

FIG. 1.—A SMALL SECTION OF THE VAST ARMADA CARRYING ALLIED FORCES FOR THE ASSAULT ON SICILY, 10TH JULY, 1943

PLANNING AMPHIBIOUS OPERATIONS

PART I

by

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To recount adequately and do full justice to the work performed by Engineer Officers in the planning and execution of the Combined Operations of the second World War would occupy far more space than is available in a short article of this nature, and would require the joint efforts of several authors to ensure that all aspects of the many problems involved were fully covered. The personal account that follows will, it is hoped, give some indication of the part played by engineers and illustrate the growth of the engineering organisation which formed so integral a part of Operation "Neptune," (the invasion of France) and subsequent events in North West Europe, as seen through one pair of eyes.

Those interested in making a detailed study of the technical problems facing an Engineer Officer on a Naval Planning Staff are recommended to read "Duties of A Staff Engineer Officer in the Naval Planning of Amphibious Operations." (B.R. 1292).

Earlier experiences, on which were based the "Neptune" set-up, may be said to be confined to the period of only some eighteen months, starting with Operation "Torch" (the North African Landings) in the autumn of 1942. To show clearly, and in their right perspective, the circumstances surrounding the planning of "Neptune," it is necessary to refer briefly to the earlier operations in the Mediterranean.

THE NORTH AFRICAN LANDINGS OPERATION "TORCH"

Although the Naval Commander Expeditionary Force (NCXF) was responsible for the production of the Naval Plan, which involved many arduous months' work at his planning Headquarters in Norfolk House, London, prior to putting it into effect, preliminary planning by Admiralty and Combined Operations Headquarters to make available the ships, craft, personnel and materials he would require had extended over an even longer period. The Admiralty Division primarily concerned is Plans Division (Q), which forms the artery through which the planners' demands pass. P.D.(Q), who co-ordin-

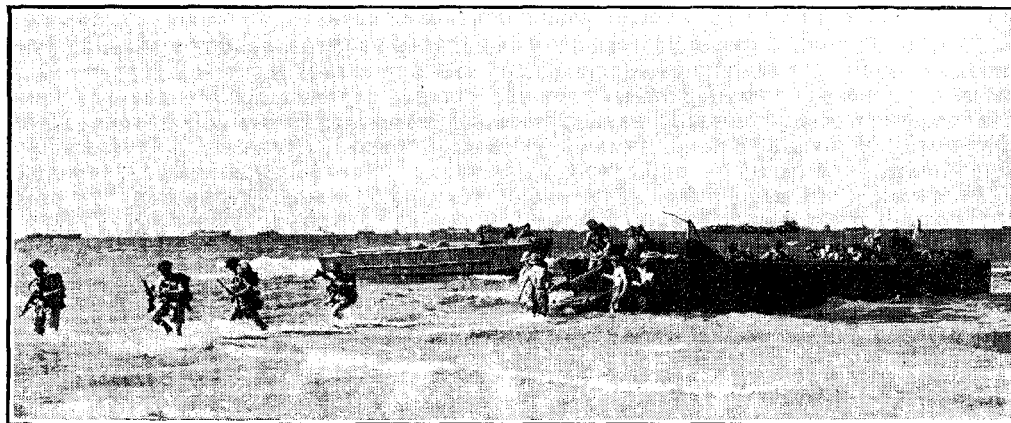


FIG. 2.—TROOPS LANDING FROM L.C.A. ON A SICILIAN BEACH

ates the efforts of all technical and supply Departments within the Admiralty, is able to balance the operational requirements against those of other stations.

The fuel problem

The directive to start planning was given on the 14th August, 1942. By September NCXF had completed his Naval Plan and the first slow convoy sailed late in October. The intricate and extensive shipping and craft movements involved the evolution of a most complex tanker programme. It was necessary to ensure that the right quantities and grades of fuel would arrive at the right place at the right time and that none of the very limited tanker capacity was uneconomically employed. The long convoy routes, to minimise the U-Boat threat from Biscayan ports, involved distances beyond the endurance of some of the escorts, and resulted in others arriving in the assault area with little fuel remaining. The demands on Gibraltar were heavy and called for a carefully timed escort fuelling plan. Planners were reluctant to have recourse to fuelling at sea in November, owing to the hazard of bad weather. It was realised that there would be an immediate need for fuel supplies in the captured ports, including coal. In spite of the collier shortage, the alternative of carrying coal as flitting in the holds of merchant ships was not favoured as this would cause unacceptable delay in the unloading ports.

