) Under these conditions it is unlikely that there would be any need for the commitment of the five divisions from the reserve of the Army which had not been attacked. If, however, they were committed the rate of reinforcement would be as follows:

	AVRANCHES-CHERBOURG-CAEN	SEINE-SOMME	PAS DE CALAIS
1st & 2nd day	4 divs from Army Res. B.	5 divs from Army Res.A	
4th,5th and 6th day	4 " " Army Grp.Res.	4 divs from Army Grp.Res	As for SEINE-SOMME Area
7th & 8th day or later	5 " " Army Grp.Res.	5 divs from Army Grp.Res.	
10th day or later	2 " " Army Res.A	2 divs from Army Res.B.	
12th day or later	3 " " Army Res.A	2 divs from Army Res.B	
Maximum Reinforcement	18 divisions	18 divisions	18 divs.
Force already in the area	2 divisions	3 divisions	4 divs.
Total Force committed	20 divisions	21 divisions	22 divs.

For the Acting A.C. of S., G-2

F. P. TOMPKINS
Colonel, GSC
Acting Executive

Annex - Maps I to IV, showing disposition of divisions in FRANCE.

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ADDITIONAL DISTRIBUTION:- 24 May 1943

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A - COAST 6
RESERVE 1
B COAST 4
RESERVE 1
GROUP RESERVE 0
SOUTH 8
FRANCE
TOTAL 20

ANNEX TO MAP NO. I
SPECIAL REPORT
NO. 28 ETOUSA
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AUTH GRANTED C.E. MAP & REPR SECT
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RANK LT COL F.A.
SECTION ASSAULT TNG. CEN.
DATE JUNE 21, 1943

COAST A
BELGIUM
A
HOLLAND
RESERVE
A
GERMANY
AMSTERDAM
ROTTERDAM
CALAIS
ROUEN
Meuse
Marne
Seine
GROUP RESERVE
GROUP
COAST B
CHERBOURG
LE HAVRE
CAEN
BREST
RENNES
RESERVE
B
F R A N C E
Loire
SWITZERLAND
BORDEAUX
SOUTH
RESERVE SOUTH
AVIGNON
COAST SOUTH
MARSEILLES

SCALE 1:2,500,000

A -	COAST	9
	RESERVE	2
B -	COAST	7
	RESERVE	2
GROUP	RESERVE	0
SOUTH		10
FRANCE		
TOTAL		30

(MAP NO. 1)

ANNEX TO

SPECIAL REPORT

NO. 28 ETOUSA

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SECT. HQ. S.O.S. ETOUSA TO REP.
0 NEG & 200 POSITIVES

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RANK LT. COL. F.A.
SEC ASLT. TNG CEN
DATE JUNE, 24, 1943

COAST A
HOLLAND
GERMANY
AMSTERDAM
Rotterdam
CALAIS
BELGIUM
RESERVE
COAST B
Cherbourg
Le Havre
Rouen
CAEN
Brest
Rennes
RESERVE
mtz or pa B
PARIS
Marne
GROUP RESERVE
GROUP
B A N C E
SWITZERLAND
R. Loire
R. Saone
R. Rhone
Bordeaux
SOUTH
ITALY
RESERVE
Avignon
South
mtz or pa
COAST RESERVE
Marseilles

SCALE 1:2,500,000

(MAP NO. III)

ANNEX TO SPECIAL REPORT NO. 28 ETOUSA

A – COAST 12
RESERVE 4

B – COAST 7
RESERVE 3

GROUP RESERVE 4

SOUTH	10
FRANCE	30
TOTAL	40

AUTH. GRANTED C.E. MAP & REPR.
SECT. HQ. S.O.S. ETOUSA REP.
O NEG. & 200 POSITIVES

SIGNED L.C. METHENY
RANK LT. COL. F.A.
SECTION ASSAULT TNG CEN.
DATE

AMSTERDAM
ROTTERDAM
HOLLAND
A
CALAIS
BELGIUM
GERMANY
COAST A
RESERVE A
Mostly mtz or pz
CHERBURG
COAST B
LE HAVRE
CAEN
BREST
RESERVE B
RENNES
Mtz or pz
PARIS
Mostly mtz or pz
GROUP RESERVE
GROUP
SEINE
F R A N C E
Loire
Saone
SWITZERLAND
BORDEAUX
SOUTH
R. Loire
R. Rhone
RESERVE SO.
Mtz or pz
MARSEILLES
COAST SOUTH

SCALE - 1:2,500,000

[redacted]

MAP NO. IV

AUTH. GRANTED C.E. MAP & REP. SECT.
HQ. S.O.S. ETOUSA TO REPRODUCE
0 NEG. & 200 POSITIVES

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SECTION ASSAULT TNG. CEN.
DATE JUNE 24, 1943

ANNEX TO
SPECIAL REPORT
NO. 28 ETOUSA

A – COAST	12
RESERVE	5
B – COAST	8
RESERVE	4
GROUP RESERVE	9
SOUTH	12
FRANCE	
TOTAL	50

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[redacted]

MAP NO. IV

AMSTERDAM
Rotterdam
HOLLAND
GERMANY
BELGIUM
Calais
COAST A
RESERVE A
over 50% mtz or pz
Cherbourg
Le Havre
Rouen
COAST B
Brest
Rennes
mostly mtz or pz
RESERVE B
PARIS
Marne
Seine
GROUP
A
N GROUP RESERVE
Loire
over 50% mtz or pz
C
E
SWITZERLAND
R. SOMME
R. RHONE
SOUTH
Bordeaux
RESERVE SOUTH
over 50% mtz or pz
Avignon
ITALY
COAST SOUTH
Marseilles
F
B
R

SCALE: 2,500,000

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Col Zeller 5

SECRET
By authority of:
A.C. of S,G-2
Initials:
Date: 22 May 1943

HEADQUARTERS,
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
Office of the Assistant Chief of Staff, G-2

22 May 1943

SPECIAL REPORT)
)
NUMBER .... 33)

THE DEFENSE OF FRANCE AND THE LOW COUNTRIES
~~AMENDED~~ -

(This paper supercedes Special Report Number 27 as issued on 1 April 1943. General agreement as to its contents has been obtained from GS(I), GHQ, Home Force).

1. THE GERMAN PLAN - The German plan for the defense of FRANCE and the LOW COUNTRIES, is designed essentially to protect the ports. It consists of the following elements (this report does not deal with the air and naval phases of the defense):

a. To repel the initial assault: garrisoning and fortification of the coastline in all likely assault areas, with emphasis on those at or near ports. Great reliance is placed on the use of artillery of all calibers.

b. To repel the assault where it penetrates the defenses of the shoreline, or, as the next stage, to defeat the initial build-up: provision of mobile reserves echeloned to the rear, and improvement of communications to facilitate their movement.

c. To prevent swift mechanized penetration for the purpose of isolating a port: obstacles in rear of the shoreline, such as inundations, minefields, bridges prepared for demolition, and various constructed obstacles, covered to some extent by fire, mostly of antitank guns and machine guns. This should not be taken to indicate that there is any true defense in depth. These passive measures are placed to accomplish delay and give the mobile reserves a chance to act. They do not constitute rear positions of a zone defense. There is only one main line of resistance and that is the shoreline.

d. To hold against attacks on ports from landward: garrisoning and fortification of ports to provide all-round defense, thus providing them the means to resist a siege.

e. To render ports useless after capture, at least for a considerable time: preparation for demolition of port facilities, etc.

2. PRESENT STATE OF PREPARATIONS - As to the progress the Germans have made in carrying out the defensive plan outlined above, it will probably serve best to discuss each item as listed:

a. The garrison of the defensive works along the shoreline varies in quality and to some extent in numerical strength with the season of the year, depending on the degree to which the weather favors an assault, and with the demands on the RUSSIAN FRONT. As a matter of fact, it varies very little in actual numbers, being maintained at a fairly constant figure apparently established by an estimate of minimum requirements. Variations in the overall strength of the garrison are usually taken up in the size of the mobile reserves maintained. As to the defensive works along the shoreline, they have received priority in construction over other installations required to complete the defensive system, and it is believed that all such works that are actually "manned" such as batteries, the more important installations within strongpoints, etc., are pretty well completed.

There is room for progress in mining, construction of obstacles, and in the concreting and elaboration of positions already installed in more sketchy fashion.

b. As stated above, variations in the overall strength of the garrison are usually taken up in the size of the mobile reserve, this element of the defense being stronger during the part of the year favoring an assaulting force. Communications facilitating the movement of the mobile reserves have been developed to a high degree.

c. Defenses back of the shoreline offering resistance to mechanized penetrations, have received a lower priority than those on the immediate shoreline, and their construction and development will probably continue. They cannot be considered anywhere near complete at the present.

d. The all round defense of ports receives a priority second only to the defense of the shoreline against assault. Garrisons are maintained at a fairly constant figure, and the installation on the seaward side are as complete as those elsewhere along the shoreline. The landward defenses of the ports were not started until shoreline defenses were rather well along, but they are now approaching completion. Their improvement in extent and strength will undoubtedly continue.

e. Extensive demolitions of port facilities, etc., have been prepared.

3. FUTURE DEVELOPMENTS OF FIXED DEFENSES - To summarize the references in the above paragraph to the future of the fixed defenses:

a. Improvements in the defense of the shoreline will probably consist of more extensive mining, construction of more and stronger obstacles, and in the concreting of installations already constructed in temporary fashion.

b. Extensive improvements in obstacles, etc., back to the shoreline can be expected.

c. The landward defenses of ports will be strengthened.

4. INTERIOR DEFENSE LINES - It is not believed that at present there exist any extensively organized positions in the interior, short of the SIEGFRIED LINE. There have been many reports of such positions, but most seem to have been in error, mistaking various installations such as signal centers, supply dumps, interior headquarters, etc., for fortifications. The old Belgian and French lines seem to have been dismantled to a degree, and much of their equipment used on the coast. The enemy is known to have made preparations for the demolition of many bridges, and it is likely that he will rely on defending river lines as interior obstacles if the coastal fortifications are penetrated.

5. DEFENSE AGAINST AIR-BORNE ATTACK - Defense against air-borne attack is initially the responsibility of local commanders, and is based on prescribed tactical doctrine which is similar to our own. Local defense is backed up by the employment of mobile reserves. Disused airdromes are ploughed up or obstructed to prevent their use by air-landing troops, and even operational airdromes are provided with movable obstacles which can be quickly put in place. (See Special Report No.29). In the case of ports with all-round defense the landward fortifications afford security, and the obstacles, etc., discussed in paragraphs 1c. and 2c. will help to confine movement of air-borne troops to the area of their initial landing, at least until the mobile reserves have had a chance to act. There is no question but that the garrison has been alerted to the danger of air-borne attack, and many local precautions have been taken.

6. ATTACHED MAP - Attached to this report is a map (Annex B) showing the present state of the fixed defenses, as follows:

a. Heavily defended areas: those where there are strong points heavily distributed to cover by fire all beaches, beach exits, and other vulnerable points, those being also blocked by obstacles. An abundance of artillery is provided.

b. Lightly defended areas: those where the most vulnerable points are defended by fixed positions, but where reliance is placed on the mobility of defending units and reserves to protect areas not directly covered by strong points.

c. Areas where there are few fixed defenses, reliance being placed on the unsuitability of the terrain to an assault.

d. Ports with all-round defense.

PERCY G. BLACK,
Colonel, G.S.C.,
A.C.of S., G-2

Annex A ... German Division Sector, Channel Coast.
Annex B ... Map. (Fixed Coast Defenses, FRANCE and the LOW COUNTRIES).

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ANNEX "A" TO SPECIAL REPORT NO. 2. ETOUSA. 22 May 1943.

GERMAN DIVISION SECTOR CHANNEL COAST

Section I ..... Introduction.

Section II ..... Size of Garrison Allotted to a given length of Coast Line.

Section III .... Weapons employed.

Section IV ..... Disposition of Troops and Weapons

Section V ..... Fortifications

Section VI ..... Notes taken at the German War College. (Fundamentals of Coast Defense).

I. INTRODUCTION

1. GENERAL - This report describes somewhat schematically the organization for defense of a strong sector on the CHANNEL COAST, in this case garrisoned by a full strength German offensive infantry division. It should be borne in mind that most sectors are held by defensive, two regiment divisions, in which case the organization for defense of the coast will remain similar to that described below, except that there will be no reserve regiment and probably less divisional artillery. In any case to avoid the impression that defense of a coastal sector is organized in stereotyped fashion, the following points should be kept in mind:

a. German Flexibility - It is standard German technique to vary the type of division and organization within the division to meet the specific situation. Therefore it is quite likely that no divisional sector will be held exactly as described herein. This "flexibility" of the Germans is further emphasized currently by shortage of man-power and equipment. In using this report, therefore, it should be remembered that it indicates the scale of resistance to be encountered only:

(1) In an importand and vulnerable part of the coast,

(2) If the Germans estimated that an Allied assault was imminent, and

(3) If the Germans had offensive infantry divisions to spare for employment in coastal sectors.

b. Defense Adapted to the Terrain - The strength, dispositions, and fortifications described herein would more likely be found on a stretch of coast where conditions are suitable for an assault. Where conditions favor the defense, divisions may hold wider sectors, the degree of fortification may be reduced, etc.