In the event the quantities provided for the initial phases proved to be correct, in spite of the earlier criticism from some quarters that the plan made an over-provision. Major casualties to tankers sustained subsequently necessitated the adoption of ad hoc arrangements to tide over some periods when a serious deficiency was thus caused.

Previous experience

It must be remembered that at this time there was little if any, previous experience to guide the planners. In the days before Combined Operations, H.M. Ships (and I purposely make no reference to landing craft, as they formed no part of the pre-war Navy) were accustomed to operate from well established bases, destroyers and submarines being assisted by depot ships. Naval, victualling and armament stores could be carried or made readily available sufficient for appreciable periods, but fuel had always been the main "headache." H.M. Ships, generally, were able to provide their own day-to-day maintenance and emergency repair facilities. The operation of large fleets including numerous and miscellaneous minor vessels and landing craft for prolonged periods off enemy-held coasts and from bases recently acquired from the enemy was quite

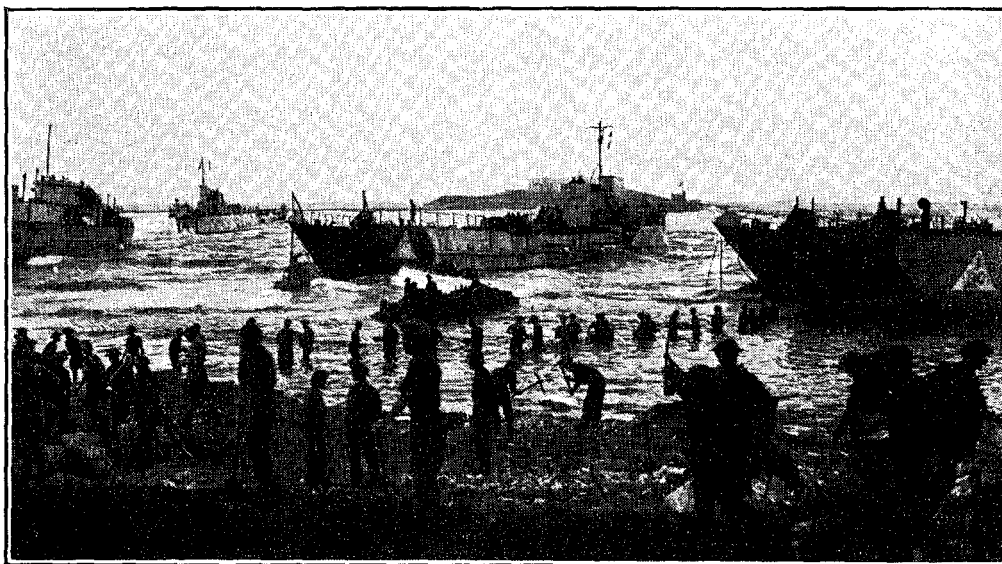


FIG. 3.—THE SICILIAN LANDINGS. UNLOADING STORES JUST AFTER DAWN. BEACH ROADWAYS ARE BEING PREPARED

a novelty. Further, our resources of materials and trained men were limited and the inevitable compromise had to be accepted between that which one wanted and that which could be made available in the time.

Previous experience may be said to have been limited to the landings in Madagascar, since the cross-Channel raids, including Dieppe, were of an entirely different nature, and did not call for the facilities required for a full-scale landing and invasion.

At Madagascar, a relatively small show, the landing craft had depended for maintenance and emergency repairs on the limited resources of the flotilla maintenance parties carried in the parent ships. These parties were provided with a limited set of spares and stores and practically no workshop equipment. They were in no way equipped or trained for carrying our repair work ashore, on the beaches, or later, in captured ports. The only other facilities available in the area, were such as could be provided over and above their own needs, by the ships' staffs of H.M. Ships present.

Flotilla Maintenance Staffs

Before proceeding further, it will be as well to describe the composition and functions of the flotilla maintenance parties. These varied according to the type of craft in the flotilla, but generally numbered some 7-8 ratings for minor landing craft and rather more for major craft, under a young and usually not too experienced R.N.V.R. engineer officer. Twelve was the average number of craft per flotilla, the drivers of which were stokers in name, but in the early days fell far short of the standard of knowledge and ability usually expected of such ratings. The maintenance staffs, therefore, were not expected to provide anything more than day-to-day routine maintenance; they depended for all else on a base staff, who were responsible for all flotillas attached to a given base. Nevertheless, on many occasions the flotilla staffs successfully completed jobs far beyond the intended scope of their facilities. Bases were usually fairly well equipped and provided with slipping and workshop facilities. Cross-Channel raids were well supported by such bases in U.K. But, abroad,

this support was lacking entirely in Madagascar, and in the Mediterranean until after the North African landings had been completed.