2. POINTS TO BE CONSIDERED - Only the units and installations normally found in the divisional sector are considered. Corps and Army reserves, which are held some distance to the rear, and defensive installations in the rear areas, are excluded. In studying the strength of such a sector, the following must be considered:

a. Size of garrison allotted to a given length of coast line.

b. Weapons employed.

c. Dispositions of troops and weapons.

d. Defensive installations (obstacles, pillboxes, etc.)

3. GERMAN THEORY OF COAST DEFENSE: Section VI of this Annex is a translation of a document captured in TUNISIA, on the fundamentals of coast defense in FRANCE. This document was apparently made up from notes taken at the German War College (Kriegsakademie). The date on which these notes were originally written is unfortunately unknown.

II. SIZE OF GARRISON ALLOTTED TO A GIVEN LENGTH OF COAST LINE

4. DIVISION SECTOR - A division sector on a well-defended part of the coast is approximately twenty-four miles long by twelve miles deep. As the usual practice is to place two regiments forward on the coast and one in reserve, the regimental front is from ten to fifteen miles depending upon the terrain and natural boundaries. The type of division which might be found is the offensive infantry division with a strength of approximately 15,000 and which consists of the following units:

Three infantry regiments,
One artillery regiment,
One engineer battalion,
One reconnaissance battalion,
One signal battalion,
One tank destroyer battalion,
Services.

5. ATTACHED ARTILLERY - In addition to the division artillery, batteries from the GHQ pool will be found. This artillery, perhaps attached to the division, normally will consist of heavy coast defense gun batteries, averaging about six for a division front. The guns will vary in caliber, but the most usual caliber is six-inch. Where guns heavier than this are found, they are usually allotted for some special purpose not associated with the immediate defense of the sector. Examples of this are the "super-heavy" batteries in the PAS DE CALAIS, the mission of which is really offensive, although they do of course contribute to the strength of the sectors in which they are located. The GHQ artillery found in the division sector may include railway batteries.

6. ANTI-AIRCRAFT - Antiaircraft batteries are allotted in various numbers according to the importance of objectives (airdromes, major towns, heavy coastal batteries, etc.). The number of batteries to be found in a type sector can therefore not be estimated.

7. ANTI-TANK - Antitank weapons are also allotted in various numbers. The number of antitank guns to be found in a type sector will usually exceed the normal division establishment.

III. WEAPONS EMPLOYED

8. DIVISION WEAPONS - Normal weapons of the infantry division remain the backbone of the defense, supplemented by those of coast defense units, antiaircraft units, and railway artillery units (if railway guns are used). In addition, miscellaneous permanently installed weapons are employed, such as guns found in obsolete tanks and tank turrets used as pillboxes. All divisional and non-divisional weapons (including those of separate units which may be found in the sector) are worked into a unified fire plan. The normal weapons of an offensive infantry division are:

[redacted]

36-105 mm gun-hows ...	In the division artillery regiment
4-105 mm guns*	In the division artillery regiment
8-150 mm hows	In the division artillery regiment
18-75 mm inf. hows ...	Six per infantry regiment.
6-150 mm inf. hows ..	Two per infantry regiment
2-75 mm inf. hows ...	In the reconnaissance battalion
84-50 mm mortars	Twenty-seven per infantry regiment plus three in the reconnaissance battalion.
57-81 mm mortars	Eighteen per infantry regiment plus three in the reconnaissance battalion.
75-37 mm & 50 mm anti-tank guns	Twelve per infantry regiment, thirty-six in the tank destroyer battalion, and three in the reconnaissance battalion.
48-20 mm dual purpose antiaircraft/anti-tank guns	Four per infantry regiment, twelve in artillery regiment and twenty-four in tank destroyer battalion. (There is considerable doubt as to whether these weapons now appear in the division structure).
81-7.9 mm antitank rifles	Twenty-seven per infantry regiment.
447 light machine guns	Some in all units of the division
116 heavy machine guns	Thirty-six per infantry regiment plus eight in the reconnaissance battalion.

9. ATTACHED HEAVY ARTILLERY - An average of six batteries of heavy artillery with the division would add to the normal fire power of the division a strength of twenty-four to thirty-six heavy guns.

* ... May be replaced by 150 mm guns or howitzers

10. ANTI-AIRCRAFT - Heavy antiaircraft batteries found in the division sector consist of four or six 88 mm guns (sometimes 105 mm guns) and two light antiaircraft guns. Light batteries usually have either twelve or fifteen 20 mm antiaircraft guns and four or five 60 cm searchlights or nine or twelve 37 mm antiaircraft guns and three 60 cm searchlights.

11. ANTI-TANK - In addition to the normal strength of the division, various numbers of antitank guns of any description, may be expected to be found as an inherent part of the structure of the defense area. These guns may include captured weapons and weapons of obsolete type.

12. RAILWAY ARTILLERY - Within the division sector, there may be railway artillery. The normal organization is two guns to a battery. The caliber of German railway guns may range from 150 mm (6 inch) up to 420 mm (16.8 inch).

IV. DISPOSITION OF TROOPS AND WEAPONS

13. DISPOSITION OF DIVISIONAL TROOPS AND WEAPONS - a. Infantry - Two of the infantry regiments are placed forward on the coast while the third is held in reserve about ten miles to the rear. The command post of each of the forward regiments is located from two to five miles inland, near the center of the regimental sector. The division command post is generally located in a fair sized town some ten miles inland. In each regimental sector two battalions are usually sited forward with the third in reserve. Forward battalion form strongpoints at beach exits, vulnerable points along the shore, and at vital areas inland (road junctions, command and communication centers, etc.). These strongpoints are

supplied with a high proportion of heavy machine guns and heavy mortars, drawn from the machine gun company in each infantry battalion and allotted to the rifle companies. Regimental antitank guns will also be located within strongpoints, and sited to cover beaches, beach exits, bridges, road junctions, and other such vital points.

b. Artillery - The division artillery regiment consists of the following units:

Three light battalions of twelve 105mm gun-howitzers each.

One medium battalion of four 105 mm guns and eight 150 mm howitzers. Although the medium battalion may not always be present with the regiment in the division sector, it is believed that when it is not it will normally be replaced by comparable artillery from the GHQ Pool. One light battalion is likely to be sited in each forward regimental sector covering the beaches, with the remaining light battalion located in the area of the reserve infantry regiment as a "break through" battalion or in reserve. The medium battalion of the division, if present, would likely be held further in the rear, having several prepared positions to which it could move in order to lay fire on the beaches or other objectives when and as required. Where medium artillery from the GHQ pool is present, it may be equipped to fire out to sea, and then would be sited well forward to fire on shipping, or, if not so equipped, would likely be used in the same way as a divisional medium battalion.

c. Antitank Guns - Antitank guns will be located on the sea-front of towns and on important beaches, sited as far forward as possible to engage hostile landing craft and tanks at the earliest opportunity and to cover beach exits and routes inland. About one third of the total available antitank guns may be held in mobile reserve. It must be remembered that the number of antitank guns found in the division sector will considerably exceed the normal division establishment.

d. Miscellaneous Units - The disposition of the remaining units of the division cannot be laid down.

14. DISPOSITION OF COAST DEFENSE AND RAILWAY ARTILLERY UNITS - It is estimated that on the average six heavy gun batteries of coast defense artillery will be found in the division sector. They are located well forward as close to the shore-line as the terrain allows, but so sited as to be protected from capture in the first phase of an assault. Turntables or spurs for railway guns will be so located as to enable these guns to supplement the stationary artillery. They will probably be sited as far forward as the railroad and terrain permit.

15. DISPOSITION OF ANTI-AIRCRAFT UNITS - Antiaircraft batteries, located where they can best protect vulnerable targets, wherever possible are sited so that they fulfill a secondary role of engaging ground and sea targets. Heavy antiaircraft guns are sited so as to be able to fire on shipping and tanks as well as aircraft, while light antiaircraft guns are located so that they can be used against landing craft, enemy tanks on the beach and beach exits, etc. Heavy guns are sited in groups of four or six while light guns are normally in groups of three.

16. MISCELLANEOUS - Machine guns of antiaircraft units, antitank units, coastal batteries, and signal installations, serve to supplement the normal machine gun strength of the division.

V. FORTIFICATIONS

17. PILLBOXES - Pillboxes are used to protect antitank guns and machine guns, although in general, open emplacements combined with shelters are preferred. They are located in company and smaller

strongpoints, sometimes on the beach, and occasionally in the cliffs backing the beach, and are mostly made of concrete with a very low silhouette. Tank turrets are also extensively used. At some locations, obsolete tanks are used as pillboxes, being dug in with only the turrets projecting above ground. In some cases the sides of the excavations into which the tanks are driven are revetted with reinforced concrete.

18. CASEMATES - Casemates may be used for the protection of coast defense guns, although the great majority of guns are found in emplacements.

19. EMPLACEMENTS - a. - Artillery - Coast defense artillery emplacements are usually of concrete, but in the case of field artillery batteries, many are built of sandbags or earth.

b. Anti-tank guns and machine guns - For antitank guns and machine guns, the open topped Tobruk type of emplacement, which has a very low silhouette and includes an underground shelter, is extensively used. There are also other similar types.

20. SHELTERS - Concrete personnel shelters and magazines are installed in all strongly defended localities. In less important sectors, dugouts, sandbagged shelters, and brick and concrete shelters without reinforcement, are still found. Shelters are installed in connection with fire trenches, emplacements, etc., to protect personnel during preparation fires.

21. OBSTACLES - There are three main types of obstacles, i.e. underwater obstacles, antipersonnel obstacles, and antitank or antivehicle obstacles.

a. Underwater Obstacles - To date there has been no evidence of extensive use of underwater obstacles. This may be due to the difficulty in keeping them in position. At DIEPPE stakes were encountered by landing craft which were slowed down but were not stopped. Extensive underwater beach scaffolding, etc., has not been installed.

b. Antipersonnel Obstacles - Wire is extensively used on all beaches, at beach exits, and around strongpoints and gun emplacements. On beaches wire is generally placed just above the high water line, and in front of promenades and seawalls. Several types of wire entanglement are used. Antipersonnel mines are also placed at many infantry beach exits, and around defended localities. Booby traps have been found on some of the beaches, set off by trip wires strung across exits and gaps in wire entanglements.

c. Antitank Obstacles - Many types of antitank or antivehicle obstacles have been reported, including walls, ditches, dragons teeth, knife rests, and rail obstacles. Walls are constructed from concrete and are often strengthened by ditches dug immediately in front. There is also an obstacle known as "Elements C" which is a prefabricated movable barrier of steel framework and cables. This has been seen more and more on beaches and at beach exits. Exits suitable for tanks and vehicles are heavily mined with antitank mines, and large minefields are known to exist in open country in rear of beaches, at important points on routes inland and protecting installations.

22. R.D.F. STATIONS - Radio direction finding stations are used extensively to give warning to approaching seacraft and aircraft and quite often direct the fire of coast defense and antiaircraft artillery. These stations are located as far forward and on as high ground as possible and are usually protected by circular sandbag or concrete emplacements. They are located within strongpoints for protection.

23. BEACH SEARCHLIGHTS - Searchlights are located where required to illuminate targets on and approaching the beach. These

searchlights are probably operated by the infantry of strongpoints, and are not used as part of the antiaircraft defenses.

24. TOWNS - A special case in fortifications which is worthy of discussion, is the strongpoint based on a coastal town. This type of strongpoint is particularly formidable. Almost all coastal towns will be found to be fortified to a certain extent to provide all around defense by fire and obstacles, as they usually have some port facilities or a good beach, and at any rate are centers of communications. Some of the more important ports have been made into fortresses (see map-Annex B). The beach is usually backed by a seawall and promenade, which will be made more effective as an obstacle by the use of wire or other means. Buildings along the water front are bricked up to include the ground floor, and thus converted into fortifications. Roads leading from the beach or waterfront are blocked with antitank obstacles. Buildings not used as fortifications and which interfere with fire are demolished. Civilian wire communications are fully employed and supplemented as required, to control the defense. For this reason battalion and some times higher headquarters are often found in coastal towns.

VI. NOTES TAKEN AT THE GERMAN WAR COLLEGE
FUNDAMENTALS OF COAST DEFENSE

25. Owing to the lack of men, defense will be organized in strongpoints. The principle of siting the strongpoint system in depth must be given up. In siting and organizing these strongpoints, the following essentials must be considered:

a. Where has the enemy facilities for landing?

b. Where beyond the landing areas will he find good roads for penetration into the interior of the country?

c. Where will he find important installations, the seizure or destruction of which is of importance for him?

d. If, further, all sectors are ruled out which are unfavorable for landing (waters where navigation is difficult, islands offshore serving as bastions, cliffs, wooded country, marsh or bogs, areas with poor means of communication), the sectors in which landing is possible or probable will then be clear.

26. a. At present, it is only in the areas favorable for landing that strongpoints should be constructed and occupied. They will be sited to fulfill the following conditions:

(1) Their weapons should command as large a field of fire as possible; that is to say, the area swept by the weapons should be as large as possible. It is unwise to site these weapons on commanding features because the ground swept is restricted in consequence, and towards the end the weapon is only able to engage targets at short ranges. The result is that one runs a big risk of seeing the enemy infiltrate below the trajectory of the weapon, the dead ground being very considerable in area.