Repair facilities provided for " Torch "

The ships carrying the craft and the flotilla maintenance parties were, so far as time and resources allowed, fitted with stowage for stores and repair facilities for the use of these parties. The fact that the ships were not released from normal trade duties until the last possible moment was a serious handicap to this work. Thus, although limited repair facilities existed afloat, there was nothing at the shore end, where the majority of breakdowns occurred, so that often the craft could not even struggle back to their ships.

The original directive which subordinated everything to the Army lift was to the effect that the Navy would withdraw by about D + 42. The decision that NCXF would in due course become C.-in-C. Mediterranean was made too late to enable adequate repair and maintenance facilities to be provided in time. *Port Repair Parties* were kitted up and assembled ready for shipment to Algiers and other North African ports, as soon as the shipping lift was available and conditions in the ports permitted the landing of relatively large and immobile parties with several hundred tons of stores. These parties were to provide general emergency repair facilities, and were well equipped and stored so to do. But it was not realised how long it would take before such parties could settle down, locate and unpack their gear and be ready for work. This phase was prolonged by the difficulties experienced in sorting out the Naval stores from all the rest, and in handling the larger and heavier items.

Two further parties, comprising 100 S.R.R. (D) ratings each, were held in reserve to back up the above when and where the need became apparent. Subsequently, a landing craft base organisation was established in the North African ports and later at Malta.

In due course, and as subsequent operations placed additional ports under our control, no less than thirty-two repair bases were established or got working in the Central Western Mediterranean, by a special section of the C.-in-C.'s staff under an Engineer Rear-Admiral, the Principal Base Engineer Officer. This was a most commendable effort considering the limited labour and material that was available and remembering the major setbacks that were experienced on occasions such as when H.M.S. *Hecla* was lost with all the equipment, spare gear, etc., which she carried.

THE SICILIAN AND ITALIAN INVASIONS

Applying the lessons learnt

The fact that the North African landing succeeded in spite of the lack of repair and maintenance facilities on a scale which conditions warranted, may be attributed to the inherent ability of our nation to improvise and to the fact that the landings were not heavily opposed. Many of the gaps were filled by the mobilisation of local labour and materials. The lessons learnt were digested by the " rear link " staff of the Deputy NCXF in London, which was already preparing plans for subsequent Mediterranean amphibious operations, whilst the staff of the N.C.X.F. later to become the C.-in-C. Mediterranean, was primarily concerned in fighting the battle in support of the Army in North Africa.

To understand what the planners' aim should be it is necessary to appreciate the sequence of events, which, in general terms is :—

Phase 1. The assault ; the landing of the assaulting troops and the supporting arms with which to capture the beach-head.

- Phase 2. The follow up ;* the landing of reinforcements to back up the assault and secure the beach-head against counter attack.
- Phase 3. The build up ;* the landing of additional troops, equipment, stores and vehicles sufficient to enable the fighting troops to break out of the beach-head and capture an adjacent port or ports, i.e., the maintenance of the Army (and R.A.F.) over the beaches until port facilities are captured and rehabilitated.
- Phase 4. Maintenance of the Army through captured ports.* A direct attack on defended ports from seaward is not a practicable proposition.

In addition to repair and maintenance, there exists an equal need for a Naval Beach Recovery Organisation to salvage stranded landing craft. These three requirements could only be met by the provision of suitably equipped and specially trained mobile parties, capable of operating with the minimum of delay after arrival off the beaches. They must reach the assault area in the initial phases of the operation.

The advanced units of the Naval Beach Recovery Organisation should arrive as early as possible in Phase 2. The whole, together with emergency repair parties on and off the beaches will be required to be fully operational early in Phase 3. Emergency mobile port repair facilities will be required to enter the ports with the advancing troops and full port repair parties to be established as early in Phase 4 as possible.

Before Sicily was selected as the next objective, three other operations which were planned, though not put into effect, gave the planners further and much useful experience and food for thought.

Planning for "Husky"—The Invasion of Sicily

By March, 1943, we had a D day—subsequently a day that was to oscillate very frequently. We knew where we were going, although the actual beaches on which we were to land the Army continued to vary almost as rapidly as did D day. It was not too bad a start, however. We also had a plan, but that, likewise, changed frequently.

The need for a flexible logistic plan is thus apparent. The whole operational plan changed a few weeks before D day with the adoption of the new "Montgomery" plan, in which the U.S. Forces abandoned the intention to land in the Palermo area and the British likewise in the Catania area, and both concentrated towards the south of Sicily. A later and better example may be found in operation "Dragoon" where it was proposed to change the assault area from Toulon to Bordeaux, which was only decided against two weeks before D day. Such a change would have meant escorts, ships, and craft having to operate 1,500 miles further from their bases than anticipated originally.

The work of a S.E.O. (Plans) involves duties which extend far beyond the normal responsibilities of an engineer officer. Some overlapping with other staff officers is inevitable, in fact, desirable, if gaps in the plan are to be avoided. The S.E.O.(P) will be wise to work in the closest co-operation with other officers, and keep up to date in all political, strategical and tactical developments concerning the operation, since these and their implications will have some bearing on decisions which he alone can and must make. He must appreciate the intended conduct of the assault forces, the "order of battle," etc., and on no account must he consider himself purely technical.

All the while, up in Scotland, the craft crews and others were training, collecting stores and preparing to land, and support the Army and Air Force (over the beaches of Sicily, though they did not know it!). The results achieved in the gales, rain and mud of West Scotland with the rawest material, was a



FIG. 4.—A TRACTOR COMES TO THE RESCUE OF A DROWNED VEHICLE

noteworthy and vital achievement equalled only by that of their opposite numbers in other Forces working amidst sand, flies and in blistering sun in the Suez Canal area.

Shortly before embarking, the Prime Minister described, in his own way, how, one day, we would invade the Continent of Europe, using the phrase “amphibious operations of peculiar complexity and hazard.” The planners, from beneath a flood of orders, amendments, intelligence and everything else, and perhaps with more respect for the Italians than necessary, agreed with Mr. Churchill.

By a nasty trick of fate, it was 13th June that the Staff caught the night train from Euston. It was not, therefore surprising that our full scale rehearsal had to be abandoned due to weather before completion! The operational ships and craft had to be used in the rehearsal, and there was little time to repair them if they got damaged, a point to be borne very much in mind.

The Mobile Land Repair Units

During this period, the first Mobile Land Repair Unit (M.L.R.U.) was equipped and trained in U.K. and had been landed at Algiers. The principle of the M.L.R.U. was conceived in the Mediterranean, based on the policy that a newly occupied port had initially to maintain the minesweepers, trawlers and other small craft used in opening it up, to be followed later by offensive Coastal Forces craft, and finally destroyers and the Army supply ships. The M.L.R.U. would hold the fort whilst the port Repair Party rehabilitated local workshop and store accommodation and unpacked its stores and equipment. The unit gained invaluable experience during the next few months, during which it provided mobile repair facilities as required in support of advanced units along the North African coast and ultimately in Tunisian ports, in which craft were being prepared for Operation “Husky.”

The principal features of No. 1 M.L.R.U., on which were based the three further units to be formed subsequently, were :—

- (i) *Complement.* 4 Officers, comprising 1 Lieut.-Cdr. (E) (in charge), 1 Sub.-Lieut. (E), 1 Warrant Shipwright, and 1 Sub.-Lieut. (Administra-

tive Officer), and some 65 ratings. These latter comprised E.R.A.'s of all trades, shipwrights, plumbers, blacksmiths, O.A.'s, E.A.'s, wiremen, motor mechanics, stokers and Royal Marine drivers (subsequently changed to Stoker drivers) for the vehicles.

- (ii) *Vehicles and Equipment.* Fitters', turning and drilling and shipwrights' workshops, lorries and/or trailers fitted to carry generating sets, welding equipment, (electric and oxy-acetylene), diving gear, G.S. air compressors and pneumatic tools, petrol driven pumps, 5-ton crane, petrol and water bowsers, stores and materials, 14 days' rations, camp equipment, N.A.A.F.I. stores, etc. Total about 50 vehicles (including trailers and 2 motor cycles). Spare gear was not carried, except that required for self-maintenance of own vehicles. Originally, 2 Oerlikons, mounted on lorries were included for defence when away from locally defended areas, but the guns were later removed and the lorries more usefully employed carrying stores.
- (iii) *Communications.* The unit depended on a telephone link being provided with the local Naval or Army network.
- (iv) *Administrative Authority.* The units always operated where directed by the C.-in-C., or Naval Force Commander to whom they might be allocated by the C.-in-C. They conformed to the orders of the N.O.I.C. or other local authority in whose area they were operating.
- (v) *Functions.* In the initial phases of an operation the units provided general naval repair facilities and assisted in craft recovery on the assault beaches and subsequently, as required, in the assault area. Their main function was to provide emergency repair facilities in captured ports until such time as a port repair party could be landed and become fully established, thereafter assisting the port repair party until required to open up further ports, or to support further beach landings.