(2) The strongpoints must have observation of as large a sector as possible.

(3) Owing to the scarcity of men the number of strongpoints will be so restricted that observation without a break of the whole coastal sector cannot be assured. It will be necessary, at a later stage, to site posts with a reasonable fighting capacity between the strongpoints; if possible, one rifle section with one light machine-gun.

b. The methods of alarm in case of enemy approach must be clearly indicated and must be communicated to each man as an individual instruction. At night patrols must be undertaken, as far as possible on bicycles.

27. ORGANIZATION OF SECTORS - a. - Each company must keep, as far as possible, one section (platoon ?) in reserve. The medium machine-gun companies will be regrouped and sections put under the

command of the rifle companies: one section will be kept, if possible, with the battalion reserve. The medium machine-guns and the (light ?) mortars are to be kept with the (company ?) mobile reserves. The regimental motorcyclists are to be formed into medium machine-gun sections.

b. It is advisable, in spite of the actual weakness of the units, to keep the company in its twelve sections, in order to man the machine-guns properly. Whilst doing this, it must be realised that the sections are weaker than they should be. It is necessary to establish very rapid liaison with all the strong-points at least by cyclist; and, if possible, all the strongpoints will be linked to the Command Post by telephone. If the wire necessary to connect them direct to the Headquarters of the unit to which they are attached is lacking, a relay system must be rigged up.

c. If, on account of the length of the defense sector, there is no company which can be kept as battalion reserve, improvise; call on the Supply Services personnel and the staffs; instruct them so that all men (including clerks, orderlies etc.) may be used for counter-attacks. The necessary training must be undertaken as soon as possible.

28. Sector-commanders must not only agree with the commanders of the other services of the Wehrmacht about their employment in case of a landing but also, from now on, incorporate into their defense plan all the weapons available in their sector. By this means some of their own weapons which are absolutely necessary at other points will be freed.

29. USE OF ARTILLERY - a. - The coastal batteries must NOT be sited in splendid isolation all the way along the coast. They must be sited to a certain extent around the main point of resistance. In addition to the fact that batteries in such isolated sites are exposed to the full action of enemy fire, they are no longer usable after the enemy has landed as they are then exposed to direct attack. They must, therefore, be sited at such a distance inland and protected in such a way that they can bring fire to bear on the whole coastal belt during an enemy landing. Their employment in this manner produces better results than firing at objectives on the sea. In the case of a battery position in the open along the coast, an Observation Post 200 or 300m. from the position is not necessary. The raison d'etre of these batteries in the open is that from such a position one can observe and shoot at the same time.

b. Each battery should have only a single barrage zone. It is NOT enough to calculate for predicted fire; fire by observation is also necessary. It is necessary to make use of all existing means of communication; wireless apparatus must be as far as possible mobile, so that one can change Observation Posts. I have been told in several places that, in case of a successful enemy landing, the coastal batteries would be able to fire on targets to landward. This can only be successful if the necessary Observation Posts are available. Firing from the map is a waste of ammunition and endangers our own troops.

30. As regards conduct of the battle, these are the essential points in brief; the strongpoints must be defended in all circumstances even when the enemy has landed and has succeeded in breaking through. The local reserves must be used to counter-attack. If the counter-attack fails then switch positions must be organized to the rear, which must be held until such time as the more weighty and deliberate counter-attack to be organized has succeeded.

NOTES:

1. This translation (Section VI) cannot be guaranteed, as the original text is not available at this office.

2. In paragraph 25, the "artillery" meant would seem to be the divisional field artillery: at any rate, the principles enunciated have NOT been followed with regard to the regular Coast Defense gun batteries.

[redacted]

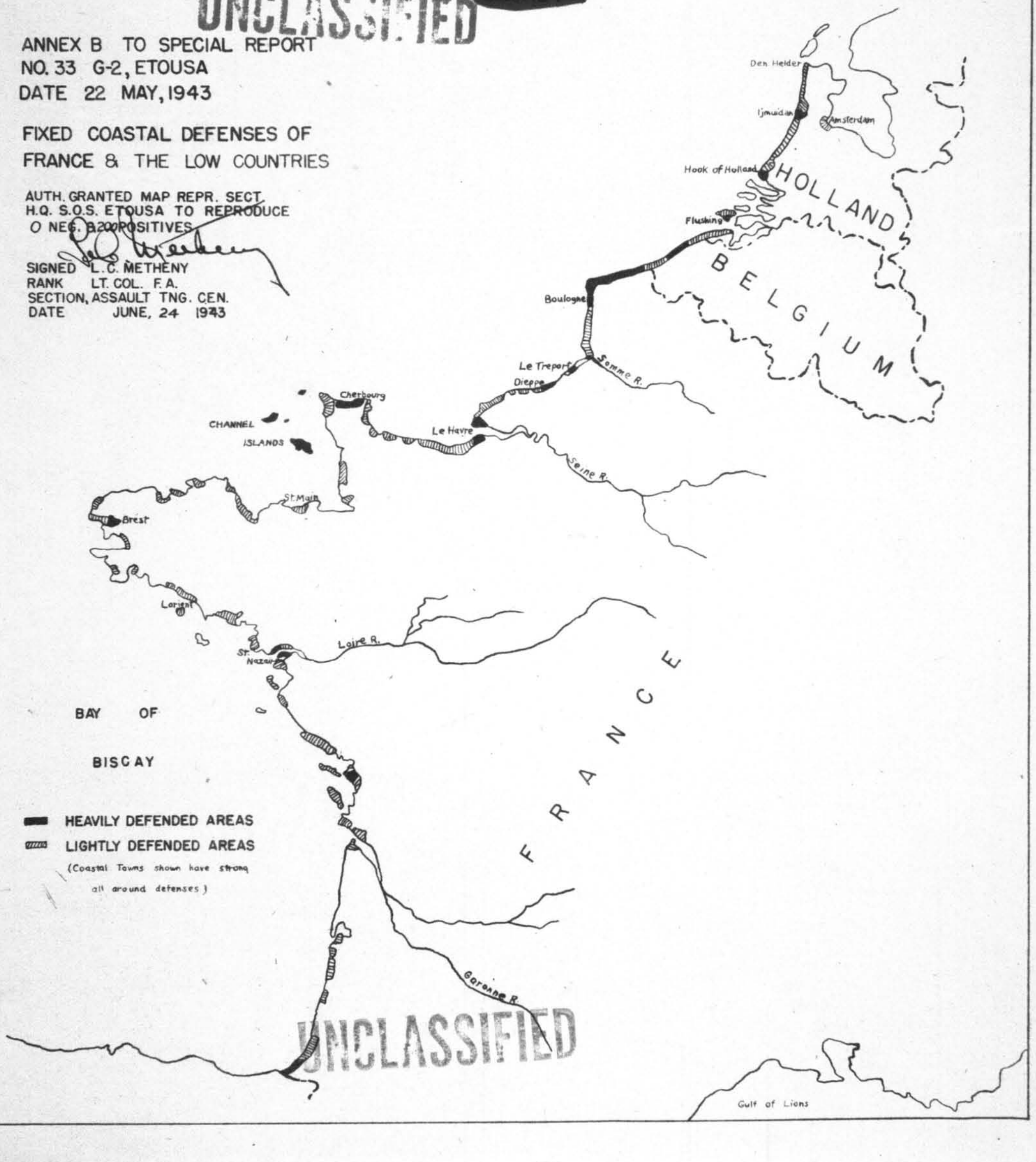
~~UNCLASSIFIED~~ ~~SECRET~~

ANNEX B TO SPECIAL REPORT
NO. 33 G-2, ETOUSA
DATE 22 MAY, 1943

FIXED COASTAL DEFENSES OF FRANCE & THE LOW COUNTRIES

AUTH. GRANTED MAP REPR. SECT.
H.Q. S.O.S. ETOUSA TO REPRODUCE
0 NEG. 200 POSITIVES

SIGNED L. C. METHENY
RANK LT. COL. F. A.
SECTION, ASSAULT TNG. CEN.
DATE JUNE, 24 1943



~~UNCLASSIFIED~~

[redacted]

ASSAULT TRAINING CENTER
CONFERENCE
HQ ETOUSA

25 May 1943
KM

ADDRESS BY: Lt Col BELL BURTON (Br)
(GSO1, British Army Intelligence)

NOTE: As his address before the Assault Training Center Conference, Col Burton read the paper "GERMAN DEFENSIVE DOCTRINE", which follows on pages 14 to 18 inclusive. The document "German Coast Defenses", pages 1 to 13 inclusive, was distributed to members of the conference.

[redacted]

GERMAN COAST DEFENSES

This paper contains a summary of German defense works in FRANCE (NORTH SEA and ATLANTIC Coasts only), BELGIUM and HOLLAND, as at present known, with particular reference to obstacles of all types, personnel shelters, magazines, and emplacements for M.G's and light guns. Emplacements for field and coastal guns are also discussed briefly, and a note on Petroleum Warfare and Smoke is added at Section XII.

1. WIRE OBSTACLES

1. Wire on Beaches - In general there are two or more continuous bolts of wire along all open beaches. They are normally sited between high-water mark and the foot of the dunes. The following types are found:

a. Knife rests, consisting of a wire entanglement on close-spaced wooden trestles. Recent photographs show that in some cases such fences are made of units with four trestles with a central cross-bar, the units being bound together end to end.

Height of obstacle	about 4 ft
Width " "	" 4 ft
Distance between trestles	" 4 - 5 ft
Length of 4-trestle unit	" 16 -20 ft

b. Apron-fences, single or double, supported on 6 ft 6 in L-section or spiral steel pickets, usually embedded in concrete blocks to a depth of about 18 ins. There is often a single coil of dannert-type wire under the "apron" of the double-apron fence, and sometimes another coil along the top of the fence.

Height of obstacle	4 - 5 ft
" " " (with coil on top)	7 - 8 ft
Width of obstacle	up to 9 ft

c. Simple 5 or 6 strand "cattle" fences. Two or three of these fences will always be found together, from 4 to 8 ft apart. It is probable that the interval between them is in many cases filled in with a wire entanglement. Such fences are also supported on 6 ft 6 in L-section or spiral steel pickets.

Height of obstacle	4 - 5 ft

d. Coiled dannert-type wire, in single, double or triple coil. L-section or spiral steel pickets are mostly used. Cases are known, however, of single-coil being supported on short concrete bollards in front of beach pillboxes. Coiled-wire fences are most favored along the top of a seawall or promenade, especially at coastal towns.

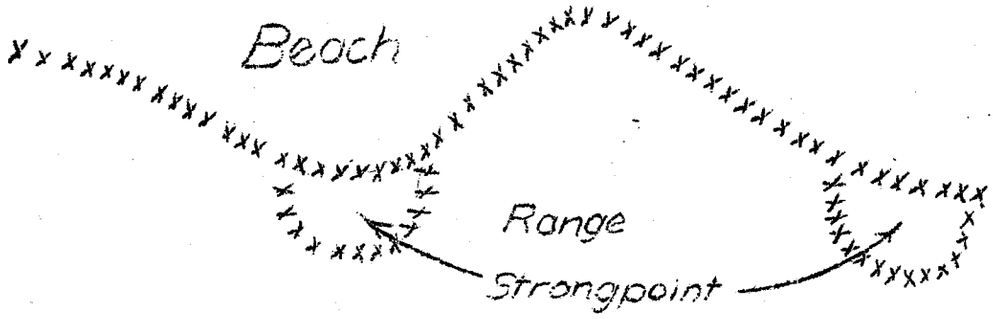
e. Trip-wire is often laid in front of the main wire obstacle. It is laid in a diamond pattern between the high-water mark and the first continuous wire fence.

Height of obstacle	4 - 6 in
Length of Diagonal of diamond shaped section?	4 - 6 ft
Width of obstacle?	12 -20 ft

f. Electrified wire (Starkstromhindernis). This type of obstacle definitely exists and has occasionally been reported by reliable sources as in use in BELGIUM and FRANCE. Presumably the outer wire fences are electrified by means of an insulated H.T. cable. Electrification can of course serve both as an obstacle in itself and as a warning device.

g. Combination of the above types. Any two or more of the above obstacles may be sited parallel to each other. A typical example of recent date consists of trip-wire, immediately behind it a trestle fence, and some 10 to 20 yards further back an apron fence; the total depth of the wired area may be about 30 to 60 yards. In some areas fences erected early in 1942 consisted of two or three belts of wire, often all the same type, very close to each other and in all constituting an obstacle 25 ft wide or more. On the seafront of town there is generally an apron or trestle fence on the beach and a coiled wire (or apron) fence on top of the seawall.

h. Siting of wire on beaches. Wire seldom runs in a straight line for any considerable distance along a beach but generally runs parallel to the shore along the entire length of the strongpoint area, either straight or in short zig-zags. Between strongpoints it juts out from the line of the dunes towards the sea; the length of the arms of one "dog-leg" may be over 100 yards (see Sketch). Thus a considerable stretch of wire can be enfiladed from each strongpoint.



i. Depth of wire round strongpoints. The distance between the outer and inner wire perimeter of a strongpoint varies according to the topography of the area and the importance of its installation. In some places it is as small as 30 to 60 yards, in others it may be between 70 and 130 yards, or even as much as 200 yards.

k. Wire below high water mark has been reported. This is certainly not common and is not likely to form a serious obstacle on the ATLANTIC or NORTH SEA coasts.

l Antipersonnel mines and booby traps may be expected in wire fences in between parallel belts of wire.