Although intended for general repair work and therefore manned by G.S. ratings, much of their work was on landing craft, which, after a little experience they were well able to undertake.

The M.L.R.U.'s in action

No. 1 M.L.R.U. was landed over one of the eastern beaches in Sicily, subsequently operated in Augusta, and later provided much needed assistance at Messina in preparing craft for operation "Baytown," the Eighth Army landing in the toe of Italy.

No. 2 M.L.R.U. was landed about D + 4 over one of the southern beaches and camped down close behind the beach. The limited resources of the beach repair parties operating this beach and clearing up the casualties on an adjoining beach had been severely taxed. The help now provided by the M.L.R.U. materially assisted in getting the situation under control. When maintenance of the Army over the beaches ceased, the M.L.R.U. moved into Syracuse.

No. 1 M.L.R.U., intended for opening up the port of Salerno, as an advanced base until Naples fell, found the town untenable owing to shelling, and settled down in an orange grove part way between the beaches and the town. From this site they assisted materially on the beaches, establishing a sub-unit on the shore which sent all major jobs back to the main camp. They also backed up the port repair Party which later was established in Salerno. Although at this time the harbour itself was free from shelling, all the approaches to the sea and landward were still under fire. From amongst the many and varied jobs performed,

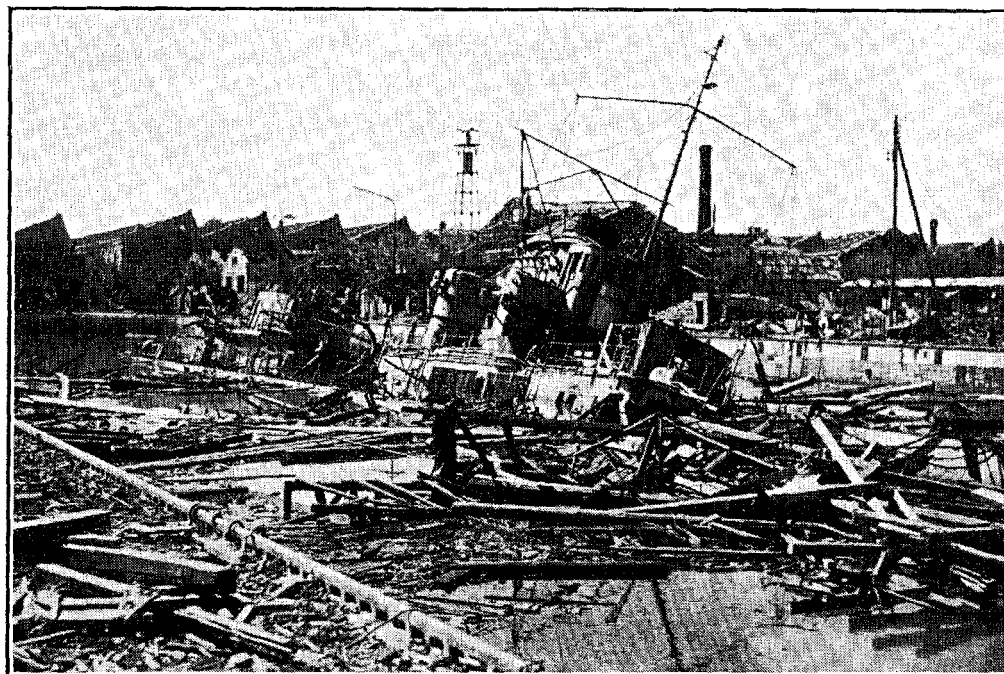


FIG. 5.—NORTH AFRICAN CAMPAIGN. A FRENCH DESTROYER DAMAGED IN ONE OF THE DRY DOCKS AT FERRYVILLE, NEAR BIZERTA

two were outstanding. On the beaches, an L.C.T. had received a direct hit on the bridge whilst beached and unloading. In spite of the fact that the Beach Master had written it off as a dead loss, the M.L.R.U. had effected sufficient repairs to enable it to operate again in a few days. In Salerno, the bows of a K Class destroyer extensively damaged in collision, were made seaworthy within forty-eight hours, enabling her to rejoin the screen off the beaches. The only clear berth with sufficient depth was inaccessible by land owing to demolitions. An L.C.T. was loaded with lorry borne welding and other equipment and secured alongside.