2. Wire round fortified towns. In the case of towns provided with perimeter defenses a single or double belt of wire surrounds the entire town and strong points are generally surrounded by a double belt of wire. The types used are as above (par 1). Such wire sometimes follows the line of hedges, ditches, etc, but is more often laid in zig-zags in open country.

3. Wire round defended localities. Similar to wire on beaches. Individual posts within a position are often separated by wire. In general, the distance from the outer edge of the wire perimeter to the nearest pillboxes or other firing posts is not less than 30 yards.

4. Wire in gullies and on cliffs. Gullies, "chimneys" etc, providing a beach exit are barred by a dense entanglement of wire, 20 foot deep or more. The wire is often continued a single fence along the cliff-tops, on either side of such a feature.

5. Wire associated with ditches, minefields, walls, road blocks, and other kinds of obstacles. See below Sections II, III, IV and V.

6. Types of wire used. Apart from ordinary barbed wire the enemy use in some areas limited amounts of a special type of wire with a hard steel core which can only be cut by standard British wire-cutting with great difficulty. In addition, P.W. have spoken of the use of wire made of soft non-corrosive metal, rectangular in section and thicker than ordinary wire. The barbs are longer and more closely spaced than usual.

II. MINEFIELDS

1. The use of antipersonnel and antitank mines is now general along the coasts of FRANCE, BELGIUM and HOLLAND. Minefields are usually fenced off and posted with "Danger" signs. There is evidence that these notices are sometimes put up as a decoy in places where there are in fact no mines.

2. Antipersonnel mines The only type of mine so far known to be in use is the German S-mine, but standard German types of buried charge are also used especially at beach exits. Minefields of this type are normally found:

a. Round the perimeter of defended localities. Mines are normally laid in 3 or 4 rows between two parallel belts of wire. As many as 6 rows may be found. The distance between mines in any direction is 9 to 1r ft, so that the depth of the minefield will normally very between 18 ft and 75 ft. Scattered mines may also be found under wire-fences and outside the wire perimeter along likely lines of approach.

b. At infantry exits from beaches. Minefields are likely to be found in turf and in dunes in the rear of beaches, also in gullies and on cliff-tops near any infantry exit. Spacing of mines is probably 9 to 15 ft intervals in any direction although one good report describes S-mines laid at intervals of 3 ft. Mines are normally laid in belts of 3 or 4 rows with a total length of 50 yards or more. It is reasonable to suppose that large minefields in open country include several staggered belts.

c. Booby traps. There is little doubt that booby traps are used. No details are known. For mined buildings see below Section III par 3.

3. Antitank mines There have been many reports of German T-mines, and recently a few reports of French antitank mines with fuze type 36. The German "Brettstuckmine" is also used. This consists of a metal case containing 1 Kg of explosive, with boards fixed above and below it by means of wire. The mine is detonated by pressure on the upper board. Antitank mines are normally found:

a. At AFV exits from beaches. Small groups of mines will be laid on the road or track and also on either side of it. In many cases the mines will be associated with road blocks (ditches or walls) on the road itself.

b. In open country in dunes or grassland in rear of beaches. Several large minefields are known to have been laid varying in length between 50 yards and 500 yards. The greatest depth of any minefield known is about 150 yards. Antitank mines are laid about 5 yards apart in any direction, and normally in belts of 4 rows, each bolt at least 50 yards long. A large minefield may consist of several staggered belts. As in the case of antipersonnel minefields, there is usually wire along the front and rear edges of the mined area.

c. At road junctions and road defiles up to 5 miles inland, especially at approaches to strongpoints and in conjunction with road blocks. Groups of 5 to 8 mines are reported to be used

at such positions either in 2 or 3 staggered rows, or in line diagonally across the road. Other mines may be laid in adjacent fields.

d. Antitank minefields of the type described in b. above are occasionally found in fields and meadows on the landward approaches to strongly defended coast towns.

III. PREPARED DEMOLITIONS

1. Cratering of roads. See below Section IV, par 8.

2. Mining of Bridges. Most bridges in coastal areas are prepared for demolition, and charges can be inserted at short notice.

3. Mining of buildings on the seafront. It is confirmed that mines or explosive charges have been placed in many houses on the seafront, especially in North FRANCE and BELGIUM. It is not always clear in particular cases whether this is done (a) in connection with the extensive clearance of buildings in and around defended localities (to clear a field of fire or deprive an attacking enemy of covered approach to the position) or (b) as a form of booby trap.

4. Port installations. Quays, jetties and moles at all important ports, including some inland ports, are prepared for demolition. Excavations 6ft 6 in deep and 2 ft 7 in in diameter have been made at 11 yard intervals along quay 2 to 3 ft from the edge. On moles, jetties, etc., similar excavations are made in two or three staggered rows across the landward end of the structure (generally about 9 excavations in all). Nothing is known of the charges used. It is probable that in some cases buildings in the port area are also prepared for demolition in the same way and cranes are certainly so. Port demolitions are believed to be controlled electrically from the naval port authority headquarters, which is generally situated in a defended locality in the town.

IV. ROAD BLOCKS

1. Concrete Walls. This is the commonest type of road block in all strongly defended areas. Walls are used to block streets and roads leading from a beach or harbor, streets inside the town at the approaches to keypoints, and streets and roads on the outskirts of the town on the landward side; also well defined exits from open beaches. Roadblocks of this type together with existing buildings will often form a continuous obstacle along the entire seafront of a town.

The following types of wall are found:

a. Continuous walls at right angles to the line of the street, across roadway and sidewalks. The thickness of the wall may be as little as 6 ft but is more often between 8 ft and 11 ft. The height varies between 6 ft and 8 ft 6 in. The top of the wall is either flat or curved. The foundations may be about 6 ft 6 in below ground level. Details of reinforcement are not known, but it does not appear to be very strong. Reinforcements bars often project along the top of the wall and are used to support a wire obstacle. The face of the wall may be vertical or may have an overhang. The back of the wall is generally sloping and may have a firestep for an antitank gun built into it.

b. V-shaped walls are now being built across beach exits, especially on open beaches outside towns. They are V-shaped in plan with the point of the V to the front. Dimensions of this type of wall are similar to those described in par a. above.

c. Walls with gaps. In the interior and on the landward side of towns there is generally a gap in the wall sufficient for one vehicle to pass at a time. This also applies to one or two roads leading from the seafront in each town, which the enemy require for their own use. In road-blocks of this kind the two sections of wall may be sited.

(1) directly opposite each other so that the gap can be closed by girders, rails or gates fitted into sockets in the end of each section (see also par 6 below), or

(2) "en chicane", i.e. one section on one side of the road, and the other on the other side some distance further along the road so that any vehicle passing through must slow down and zig-zag. The distance between the two walls may be from 16 ft upwards.

NOTE: (1) There is often a ditch in front of continuous walls of types (a) and (b) above, or a tank-trap in the form of a pit covered with planks or netting.

(2) In BRITTANY wall road blocks are often made of stone (principally granite).

2. Antitank ditches are found blocking roads, especially along coast roads and country roads. There may be two ditches within a few yards of each other. At present a gap in the ditches for a single traffic is left.

Width of ditch	10 - 12 ft
Depth of ditch	6 - 8 ft

The ditch is generally revetted (at the back) with concrete and sometimes entirely lined with concrete. Steel rails projecting about 3 ft are often embedded in the concrete.

3. Dragons' teeth are used to block streets and exits from quays, also well-defined beach exits, such as beach ramps. Known instances of this type of obstacle consist of 3 or 4 staggered rows, 6 to 8 ft apart. The distance between teeth on one row is also about 6 ft to 8 ft. All dragons' teeth so far seen on air photographs appear to be regular pyramids between 2 ft 6 in and 3 ft high.

4. Concrete pillars are used in the same way as dragons' tetth but are also found across hollows in dunes which might provide an exit for vehicles. They are used in one, two and possibly sometimes in three rows, not always staggered. In dune country they are generally on a forward slope near a crest. The pillars are sometimes rectangular about 3 ft in size and 4 ft high, and sometimes cylindrical, about 3 to 4 ft in diameter and 4 ft high.

5. Rail-Tetrehedra (Pyramids) made of steel rails or L-section irons are used to block beach exits, ramps, beach promenades and streets leading from the beach. They consist of three or four pieces of rail in the form of a core with the ends embedded in concrete and bolted together at the top. There appear to be two types:

a. 3 ft 3 in high with the ends bolted together.
b. 4 ft 6 in high, bolted 3 ft 3 in above ground level, with the ends projecting above the join.

6. Vertical rails are occasionally used in two or three rows to form blocks across streets or well-defined exits on open beaches. The rails are about 4 ft high and are embedded in concrete blocks.

7. Wire blocks (timber and iron gates, chevaux de frise, knife rests). Road blocks consisting of a wire entanglement or fence at each side of the road with the gap between closed by movable gates of various types, were common in 1942 but are steadily becoming rarer as the use of concrete walls and other types of obstacle described above increases. They may all be still in use, however, to close gaps in concrete roadblocks. (see par 1 c above). Belgian Elements "C" are also used for this purpose (see below, Section V, par 3 iv).

8. Brick walls are of two kinds:

a. Perimeter walls surrounding the harbor area at a few ports. These are about 10 ft high and not more than 3 ft thick. There are loopholes for small arms at intervals along the wall.

b. Street blocks in towns, also about 10 ft high and 3 ft thick. These are probably now being replaced to a large extent by concrete walls, and are not likely to be found at beach exits.

9. Cratering of roads Preparation of roads for cratering has been reliably reported, and in a very few cases beach roads have already been blocked in this way. Nothing is known of the charges used.

V. CONTINUOUS ANTITANK OBSTACLES (Walls, ditches, scaffolding, inundations).

1. Concrete Antitank walls are found along the rear edge of beaches especially on the edge of a seawall. They are also found across the estuaries of small streams, with a gap in the middle to allow the water to flow out. They are similar in structure and dimensions to wall road-blocks (see above Section IV, par 1 a.). In addition to the type with vertical face and rounded top, however, occasionally a type is found with vertical face curving outwards to overhang the beach; in this case the top of the wall is flat.

(NOTE: (1) Where possible an existing seawall is adapted to form an antitank wall, by clearing away sand and gravel in front of it so as to increase the height of the wall and make an additional ditch obstacle. On many beaches this work requires constant renewal, owing to the effect of storms and tides.

(2) Tank-traps, in the form of camouflaged pits, are often placed in the vicinity of antitank walls. The Germans consider this a very useful form of obstacle.

(3) On the seafront of towns it is more common to build concrete antitank walls across streets leading from the beaches and to brick up the front of buildings between the streets or build a brick wall against the front of the buildings, than to build a continuous wall along the seaward edge of the promenade.

(4) Pillboxes may be built into a continuous antitank wall at intervals along its length, and antitank guns may be mounted on fire steps built into the back of the wall. There is generally wire along the top of the wall.

2. Continuous antitank ditches are of two main types:

a. Round strongly defended ports. Ditches of this type, found principally in HOLLAND but also at a few places in FRANCE and BELGIUM, are all water-obstacles. In general the width of the ditch varies between 20 and 40 ft; the depth is unknown, but has been reported to be as much as 15 - 20 ft. Most ditches follow a zig-zag course with single stretches some hundreds of yards long. Near ST MALO there is a recently

constructed canal some 300 ft wide which is of course a water-obstacle; the main function of this ambitious work is however unknown. North of FLUSHING there are two ditches, roughly parallel to each other and about two miles apart. There is generally a thin belt of wire on the outside of the ditch. Behind the ditch there are strongpoints and isolated pillboxes at intervals, generally sited to enfilade the zig-zag arms of the ditch; these defended localities are also protected by wire, which may be sited as much as 50 yards back from the ditch.

b. In front of our round defended localities. Such ditches are usually about 9 to 12 ft wide and possibly about 8 ft deep. On sandy beaches the ditch is generally revetted or lined with concrete or brick. They are commonly found:

(1) Completely surrounding strongpoints containing RDF or other wireless installations. There is generally a thin belt of wire some 10 to 20 yards in front of the ditch, and a thicker belt some 50 yards behind it.

(2) In front of beach strongpoints of all types (infantry, CD artillery, AA artillery), at the foot of the dunes and behind the beach wire.

(3) Along the seafront of towns, especially in front of an antitank wall or seawall. A ditch of this kind is sometimes a hollow scooped out in the beach some 10 or 20 yards in front of the wall, without revetment; or it may be immediately in front of the wall.