After four weeks of such work, the Unit moved into Naples, where it found an ideal H.Q. in the Yacht Club, complete with small slip and sheltered alongside berths for vessels up to the size of M.M.S., all of which minor work it handled on behalf of the Base Engineer Officer.

Owing to the destruction and blocking of the majority of the unloading berths, a desperate need existed for many weeks for as many landing craft as possible to unload ships anchored off. The state of these craft, many of which had operated almost continuously in North Africa, Sicily and off the Italian beaches, called for constant attention. In due course, a full scale landing craft base staff arrived. But the need for such a move had not been foreseen. The base staff had been fully occupied in North Africa up to this time. A considerable period inevitably elapsed in packing up, loading, transshipping such a far-from-mobile party, and getting them settled in the new location. Meanwhile, the M.L.R.U. and Port Repair Party competed with the situation.

No. 2 M.L.R.U. meanwhile and subsequently, was doing invaluable work up the east coast of Italy.

Craft recovery

Concurrently, plans were in hand to provide, train and equip parties whose functions were to refloat minor landing craft and, so far as practicable, major landing craft stranded as the result of enemy action and/or navigational mishaps. These parties were to be assisted as necessary by shallow draught tugs.

This work entailed many hull repairs, although rudders and propellers also featured largely. Shipwrights, therefore, constituted a large proportion of the parties' complement. For Operation "Husky," seven parties were formed, equipped and trained; two in U.K., as part of Force V, which sailed direct to the southern beaches from the Clyde, and five in the Middle East, from which they sailed to the eastern beaches of Sicily.

Allocation of Beach Repair Parties

According to the size of a beach and the amount and nature of the traffic planned to pass over it, and bearing in mind the number of parties available, one or more Beach Repair Parties were allotted to each beach and conformed to the order of the Senior Naval Officer (Landing). They worked directly under one of the Beach Masters, who was administratively responsible for the party. Also working under the Beach Master were the R.N. Beach Commandos. They formed a seamen working party whose responsibility it was to open up, mark, and operate the beach from the Naval side. Much of the success of the Beach Commandos and of the Beach Repair Organisation depended on close liaison and co-operation between them.

On the beaches at Sicily

We had arrived non-stop from England to within 6 miles of the enemy coast almost unmolested. Things were happening. They did not go perfectly. But the assault craft had gone off shorewards. The second wave followed. Coloured lights were seen from the beaches that spelt success. From then on an endless stream of troops, tanks, guns and stores headed for the beaches. Initially 160,000 men, 14,000 vehicles, 600 tanks, 1,800 guns, to be followed every day and night by reinforcements and supporting troops. By p.m. D day, the Beach Repair Parties were ashore, although without some of their stores. But was that really surprising? Working closely with the R.N. Beach Commandos they were soon assisting in attempts to repair and refloat craft stuck on the treacherous runnels lying off the beaches. A "grave yard" was established clear of unloading points to which damaged craft would be taken for repair and close to which, under cover of the sand hills, a Repair H.Q. was set up.

The Army were soon out of sight inland. The Navy's job was to see they got all that they wanted, towards which end the Repair Organisation contributed no small part, for, though the enemy caused few casualties to craft, the weather and other natural hazards continued to take its toll.

Since these parties would often be working on beaches remote from any other form of repair facility, they had been designated Beach Repair Parties and an attempt was made to equip them sufficiently to enable emergency engine repairs as well as hull repairs to be effected in conjunction with the flotilla maintenance parties who were also landed. Unfortunately, the means of suitably equipping the latter for work ashore could not be provided in the time available, and their effectiveness suffered accordingly. Nevertheless, throughout the operation the work of disembarkation over the beaches was remarkable and the C.-in-C. made a congratulatory message to all landing ships and craft and the repair staffs.