3. Steel scaffolding. The nearest approach to the British steel scaffolding obstacle used by the Germans is the Belgian or French "Elements C". The Belgian "Elements C" consist of sections of steel framework, 10 ft long and 10 ft high with bracing to the rear; the sections are moved into line on rollers and then bolted together to form a continuous line, fixed but with a small degree of elasticity. The French "Elements C" consists of smaller units 2 ft 6 in long and 6 ft 6 in high with brading to the front. Thus whereas the Belgian type presents a vertical face to the enemy the French type presents a sloping face, the object being apparently to make the tank run up the obstacle and expose its underside to antitank fire. Obstacles of these two types are found:

a. Along open beaches, occasionally in stretches over a mile long, sometimes across the estuaries of small streams. The obstacle either follows a straight line along the top of the beach , or, if sited some distance in front of the dunes on a broad beach, runs in a zig-zag course, as in the case of beach wire (see above Section I, par 1 h.).

b. In front of and at flank approaches to defended localities.

c. Along quays and jetties (generally as a stop-gap while concrete walls or other street blocks are being built).

d. In single elements of the Belgian type as movable barriers for streets, bridges and possibly also railway lines, (see above Section IV, par 6).

4. Inundations In areas where there are small rivers or streams with narrow estuaries and a fairly wide flat valley behind, the practice of damming up the estuary, usually at a bridge, and controlling the flow of water by some sort of sluice is fairly common. In this way areas up to three miles inland and up to one mile broad can be flooded in emergency so as to form a barrier to troops and vehicles.

VI. PERSONNEL SHELTERS AND MAGAZINES

Concrete shelters and magazines are installed at all strongly defended localities. In less important sectors of the coast, dugouts, sandbagged shelters and brick or concrete shelters without reinforcement are still found. Where it is impossible to build shelters completely underground the portion above ground level is covered with earth. Generally to a depth of 3 ft. Acess is by steps or sloping corridor, revetted with brick or concrete. Moreover, shelters and magazines are generally connected with firing positions by a trench, revetted with brick or concrete and often covered in: these trenches are linked up to provide a continuous communication system throughout the strongpoint. All shelters are of standard types, The strength of reinforcement varies with the type, and is described below where known. The entrances to all known shelters are zig-zag and are protected by fire from one or more loopholes. In addition, most types may have one or two Tobruk-type cupolas built into the roof for small arms or signals purposes. (See below Section VIII B. a.)

The following types are known (Measurements given of length, width, and height are exterior measurements):

a. Type 1a (magazine, 1 compartment)

Length	27 ft
Width	19 ft 6 in
Thickness of wall	3 ft or more
Thickness of roof	3 ft or more

b. Type 2a (Magazine, 2 compartments)

Length	34 ft 6 in
Width	31 ft
Thickness of wall	6 ft 6 in (possibly only 4 ft 6 in)

c. Type 501 (personnel shelter, 1 compartment)

Length	40 ft approx
Width	31 ft 3 in
Thickness of wall	6 ft 6 in
Thickness of roof	6 ft 6 in

The reinforcement is probably similar to that used in type 608 shelter. There are probably 8 rows of reinforcement in the walls. There is also good evidence that steel girders or rails are used to reinforce the roof.

d. Type 502 (personnel shelter, 2 compartments)

Length	47 ft 6 in
Width	31 ft 3 in
Thickness of wall	6 ft 6 in
Thickness of roof	6 ft 6 in

For reinforcement see above - type 501

e. Type VF 7 (generally magazine, also used for kitchens, first aid posts, etc).

Length	36 ft
Width	33 ft
Thickness of wall	?
Thickness of roof	?

NOTE: There is also a Type VF 7B which probably is essentially the same as the VF 7.

f. Type VF 2 This is a small shelter, mostly underground, but with the front face exposed. It is probable that it is in fact a pillbox with a loophole in front.

g. Type 608 (Battalion, or Brigade or equivalent Hq shelter, 8 compartments).

Length	50 ft
Width	45 ft 3 in
Height (incl floor)	16 ft 6 in
Thickness of wall	6 ft 6 in
Thickness of roof	6 ft 6 in

Reinforcement of the roof consists of spotwelded mats (similar to our BRC Fabric) in 7 in squares; the mats are 7 in apart. The diameter of the rods used is about 15 mm. The walls are more lightly reinforced; possibly they have only 7 mats.

h. Type 618 (Divisional ? or equivalent Hq shelter: 18 (?) compartments).

Length	?
Width	?
Thickness of wall	? 6 ft 6 in
Thickness of roof	? 6 ft 6 in

i. Type 629 (shelter for antitank gun and detachment, 2 compartments)

Length	36 ft 4 in
Width	35 ft 9 in
Height (incl floor)	5.1 m
Thickness of wall	6 ft 6 in
Thickness of roof	6 ft 6 in

Total amount of concrete used 675 cu metres.

j. Type 117a (Divisional (?) or equivalent Hq shelter, 17 (?) compartments).

Length	70 ft 10 in
Width	46 ft 6 in
Thickness of wall ?	6 ft 6 in
Thickness of roof ?	6 ft 6 in

NOTE: This is presumably a varient of a Type 117, one possible example of which is known.

k. Type "L" (i.e. Leitstand) (Coastal Battery Observation Command Post, 9 compartments).

Maximum length	67 ft 6 in
Maximum width	55 ft
Forward Observation Room	
Length	15 ft
Width	22 ft 6 in
Rear bay	
Length	12 ft 6 in
Width	17 ft 6 in
Thickness of wall	6 ft 6 in
Thickness of roof	6 ft 6 in (?)

l. Another type of Battery Observation and Command Post similar to type "I" is known. This type is probably obsolescent but still exists in some areas.

m. One headquarters shelter measuring approximately 190 ft by 57 ft has been seen on air photographs. This type is otherwise unknown.

n. Sentry-boxes. Reinforced concrete sentry-boxes with steel doors are in use. They are cylindrical in shape, pointed at the top. There are probably observation slits in the walls. It is possible that other types exist; a hexagonal type, with observation slits in all six walls, has been reported. Copulas or Tobruk posts on the roofs of shelters have also the function of sentry-posts.

VII. COMBINED SHELTERS AND GUN EMPLACEMENTS

The following types of shelter with a gun emplacement on the roof are known:

a. T-shelters, resembling a T in plan. These are partly underground; the part above ground is covered with earth or camouflaged with netting. On the roof over the "leg" of the T is a circular emplacement for a light coastal or AA gun. Inside the shelter there are two separate compartments for the gun crew and for ammunition.

b. Light AA Gun emplacements, consisting of a rectangular shelter partly underground, with an octagonal gun and emplacement on the roof. The part of the shelter above ground is heaped with earth to the level of the parapet of the gun emplacement. There is an inside stairway from the crew's quarters to the roof.

Length	14 ft 6 in
Width	13 ft
Height	19 ft 6 in
Height above ground level	13 ft
Height of parapet on roof	2 ft 7/ in
Thickness of wall	3 ft 3 in
Thickness of roof	4 ft 6 in (?)

c. Heavy AA gun emplacements, consisting of a raised concrete structure subsequently heaped up with earth at the sides, have been seen on air photographs. The interior layout is not known but presumably there is a shelter for the crew under the gun-platform as in type (b) above.

VIII. PILLBOXES

A. With firing slits in walls. In general open emplacements for MG's and light weapons are preferred to pillboxes with loopholes of the ordinary type. For the Tobruk type MG post and armored MG posts, which are much used, see below. Nevertheless pillboxes are found especially in the following positions:

1. Built on or into the seawall at towns.
2. Built into antitank walls.
3. Inside towns, inland at road junctions and at the approaches to key points, (eg post offices, port installations). These are often of unreinforced concrete, or even of brick.
4. On open beaches covering well defined beach exits.

NOTE: Tank traps in the form of pits covered with planks or netting, are believed to be common at the approaches to pillboxes, both in front and in rear.

A considerable variety of types is used. The following are standard.

a. For 1 heavy MG and 6 men)
b. For 2 heavy MG and 12 men) Details unknown
c. For 2 heavy MG's mounted in the end-walls. This is a type much used in the SIEGFRIED line, and certainly found sometimes on the coast of the Occupied countries, but certainly NOT common there. The pillbox is built into the sides of a hill and the MG's cover the slopes on either flank.

d. For antitank guns (or heavy MG's) a type with a very wide firing slit along the whole of the front wall.

e. For antitank gun and heavy MG coaxally mounted. The mounting is a tank mounting (usually with a 4.7 cm antitank gun) fitted into the front wall of the pillbox.

f. "Mushroom" post (Bilf-stand) for one man with an automatic weapon. Little is known of this type, except that it is much used, especially along roads, and that it consists of a

steel cylinder with a mushroom like turret with wide firing slits on top. It is probably about 6 ft 6 in high and the cylindrical part has a diameter of about 3 ft.

B. With aperture or turret in roof

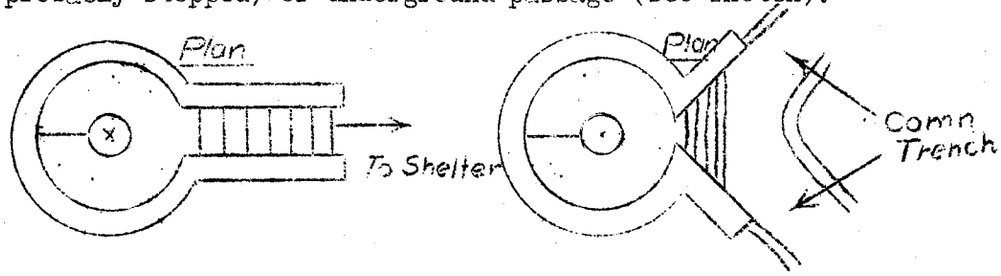
a. A type of MG post much favored by the Germans in coastal strongpoints is the so-called "Tobruk emplacement" (Tobruk stellung) probably developed from a similar British type used at TOBRUK. This consists of an underground shelter connected by steps or a short passage with a hexagonal chamber, the top of which is at ground level. In the roof of this chamber is a circular aperture, 2 ft 7½ in in diameter, in which an MG is mounted. The primary use of the Tobruk post is for AA defense. On the seafront of towns the shelter is sometimes the fortified cellar of a house with an underground passage leading under the promenade to the MG post on the edge of the seawall.

NOTE: Tobruk emplacements may also be built into the roof of practically any type of shelter, especially headquarters shelters.

b. The armored MG post (Betonstellung mit Panzerkuppol) is similar in design to the Tobruk type, but instead of an aperture has a tank turret (generally from an old French tank) or similar cupola mounted in the roof. The armament may be an antitank gun (generally 4.7 mm) or MG or both coaxially mounted. The turret traverses through 360°. This type of position is also much favored in coastal positions. Tank turrets, like Tobruk posts are also found mounted on the edge of a seawall or on the end of a harbor mole, access to the shelter underneath being either by an underground passage from the cellar of a nearby house or by a manhole near the turret.

IX. OPEN SHELTERS, EMPLACEMENT FOR MG's ANTITANK GUNS AND TANKS

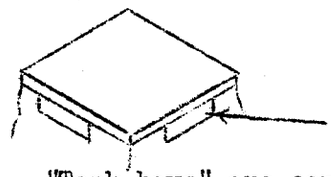
a. Open circular or horse shoe shaped MG posts about 4 ft 6 in below ground level, and about 8 to 10 ft in diameter. The floor is of concrete, the revetting and parapet wall generally of brick. In the center is a concrete block on which the MG is mounted. Access is from the rear by an open corridor (probably stepped) or underground passage (see sketch).



b. Dug in MG posts are known, but probably exist only as temporary positions till fortified posts are available, or in lightly defended areas. They consist of a semi-circular pit of 7 ft diameters and about 4 ft 6 in deep; the spoil is heaped in front in a semi-circle forming a parapet about 10 in high. (see sketch).

c. Open circular hexagonal antitank gun emplacements are common at all strongpoints and at road junctions and bridges. They may be from 10 to 15 ft in diameter. They are generally connected by an underground passage, which may be roofed over, with a shelter or other covered position.

d. "Table" emplacements for antitank guns exist at a few places. They consist of a square pit covered with a concrete slab supported on four short legs (see sketch). Dimensions are not known.



e. "Tank-bays" are constructed, especially near bridges and road junctions but also on beaches, as firing positions for tanks in a static defense role. They usually consist of three walls, with an opening in rear for the tank to move in and out. The parapet of the wall is high enough to protect the chassis of the tank, i.e. about 4 ft. Most of the tanks used in this way are old French equipment.

X. GUN EMPLACEMENTS, SEARCHLIGHT POSITIONS

a. Field gun emplacements for guns and gun-howitzers of 4 in caliber are generally circular and about 25 to 30 ft interior diameter. They take the form of circular pits about 3 ft deep, the spoil being used to form an earthern parapet which may be as much as 12 ft thick. There is an opening in the parapet in rear of the gun.

b. Medium and heavy howitzer emplacements are similar in design. For 12 in hows they are about 30 ft in diameter, for 15 cm hows. as much as 44 ft. Some static batteries with medium and heavy hositzers possibly have concrete gun platforms.

c. Army coast gun emplacements for 3 in, 4 in and 6 in guns (nearly always field equipment on wheels) have invariably a circular platform of strongly reinforced concrete and a surrounding concrete or brick parapet wall. The gun platform is 3 to 4 ft below ground level; the immediate supply of ammunition is kept in niches in the parapet wall. The commonest type of mounting, especially for 6 in guns, consists of a steel frame pivoting on a raised concrete block in the center of the emplacement. The wheels of the gun-carriage are attached to the steel frame, and the end of the trail runs on a rail round the circumferance of the emplacement. For guns of lighter caliber an ordinary platform mounting is also common. There are generally communication trenches, lined with concrete or brick, leading to the underground personnel shelter, and magazine in rear of the gun.

Interior diameter of	3 in	gun	emplacement		18-20 ft
"	"	4 in	"	"	27-30 ft
"	"	6 in	"	"	40-45 ft

d. Naval coast guns in the case of medium and heavy guns have generally turret-mountings and an underground magazine immediately in rear of the emplacement. A few heavy batteries on the CHANNEL coast have additional concrete protection for the gun-turrets in the form of casemates with walls and roof at least 10 ft thick. Light naval batteries often have field equipment, in which case the emplacements resemble those of the Army coast artillery.

e. Railway guns are usually mounted on turntables, mostly of 75 ft or 95 ft diameter. A few batteries of lighter caliber have positions on spurs.

f. Heavy AA gun emplacements are normally square, the internal measurement being 25 ft x 25 ft. Fortified positions on the coast have 4 ft high parapet walls of concrete; older positions have earth parapets (see also above Sec 7 (c). Heavy AA guns, especially those which have a coast defense role, may have a steel shield or even, in a few cases, a complete turret.

g. Light AA emplacements are also square with 10 - 15 ft side according to the caliber of the gun. (see also above 7, b.). Light guns are sometimes mounted on wooden towers up to 65 ft high, or on moveable towers or tubular steel 26 ft high.

h. Searchlights on beaches are normally mounted in circular emplacements of concrete or brick with a low parapet wall. Searchlights of the 24 in type have emplacements of about 15 ft diameter. Larger searchlights used by the AA artillery are in 24 ft emplacements, generally with an earth parapet, if they are sited back from the coast.

XI. ARTILLERY OBSERVATION POSTS

As a general rule all OP's are situated within a defended locality.

1. For concrete battery OP and Command post see above Section VI (k), and (l)..

2. "Fortress" observation posts are sometimes in the form of a revolving steel cupola mounted on the roof of an underground shelter. This type contains a Barr and Stroud type horizontal base range-finder.

3. Some OOP's are on towers or in the upper storeys of civilian buildings, field artillery OP's are frequently at the top of the nearest church tower, especially in the LOW COUNTRIES.

XII. PETROLEUM WARFARE AND SMOKE

a. Petroleum Warfare It is considered probable that petroleum warfare devices are being incorporated at present into the general defense scheme in highly defended areas. Infantry positions, especially on the seafront at towns are equipped with flamethrowers of the ordinary types. There is evidence that flame projectors are being installed in concrete pillboxes. The length of the flame emitted is not known.

Flame barrage tests are reported to have been carried out on one beach. Floats filled with petroleum were ignited electrically and a sheet of flame produced on the water. It is NOT known whether the tests were considered successful enough for the device to be adopted. To be effective such a barrage would require large quantities of petrol and ideal climatic conditions.

b. Smoke Smoke generators similar to those used for the antiaircraft defense of some ports have recently been reported along one section of the coast. The projectors consist of round metal containers, 70 cms high and 40 to 50 cms in diameter, installed at 50 yard intervals along the coast road. On top of the container there is a single filler cap and a spout ending in a diffuser rose. The smoke generated from the liquid in the containers is stated to be odorless and harmless though possessing a slightly irritant property.

/s/ J. L. AUSTIN, Major CS
for G.S. (Int)

ATTACHMENT NO. 1.

GERMAN DEFENSIVE DOCTRINE

Its application to the Defense of the West

In the first two years of the War we had, unfortunately, little opportunity of studying GERMAN Defensive methods, in the Field - and only too much opportunity of studying her methods of attack. Even the GERMANS themselves, imbued with the spirit of attack and with success meeting their efforts, neglected the study of defence and defence training. A doctrine for defensive tactics had, of course, been worked out, and was taught at the GERMAN Kriegsakademie, but the GERMANS never put their heart into it, so to speak, and training was, generally speaking, deficient in this respect.

There was little that was very startling in the original GERMAN conceptions, but it is perhaps worthwhile to look at them, for they form the basis of the plans and dispositions subsequently made for the defense of FRANCE and the LOW COUNTRIES.

GERMAN DEFENSIVE PRINCIPLES

1. Defense was to be organized in depth: it was clear that it was impossible to build a linear defensive system which could not be pierced if the attacking forces were massed on a narrow front, and defenses must therefore be arranged so that a break-in did not mean a break-through.

2. This again entailed strong points with all round defense; strong points which should be mutually supporting and sited so that an enemy penetrating between them would merely be drawn on into even heavier concentrations of fire till he was finally brought to halt and destroyed, or delayed in unfavorable ground till a counter-attack was put in. It follows that each strong point must be held even though surrounded by hostile forces.

3. Above all, and this is what we would expect from an offensive minded army, the object of the defense was envisaged as being to wear down the attack and to hold it, till a counter-attack could be launched, generally with armored forces.

GERMAN teaching divided the defensive position into three main zones:-

(i) The Advanced Position

(ii) Battle Outposts

(iii) The Main Line of Resistance

Troops in the advanced position had the task of delaying the enemy in his attempt to gain a starting line for his attack against the main line of resistance; and of gaining information and denying it to the enemy. They were to have some supporting weapons of their own, but were to be sited so that they could be supported by, at any rate part, of the artillery in the main position.

Consequently the advanced position was to be some 5000 - 7000 yards in front of the main line of resistance.

The task of the battle outposts was to gain time and to deceive the enemy as to the real location of the main line of resistance. They were usually some 2000 yards in front of the

main line of resistance. - i.e. within effective support of the artillery of the main defensive position.

The main line of resistance was to be organized in depth, though not in such depth that the majority of the infantry weapons could not bring down fire in front of the main position. Defense was to be based on mutually supporting centers of resistance organized in depth and capable of all round defense.

Withdrawal according to orders by troops in the forward position was permissable but the strong points in the main line of resistance were to be held 'to the last man and for the last round'.

The normal frontages for an encadre division were 6000 - 7000 yards.

But when the GERMANS were at last brought to the defensive in AFRICA and FRANCE they had not sufficient troops to fit these frontages, and the system had to be modified accordingly.

The development of GERMAN Defensive Tactics in AFRICA is admirably set out in your 8 M.I.S. Special Series Booklet on "The Development of GERMAN Tactics in CYRENAICA" 1941, but even in AFRICA the position was very different from that which the GERMANS had to face in FRANCE and the LOW COUNTRIES as BRITAIN's strength grew and the possibility of an invasion from BRITAIN increased. The campaign in RUSSIA, unexpectedly costly severely limited the number of troops available for the WESTTO under 50 Divisions, and these mostly of low establishment and inferior quality. With these a coastline some 1800 miles long had to be guarded. Even if all divisions were put on the coast, each would still have an average frontage of 35 miles or so - some 9 times longer than the frontage envisaged in the GERMAN pre-war theory of the Defense. It was clear therefore that the Defensive theory outlined above would have to be modified drastically.

There fell into our hands recently some notes on "The Fundamentals of Coast Defense" taken at the GERMAN Military Academy by a student whose identity is unfortunately not known. These notes are quoted in the E.T.O.U.S.A. G.2. S.R. No. which is available to you. They make interesting reading. Among other features, the effect of "thinness on the ground" is immediately apparent. I quote -

"Owing to the lack of men, defense will be organized in strong points. The principle of siting the strong point system in depth must be given up".

Even by giving up siting in depth and stringing the available strong points along the coast, frontages were still too long for continuous coverage, so rules are given for the selection of sites - "the following essentials must be considered (see M.R. 40 Annexe III par.1) and will then be clear".

His note then goes on "At present it is only in the areas favorable for landings that strong points should be constructed and occupied".

Thus the original GERMAN Doctrine of Defense has had to be much modified before it could be applied to the Defense of the West. Far from organizing the Defense as a "cushion" giving way at first., with resistance gradually getting stronger as the penetration gets deeper. The fact that the sea is such a

tremendous obstacle has made it more logical and economical to dispense with the advance positions and battle outposts and to site the main line of resistance right forward in a shallow line, forming a "crust", rather than a deep defensive zone. The GERMAN policy is to defeat invasion on the coast. Consequently coastal artillery is sited to engage ships and craft before they can land. Should craft reach the beaches, the GERMAN intention is to hold the invaders on the beaches by obstacles while they are destroyed by fire from well protected localities lit either by beach lighting or flares.

The principle of defense in depth has been abandoned because of the length of coast line though the zone of fire through which an attacker must pass remains as deep as before. Even then the enemy has not been able to maintain a continuous crust along the whole coast but has had largely to concentrate his defenses on the sectors and beaches most susceptible to attack. Thus in the PAS DE CALAIS, where fighter cover is possible, the frontages are 20 - 25 miles, and insofar as they are available; good; 3 regiment divisions are used to hold them. Elsewhere, e.g. on the West Coast, divisional fronts may be up to 80 - 90 miles and inferior troops are used. In one case, for which accurate details are known, on the South Coast of BRITANNY, a company holds a front of approximately 25,000 yards, or, say 14 miles. Under these circumstances it is clear that the enemy must, and in fact does, concentrate on the defense of those beaches which are most favorable for landing; the gaps are covered by small patrols.

Even these are too numerous for every suitable beach to be adequately defended against a strong attack, so great stress is laid upon the maintenance of a reserve at all levels - local reserves which can joint in the fight - for the beaches when the locality of attack has made itself apparent. In a 3 regt. division it is normal to have 2 regt. sup; each of these has 2 battalions up and one in reserve - each of these has 2 reinforced companies up and one in reserve.- Thus, in a division which consists of 27 reinforced companies, only eight are likely to be on the coast, the remaining 19 being in reserve.

Most coastal sectors are held by 2 regt divisions - an organization which does not allow of a reserve regt. In this case there might be 8 companies on the coast and a total of 10 companies in reserve - two battalions each and 3 reinforced companies in regt reserve and each of the 4 battalions on the coast having one reinforced company in battalion reserve. It is impressed on commanders that if no reserve is available they must rake one up from somewhere - and must train cooks, drivers and anyone else they can lay their hands on to be ready to step into the breach in an emergency.

These local reserves will normally be used to reinforce the fixed beach defense positions. They are not used to man defense positions further inland. In addition, there are the mobile reserves for counter attack. For, though "defense in depth" in its original form has been given up, the essential importance of counter-attack, especially by armor is still stressed. The GERMAN plan is to stage an armored counter-attack before an invading force can consolidate a bridgehead, and get enough troops ashore to offer adequate resistance. At present the GERMANS appear to have no specific knowledge of any allied plans for invasion, and the available armored reserves are therefore fairly equally spaced some 30 miles or so behind the coast line; placed so that at least one armored division could reach any likely landing area within eight to twelve hours of being ordered to move. Reserve divisions are centrally controlled, so that should the initial armored division

counter-attack fail, additional divisions could be brought up at a rate of between one and two divisions per day for a co-ordinated counter-attack on a larger scale.

These armored divisions are in varying stages of efficiency, being divisons which have been brought back from RUSSIA for a rest and refit or newly formed divisions. A division which has just arrived will be of little fighting value, being in a very battered condition, but will rapidly receive drafts and new equipmeny, and as it has a good core of personnel who are thoroughly experienced and seasoned they quite soon become efficient fighting units again. At any given time there might be in FRANCE two armored divisons in first class order, which have been in FRANCE for six months or more, two nearly at full strength and two in the early stages of re-organization. But this varies from time to time.

To return to the beach and coast defenses - the crust - besides the infantry defenses a feature of the defense is the large amount of artillery of all kinds employed. There are heavy and light C.D. batteries and mobile railway guns, mainly sited for the defense of the ports.

Beside these, the use of light guns, including field light A.A. and A/tk guns is a feature of the GERMAN Beach defense system. The number available in a div sector will usually exceed the divisional establishment for such weapons. For instance, in a heavily defended sector it will always exceed 100 and may be as much as 150. In a lightly defended area, e.g. CAEN or South West France, the total will probably be 50 - 75 per div. sector (which it will be remembered, is much larger than in the heavily defended areas).

In this figure are included the following types of gun:-

(a) Field guns and infantry guns of 75 mm calibre - obsolete GERMAN models or captured weapons.

(b) Some gun hows of 105 mm and more

(c) A/Tk guns 25 - 75 mm. Often mounted in tank turrets.

(d) Lt. A. A. guns of 20 mm to 50 mm calibre.

In addition, the divisional artillery will be sited so that it can fire on the beaches while being sufficiently far back, say 2000 yards for it not to be embroiled in immediate fighting for the beaches.

In rear of the beach fortifications, military installations such as higher headquarters, Army and G.A.F., Artillery batteries, airfields, signals installations, R.D.F. stations and beam stations from their own strong points for local defense. In addition, static troops inland, e.g. supply and Feldkommandanturen make arrangements for their own local protection.

The GERMANS attach great importance to the defense of ports, believing that the early capture of a port is essential to us if we are to maintain ourselves. They have therefore, tank obstacles guarding all likely A.F.V. exits or open beaches and a defensive perimeter round the landward side, with A/Tk ditches, wire, minefields, roadblocks, strong points, etc., though these latter are not at present occupied by infantry. They have, moreover, made extensive preparations to demolish quays, moles and harbor installations.