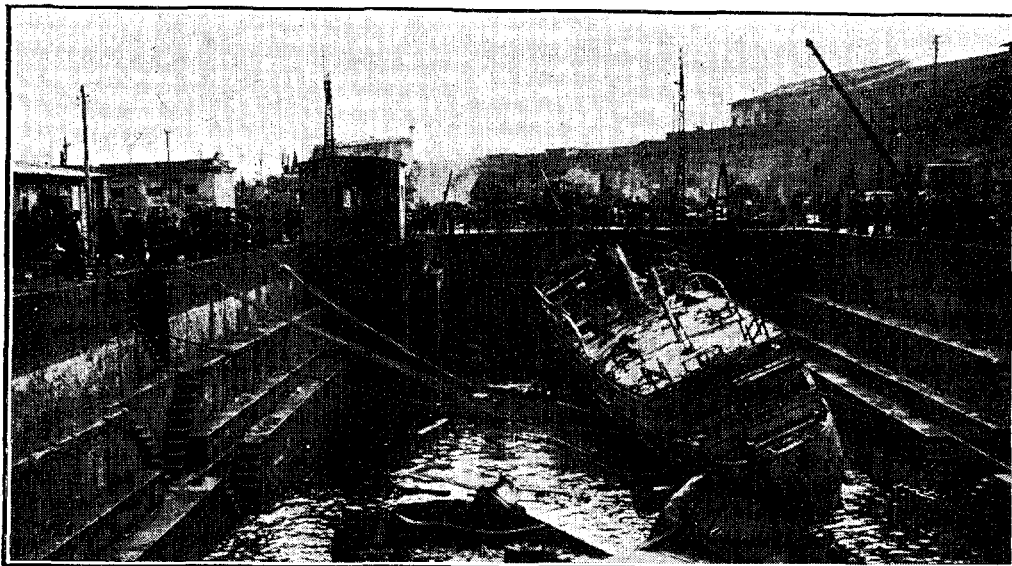


FIG. 6.—NAPLES. THE DOCK GATE OF THIS 250 FT. DRY DOCK HAD BEEN DESTROYED. SCUTTLED IN THE DOCK WERE A 300 TON ITALIAN MINESWEEPER, A 60 TON SCHOONER AND A 150 TON STEEL BARGE. A 150 TON DOCK-GATE WAS BUILT AND PLACED IN POSITION

Those Beach Repair Parties who had the support of No. 1 and No. 2 M.L.R.U.'s functioned well, in spite of the fact that one of them lost much of its stores when the ship carrying them from U.K. was torpedoed on passage. To varying extents, all of them suffered from loss of stores, occasioned by the fact that they were loaded in ships of the assault convoy together with all the other Army and R.A.F. stores with which they became inextricably mixed, so fetching up, presumably, in various Army store dumps ashore; at least they were never seen again by the Naval parties.

These parties comprising some 15 ratings each, were in charge of a Lieut. (E) assisted by a Warrant Shipwright. They had no transport, so that once landed with all their stores and equipment, they were immobile. Their principal item of equipment was a weird and ungainly monster known as a Le Tourneau type crane operated by a D8 diesel driven tractor. Both were track mounted to enable them to traverse all but the softest beach surfaces. The crane had no parts that would suffer from immersion in sea water, but the tractor had to be water-proofed to enable it to "wade". In those days, the "wading" depth was only 3' 6" in almost calm water. The maximum load was 12 tons at a fixed and limited radius. This was sufficient to lift bodily minor landing craft, except L.C.M. One end only of the latter could be lifted at a time, but this enabled hull repairs to be made, and the craft to be dragged down the beach to the water again. The almost complete absence of tide in the Mediterranean, whilst lessening the risk of becoming stranded, meant that to effect underwater repairs, craft had to be lifted up the beach and subsequently refloated.

Other, but no less essential, pieces of equipment were a petrol trailer pump and an electric generator welding set, also used for battery charging. Owing to the nature of the mounting of the latter, and the absence of a towing vehicle for either, without immobilising the crane, considerable difficulties were experienced in using these essential items. It must be remembered that craft became stranded at points often considerable distances apart, and time wasted in getting from one to another seriously reduced the number that could be dealt with each day, or on each tide. During the night, or by the next tide, they may become total losses, apart from the fact that they obstruct beach approaches,