The problem of defending a port is, however, not an easy one, since a lengthy perimeter entails a lot of troops if it is to be adequately manned and these are not at present available.

PRIORITY OF DEFENSE.

The GERMANS have had to work out the defense of the West (a) against raids, and (b) against a permanent invasion. It may be that they do not appreciate that an invasion is imminent and that troops would be disposed differently if they did; but whereas troops can be moved, concrete cannot, and concrete defenses take time to build. They have therefore had to build concrete defenses both against raids and a full scale invasion.

From a study of the amount of work which had been done in various sectors, it seems that there are two "main efforts" in the GERMAN program.

The first is BELGIUM and the PAS DE CALAIS; this is still, I think, clearly against a main invasion, since this section is within the most effective fighter cover from aircraft based in BRITAIN, and on the shortest route to GERMANY itself.

The other is the submarine bases on the West Coast which, though not particularly suitable for a main invasion, are an obvious target for raids, and are vital to GERMANY, since on the success of her submarine operations lies her main hope of winning the war.

SUMMARY.

To sum up, the GERMANS hold the West with a coastal "crust", comparatively thinly held by troops, but with large quantities of artillery and concrete fortifications and obstacles. This crust is designed to take the first shock of invasion and either destroy landing forces or prevent them from consolidating their position till the armored reserves held not far from the coast can arrive, and drive the invaders back into the sea. In view of the difficulties an attacker has to face in landing sufficiently large quantities of men and equipment over beaches to overcome the initial resistance and a counter-attack before this armored attack is put in, it must be acknowledged that the GERMAN Defensive System presents a difficult problem for an invading force to overcome.

G.S. (I)., C.I.S.,
G.H.Q. HOME FORCES
May 1943.

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DISCUSSION FOLLOWING LECTURES
BY COLONEL ZELLER AND COLONEL BURTON
ON
GERMAN COASTAL DEFENSES AND DEFENSIVE DOCTRINE.

25 May 1943.

The general discussion developed the following points:

As for information as to whether the enemy intends to reinforce their main line of resistance, it was stated that there is no question but that the Germans will early discover where our main effort is to be and will move up reserve divisions to reinforce their positions. Even divisions from Russia, Norway or Southern France might be moved in, if action is prolonged. It is believed that their defenses are now drawn the way they intend to hold them. It is doubtful that they will increase the number of men at a given strong point. Due to limitations of personnel, materials and labor, they have by now definitely established what they regard as a minimum effective disposition of troops, to be reinforced only by mobile reserve divisions. However, if their Intelligence informed them of craft approaching, these mobile reserves would be moved in immediately. The estimate of rate of reinforcement of reserves is based on movement forward without resistance.

Work on west coast defenses was not reduced in any way due to threat of invasion in southern Europe.

The difference between a heavily defended sector and one not so heavily defended, lies in the closeness of one strong point to another. In a more heavily defended area, they will be 1,000 yards apart; in a less defended area, they will be 2,000 or 3,000 yards apart. The distance between the pillboxes varies. In a strong point, there may be two for light machine guns, 2 antitank pillboxes and 3 medium machine gun pillboxes. It depends on the strong point. There is no hard and basic rule. The pillboxes support each other. In a heavily defended area, they will be about 1,000 yards apart. One can expect to find 3 or 4 supporting each other in small arms range, although the effectiveness of such support is limited by smoke. Isolated ones might be found 4 or 5 miles back from beach. The pillboxes are usually 2 meters thick. Many of these pillboxes take machine guns which are to bring their fire to bear on the sea. The strong points contain concrete shelters in which the enemy hides during bombardment. After the bombardment, he gets into the weapon slits and resumes fighting. There are machine guns and entitank guns in their emplacements from where they fight. Photographic evidence indicates that the strong points are on the coast or around towns. There is hardly any evidence of their being built more than 4 miles back from the coast. The rivers are expected to form the secondary line of defense. We know of no defensive positions behind the coastal positions. If there are, they will not be of concrete, but wires and mines, as it was in North Africa.

Regarding German positions in depth, in terms of yards, a division with about 7,000 yards frontage, would have about 2,000 yards depth. All defenses are becoming more linear. Their front line starts when we get into our boats so they have the depth.

The following types of fire are expected to oppose a landing: artillery, mortar, machine gun, antitank mines, wire, physical obstacles, actual fire of all kinds. We will run into a lot of flanking and hidden machine guns. The most dangerous will be

hidden machine guns. There are no present means of location of hidden machine guns. Most of our information is obtained from photographs which are interpreted by our experts but they do not reveal hidden gun positions.

Regarding the morale and fighting strength of the divisions at any given time, it appears that there is no settled time that divisions are relieved at strong points. We believe it is not often. Many of the divisions used are returned from the Russian front for reorganization - which usually takes 5 - 6 months. Training divisions also are used and they seem to be there permanently, although the personnel changes. There are troops present being trained and holding the coast at the same time. Inferior grade men have recently been used. Some divisions have been there as long as two years. They have always been first rate divisions but we have recent reports that a second rate division has gone into one area. The combat efficiency of these units, as mobile units, would be low, but sitting behind concrete, as they are, they are all good divisions for the purpose for which they are intended. We cannot rely on the possibility of effective assistance from the French. It is too uncertain.

There was outlined the proposed defensive tactics of a British Infantry Division, after which a discussion compared the American defensive system with that of the British. Question was raised as to the amount of information G-2 could supply for an operation. It was stated that, while much is known about the French coast, once a specific location is designated, additional information can be secured.

A summary indicated that we know definitely that the Germans are defending France and the Low Countries with a crust of defenses along the high water mark, supported by heavy gun artillery and backed with lighter artillery in the rear. This artillery fire is reinforced by air attack. We will first come under attack from the air while we are loading the boats and, as we approach the beach, we will come under more and more artillery fire. As the invasion progresses inland, obstacles of every type will be encountered and must be overcome under fire from echelon reserves, The Germans seem to rely on river lines for second line of resistance, so we will encounter demolished bridges. The problem posed by this defensive system is to get through this crust of obstacles covered by intensive fire, and to come to grips with garrisons along the coast, before the reserves further back can be brought up. It was added that these garrisons are scanty. The shortage of manpower is Germany's most acute problem. Our information is that they have drawn every available man from industry and are even using prisoners of war in their Army.

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ASSAULT TRAINING CENTER
CONFERENCE
HQ ETOUSA

26 May 1943
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ADDRESS BY: Commander ELLIOTT B. STRAUSS, U.S.N.
Commander, U.S.Amphibious Force, Europe and
United States Naval Officer, Combined Opns Hq

Naval Support in a Landing-Assault

In discussing our subject today, Naval Support in a Landing-Assault, I shall try to follow the agenda prepared by the Chairman, Colonel Chase. In that way, we will be able to cover the points outlined and remain within the limitations of the subject assigned to me.

The first question deals with the types of landing craft which will be available for an operation such as that under discussion. I believe that you all know about landing craft, in general, and their characteristics as they will relate to a cross-Channel invasion, as differentiated from a raid. Certain of these craft are suitable for the contemplated operation, as we shall see.

One can see, from the shape of the English Channel, that an operation in the East can be done mostly with landing craft, by having the craft make the passage themselves. In the West, larger carriers will be necessary. In talking over plans, from time to time, one general scheme usually presents itself - that the operation will be primarily British in the East and mainly U.S. in the West. Thirty LSI can be handled in the Channel, what with operations and administrative facilities as they are. LST and LCT can also cross under their own steam and can be used.

In this way, thus far there has been only one landing against a determined opposition. That was at Dieppe. Therefore, our main experience on this subject comes from Dieppe where, from the naval and air standpoint, the operation was quite successful.

In the contemplated operation, American personnel will make the assault in LCVP, which are armored. A large proportion of LCI(S) and LCI(L) will also be used. The LCI(S) carries about one hundred (100) men and has the advantage of being armored. It has a range of about 500 miles. The LCI(L) carries two hundred (200) men but it is not armored. For that reason, it is not considered as favorable a craft to use. For transporting vehicles, we would use LCM, LCT, and LST. The latter, the LST, is the more valuable because it can carry, roughly, fifty (50) vehicles.

There can be considerable argument as to the speed of these various craft but, in general, an LCVP, with one engine in a flat sea, can get up to 15 knots. When passengers are aboard, this speed is considerably slowed down. In formation, it slows down even more. LCVP and LCA can go about eight (8) or nine (9) knots in moderate seas, in formation, LCM and LCT can do between six and a half ($6\frac{1}{2}$) and seven (7) knots in formation, but under certain conditions, their speed may drop to three (3) knots.

The slope of bottom is also important to note. Most of these craft were designed to go up on beaches much steeper than we will find on the French coast where the average beach gradient is 1-100. LCT(4) and LCT(5), however, can do 1-135 and are therefore all right for this purpose.

The next question deals with the number of various type of landing craft most suitable for landing assault infantry battalion with its normal combat team attachments. In dealing with this subject, we do not like to consider landing craft groups in relation to divisions, since the term division is too indefinite for our purposes. One must consider whether it is an assault division which is to be landed, or a follow-up division. How much armor will they have? How many vehicles? How many men will be involved, etc. All of these things must be known. The better manner of approaching the problem is to consider it in connection with regimental combat teams, or, as the British do, with brigade groups. A battalion of infantry would take twenty (20) LCP and 6 LCT; about 916 men and 60 vehicles. But if one considers it from the standpoint of a division, as I stated above, one must know whether the division is composed of 15,000 men or 30,000 men; how many vehicles, etc.

The next problem is to what extent do the various characteristics of a beach affect the troops and vehicles as they are getting ashore? One of the items to be considered is the beach gradient, which has already been discussed. Another characteristic of most beaches to be encountered is that they are flatter at low tide than at high tide. Surf is another important question. If there is a real surf, you just cannot land. A rule of the Navy is that, if the line of surf is visible from seaward, you will be unable to get through it. You can get through a four (4) foot wave but you cannot get through a four (4) foot surf. A surf is about double a wave, as it is figured. Another thing to be considered is the fact that, if the tide is very high, it may be necessary for you to let your craft dry out after each landing. In addition, you must consider the tidal current along the beach, as it may push the craft together and intervere very strenuously with the operations. Shingle, much of which is round pebble from one (1) inch to four (4) inches in diameter, is no obstacle in beaching a craft. Usually shingle beaches are steep beaches, which may be considered good for grounding but bad for tracked vehicles. Runnels, which are troughs parallel to the beach, are a serious trouble. The type of ramp which is used on the landing craft can often cause difficulties. As the vehicles come off the craft over the ramp, they have a tendency to push the ramp down on to the beach and to cause the ramp to create a runnel of its own, an additional handicap. To overcome these difficulties, one way is the waterproofing of vehicles; another is the use of steel mats on the ramps.

The next question I have is this: In a cross-Channel operation, what types of standard naval vessel will be furnished for fire support for the landing and what are the characteristics of their gunfire? Naval craft for fire support will be very few, indeed. We will have to depend on means other than naval craft for this fire support. We will have a number of destroyers but their gunfire is not wholly suitable for support of landings. They are, however, the best we have to offer. Standard fire from the guns of naval ships have a flat trajectory. It would be impossible to outfit a cruiser for the purpose of furnishing this fire support since, at any moment, it may be called away to fight a naval battle and must be prepared to meet that issue at any time. The high velocity shell has certain advantages against concrete. The British already have two monitors and are providing another. They have twin 15" guns and antiaircraft guns, as well as good horizontal armor against bombings and can be moved very close into the beach. As for battleships, they roughly have one hundred (100) rounds per gun, enough for an hour's continuous firing. Cruisers have one hundred and fifty (150) rounds per gun and can furnish about one and a half (1½) hours of continuous firing. This more or less covers the

volume, duration and effectiveness of any anticipated naval gunfire under the contemplated conditions.

How closely can the leading assault wave approach the beach before it will be necessary to lift naval gunfire? What I say must not be taken as official but it is about the best opinion that we have thus far. As an over-all result of reading on the subject and of talking it over with other officers, one might say that, in the daylight, by indirect firing, you can probably keep large gunfire within 1000 yards of your troops. At night, 2000 yards would be safer. If this fire is delivered from the flanks, it is much more accurate. The reduction of specific shore targets, however, is extremely, troublesome. Naval gunfire cannot be relied upon for that purpose. Therefore, before you can get your landing craft into shore, you must find means of reducing the shore batteries. Perhaps aerial bombardment can do much to accomplish this. Dive bombing also might do a great deal but has many limitations. In my opinion, the thing that beat the military forces at Dieppe was the fact that they had no means of overcoming the active and passive defenses on the beach.

As regards special types of close support gun-boats, monitors, rocket craft and the like, a number of LCT have been converted into LCG. They are of two main types. One has two 4.7 guns. No decision as to the guns aboard the second type has yet been reached. The LCT, in these cases, has been armored and has had three engines put into them, enabling them to approach at 15 knots. The LCT(R) has a great many possibilities. She is on the confidential list although a great deal is known about her. In one salvo, she can fire around 800 rockets, depositing them in an area 600 by 400 yards and this could do much damage. The rocket guns aboard this craft are fixed. Incidentally, the rocket guns are a good way of laying smoke, when required.

The LCS(M) and LCS(L) are useful craft within certain limitations. One great advantage they have is that they can be carried in a larger ship. The LCS(M) carries a 4" mortar, two 50 calibers, two Lewis guns and smoke. One of the major difficulties, in considering naval gunfire, is that you are dependent on naval fire control which is difficult because of the motion and other factors. However, once you ground a craft, she is no longer under naval fire control and becomes, in effect, armored artillery ashore. These craft which I am discussing are constructed for the purpose of giving required support at or very near the beach. There is another method - that of taking 25 pounders and carrying them in LCT's, using them as waterborne artillery up until the point where the LCT grounds. The LCG(M) carries two 25 pounders or two 17 pounders, and is armored. It is useful for breaking up concrete emplacements, pillboxes, etc. Self-propelled artillery, carried in on LCT or LST can be run from these craft in to the water and be used from a hull-down position.

Smoke, in a combined operation, is extremely important. At Dieppe, when the destroyers were lying off the beach, each ship tossed over cannisters of smoke with the result that the ships were practically free from damage from fire, while in the smoke. When you cannot neutralize enemy batteries on the flanks in any other way, smoke can be employed to blank them out. However, it must be remembered at all times that smoke affects your own assault when you use it, since it may interfere with your fire control. The rocket ship, as stated before, can fire as many as 800 smoke projectives at a time.

What supporting naval fire can be given for the advance inland of assaulting troops? The answer is that the further the troops get away from the actual beach, the harder it is to support them with naval fire. The ships at sea can give support only for a limited time beyond which you must not depend too much on naval gunfire.

What exchange of liaison should be effected for fire control purposes between assault units and supporting naval units? The exchange of liaison between the fire control parties afloat and the assault units ashore is difficult. The headquarters ship must be a separate unit, and will control the naval supporting fire. At the earliest possible moment, the forward observation officer will be landed. The ideal way to control fire is to have your plans so well worked out that the areas to be covered by the supporting craft and the naval gunfire are laid out carefully in advance. It is important to remember that, no matter how elaborate a plan of communications is evolved, you cannot depend upon communications or signals as much as you would like. Only through a prearranged plan of fire can you accomplish your aim. While afloat, the guns are controlled from the headquarters ship. Once they have grounded, they become artillery and are controlled like any other land artillery.

Comdr Strauss 5

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Discussion following the talk by Comdr Strauss, U.S.Navy

The discussion was opened by a question as to the relative effectiveness of ships' gunfire and shore battery gunfire. Naval officers pointed out that the shore batteries have a distinct advantage over the ships batteries in the daytime, but that the opposite is true at night due to the fact that the shore batteries are fixed and the ships can move about in the darkness. Naval gunfire is very effective to neutralize shore defenses during the approach to the beach of the assault waves, but cannot be depended upon to permanently reduce well emplaced and protected shore batteries. Commandos, Rangers, or Assault troops of this type are most effective to attack and permanently reduce shore batteries. Naval gunfire delivered from the flanks will give closer support to the assault troops than that delivered from positions directly behind the assault.

A question was asked concerning the production of landing craft and the rate of arrival of craft in this theater. An officer from the U.S. stated that a standard specification as to type and construction was in effect and the supply of craft would be ample. Priority of delivery however, will be determined by contemplated operations. The conference was referred to a publication issued weekly in Washington D.C., prepared by "Combined Operations". This publication sets forth statistics on production of landing craft.

The availability of cargo space for shipment of landing craft will determine the rate of arrival unless a priority is established for this theater. It was stated that the craft that were shipped to Africa were shipped by Army Transports and LSTs.

An inquiry was made as to whether there was any doubt of the ability of the LCT to make the trip from the south western part of England to the coast of France. There was no doubt of the ability of the LCT to make the trip. The operational limit of the LCT(5) was described as 500 miles and that of the LCM(3) as 125 miles. However, it was the opinion that, from an operational standpoint the LCM(3) was not practicable for use in "shore to shore" cross channel operations. In the narrower channel distances where the average distance is 40 miles the smaller landing craft such as the LCA (British, will require 5 hours to make the trip. Although it is physically possible for these craft to make the trip, transportation by larger craft to a point nearer the European coast is highly desirable.

The question was asked "Is anything being done to silence the motors in landing craft"? The reply was that experiments are being conducted in this matter but it was not known how much had been accomplished.

A discussion of the training of small boat crews indicated that the British procedure was to give three (3) weeks of individual training and follow that with four (4) weeks of training as units. At the end of this seven (7) week period the trainee was considered a boatman. The training time for Combined Operations Sailors (British) was indicated as now being three (3) months. Present U.S. arrangements provide for three (3) months training of boat crews before they are assigned to a theater of operations. The training continues aboard ship during the trip to their assigned stations. It was pointed out that small well

trained forces usually had little trouble in landing on the correct beach, but that in many exercises and operations, improperly or insufficiently trained crews have had considerable difficulty in hitting the right beach.

Much of the difficulty that has been experienced has been due to navigational difficulties caused by insufficient training of the crews and poor navigational aids. An officer from the U.S. stated that at a recent conference in the States it was concluded that a boat compass was completely unreliable, however, the compass problem has been investigated and a new type is being developed to be supplied to all landing craft. It was added that extensive research has been going on in the U.S. on special navigational aids that are independant of visibility. These aids include radio devices.

The problem of towing LCAs behind LCIs is a point for further study and investigation. It does necessitate the transfer of troops from one type craft to another and it may not be practicable or possible to tow under conditions of heavy seas.

The necessity for having a plan which provides for continuous operation without an interval was agreed. The conditions imposed by rising and falling tides must be surmounted so that operations are not suspended.

In discussing how close Naval ships and craft could come in to the shore thespeaker stated that the LCS could actually beach and thereby become shore artillery, and that the characteristics of the coast dictated how far in the ships could come. Normally destroyers can come within 700 to 800 yards and cruisers from 3/4 to 1 mile.

The discussion turned to types of Naval supporting fires. In addition to the heavy bombardment by the larger naval guns, the following were mentioned briefly: 5" AA ammunition fuzed for an air burst about 50 feet off from the ground is very effective against personnel; artillery mounted in craft, special small support craft, and rocket craft were discussed briefly. The rocket craft carries roughly 800 rockets; when they are fixed which will probably be within a short time of the start of the action, it will require one day to reload. The need for accuracy of fire support in a landing assault was emphasized, and there should be a naval gunfire control party ashore with every landing group.

The various methods of producing smoke were discussed. The Navy can produce smoke by a number of different means such as smoke producers on the small personnel craft, 4.2 chemical mortars mounted in small support craft, smoke fired from destroyers, funnel smoke and smoke produced by naval aircraft. The navy can furnish smoke where it may be desired but plans for its use must be coordinated between Naval and Ground Forces so that the use of smoke by one does not handicap the other.

In discussing the conditions of daylight and darkness as they affect the quality of fire support the Navy can deliver, the following opinions generally prevailed: Navy members agreed that better naval support could be anticipated in daylight than at night. It was pointed out that close support at the moment of assault was the really essential support and conditions of darkness placed considerable restrictions on the ability of naval gunfire to very closely support the assaulting troops. Contrary to the adverse effect that conditions of darkness impose on naval gunfire, darkness has very little effect on the well defined and fixed fires that can be delivered by the weapons of the beach defenders. A Navy member stated that navigational aids are quite

reliable and that the Navy would rather make the approach under cover of darkness than in daylight.

A discussion on the use of radar, emphasized that although we are using it very successfully, the enemy also makes extensive use of this means in his coastal defenses. In some of the raids that were made on the coast of France, radar evidently did not disclose the presence of craft. Radar has also failed to disclose the presence of low flying aircraft. However, radar is developing rapidly and the deficiencies it now has will no doubt be corrected.

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Review of Discussion following the address
"Naval Support in Landing Operations" by
Comdr E. B. Strauss, U.S. Navy

Subject: Naval Support in Landing Operations.

1. The question of the types of landing craft that are most suitable for landing assault infantry battalion combat teams was discussed.

Conclusions reached:

(1) The leading elements of a landing assault battalion must be landed from the small landing craft (36' and 50' craft and LCI(5)) The larger craft and ships, LCI, LCT and LST should not be brought into a defended beach initially.

(2) For the shorter channel distances it is practicable to transport the landing force in small landing craft from the near shore, but for the wider stretches it is necessary to transport troops in LSI or transports and lower the landing craft at sea. Theoperational limit of the LCT(5) was described as being 500 miles and that of the LCM (3) as being 125 miles. From an operation standpoint it is not practicable to use the LCM(3) for "shore-to-shore" cross-channel operations.

(3) An LSI must be unloaded in one flight as the problem of forming up successive launchings of craft and maintaining the LSI's geographical position in a current (perhaps in darkness) is unsurmountable.

(4) Towing LCAs behind LCIs is barely possible but has not yet been proved. This requires the transfer of personnel from one type craft to another off the beaches and will slow the passage of the LSI. Weather conditions involve difficulties. Further numbers and types oflanding craft are examples of a suitable lift for landing units as follows:

Assault Regimental Combat Team

Personnel 6LSI averaging 8 LCVP	- 1440	
12LCI (S)	- 2400	- 3840
Vehicles 60LCT	600	
5 LST (2)	250	-- 850

Infantry Battalion

40 LCVP, 6LCT, and 12 LCM

[redacted]

2. The question of the limitations imposed on landing craft by beach gradient, surf, tide, shingles, etc., was discussed.

Conclusions reached:

(1) Beach gradient governs the point at which craft ground and therefore is a main consideration in the planning of any operation. Beaches usually have a steeper gradient at the high tide mark than at the low tide mark. If steep bottomed craft ground on flat beaches, the vehicles they carry must be waterproofed; bridging devices must be used between the craft and shallow water, for the craft must be allowed to dry out. In the latter case, the craft is immobile from one high tide to the next. The mean draft of a L.C. has perhaps more influence on the point at which it grounds than does its draft aft or while afloat, as on grounding, the bow will dip and the stern come up.

(2) A surf of 4 to 5 feet is the maximum in which small craft may land.

(3) Flexible banalore torpedoes may be a means of blasting a channel through runnels.

(4) Craft usually ground close inshore on shingle beaches as they are apt to be steep but tracked vehicles find them difficult to cross and means of assisting them should be found.

3. The question of the fire support that can be given the landing of heavy and light ships guns was discussed:

Conclusions reached:

(1) Naval gunfire cannot be counted upon to reduce permanently the well emplaced and protected shore installations, but may neutralize their effect during the landings. Permanent reduction of these hostile batteries and defenses must be accomplished by Commandos or means other than gunfire.

(2) A man of war cannot normally be depended upon to destroy point targets ashore.

(3) Experience to date has shown that it is impracticable to have a naval ship stand up under the fire of shore batteries, and that for overcoming these shore batteries, Commandos and Rangers are most effective.

(4) Naval gunfire can be delivered more effectively from the flank.

(5) Special types of small, close support craft, gun barges and the like are urgently needed to fill the gap between naval fire support and organic artillery support of the landing force.

(6) Due to limitations of naval fire support it is necessary to land some artillery of the landing force early in order to support effectively the infantry moving inland.

(7) Naval gunfire must be lifted when troops come within the following distances from the beach:

1000 yds daylight (indirect fire) major calibre
2000 yds Night (indirect fire) major calibre
200 yds close in on flanks, direct fire

Destroyers - 500 yds shooting from behind assault
200 yds on flanks.

(8) In general, Chapter 6 of FM 31-5 was accepted as controlling.

4. The question of what smoke could be laid by the Navy, and by what means, was discussed.

Conclusions reached:

(1) The following means are available to the Navy for laying smoke during a landing operation:

a Small smoke producers on the back of personnel craft.

b 4.2 chemical mortars mounted in LCS

c Funnel smoke

d Smoke curtain by aircraft.

e Smoke shell fired from destroyers

f Smoke bombs dropped from aircraft

g Smoke rockets

h Experiments on development of exhaust smoke apparatus.

(2) The first use of smoke in an operation would be to blank off flanking shore batteries harrassing the naval force.

5. The problem of navigating landing craft was discussed.

Conclusions reached:

(1) Landing craft crews must be better trained, and improved navigational equipment must be provided. This is receiving attention. However, crews will still be relatively inexperienced and navigation of landing craft probably will not be of a high order.

6. The question of day or night landings was discussed.

(1) The Navy would rather make the critical turn and approach the hostile shore under cover of darkness, especially since navigational aids are being developed which are independent of visibility. However, better naval fire support can be anticipated in daylight than at night.

7. The question of Radar was discussed:

Conclusions reached:

(1) Radar is used to locate our own position in relation to the shore line.

(2) Radar is used to guide our craft ashore.

(3) The enemy also makes extensive use of Radar in connection with the defense of his coast-line and in spotting hostile movements, and this renders tactical surprise, even at night, difficult.

8. Further Conclusions:

(1) "Scorpions" are exactly one foot wider than any landing craft now available; therefore, "Scorpions" of proper width must be provided for use in amphibious operations.

(2) Radio-telephony is unsatisfactory for giving orders to small craft which have no transmitters for acknowledging receipt of messages.