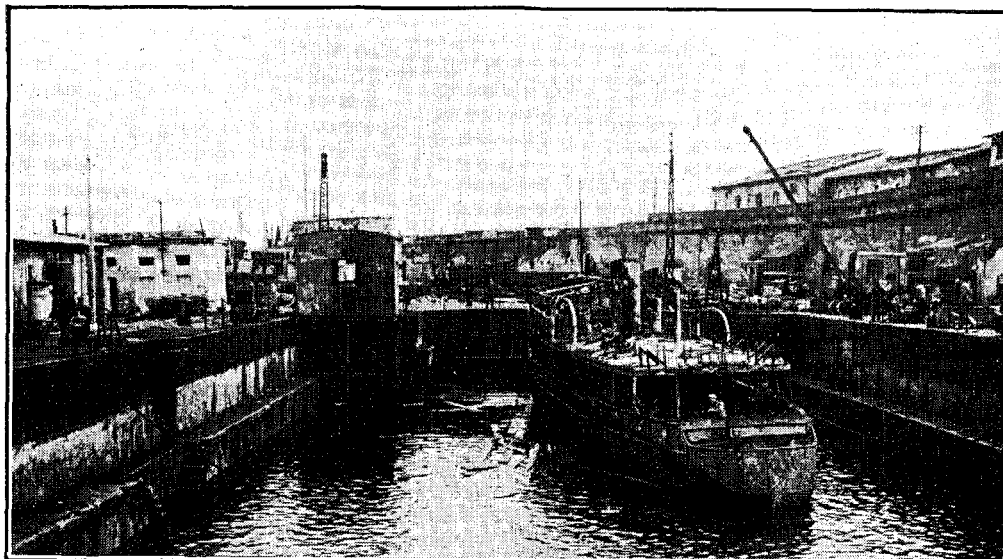


FIG. 7.—THE DOCK (FIG. 6) EIGHT DAYS LATER. THE MINESWEEPER WAS REPAIRED AND READY FOR REMOVAL

thereby impeding the unloading of other craft. Should they become a wreck submerged at high tide, they are a navigational menace.

Refloating is often facilitated and in the case of major craft, only possible if adequate towing facilities by *shallow* draft craft are available from seaward. In practice, it was found such facilities could only be provided by major landing craft, the diversion of which for towing, upset the unloading programme and inevitably meant that the tow was not available when required, and a repaired craft often suffered fresh damage whilst waiting to be towed off.

The lack of adequate camping equipment caused some discomfort but was not seriously felt in the fine, warm Mediterranean summer. Such would not be the state of affairs at other times in other places.

Craft recovery at Salerno

So far as station resources and time permitted, some modifications as follows were effected in the two Beach Repair Parties scheduled for operation "Avalanche", the landings at Salerno, Italy.

- (i) *An increased complement* was arranged by reforming three of the "Husky" parties into two new parties, the spare Engineer Officer being held in reserve as assistant to the Force Engineer Officer.
- (ii) *A degree of mobility and independence of Army lift* was ensured by accommodating each party in its own L.C.T. The type selected provided ample stowage and good protection for equipment from the weather. No special living accommodation could be provided but utilising hammocks (slung on the tank deck) and portable cooking equipment, the party as well as the crew all fitted in well enough. Tents and ground sheets were also carried to house a proportion ashore on arrival.
- (iii) *Shallow draft towage* facilities were provided by these L.C.T. These operations were, unfortunately, often interrupted by wires becoming foul of the propellers and the units own shallow diving equipment proved most useful.

- (iv) *A lifting gallows* was fitted to the bows of one L.C.T., (unfortunately, time prevented both being so fitted) and the lifting wires run to the L.C.T. capstan aft. It was hoped this device would materially assist in effecting hull repairs to minor craft and in refloating them but it was not long before the gallows arms became bent, as the result of a collision with a ship's side, and ultimately collapsed when trying to salvage a sunken section of pontoon causeway.
- (v) *D.U.K.W.'s* (Amphibious 3-ton lorries) were allocated one to each unit and proved invaluable for transporting men, stores and equipment both along the beaches and to craft anchored off waiting repair.

These parties were ably supported by No. 1 M.L.R.U. as already mentioned. After some three weeks, during which all work was performed on and off the open beaches (luckily there was only one serious blow during this time), it was possible to tow the more seriously damaged craft into Salerno harbour for repair by the Port Repair Party. Any attempt at entry in the early days brought down a hail of fire from the surrounding hills.

An illustration of the unexpected type of job that was likely to arise, and of the versatility of the personnel involved, is provided by events after the fall of Naples. Scarcely a boat remained serviceable in Naples. The Italians had removed them in large numbers to Ischia and Capri Islands to avoid the fury of the Germans' policy of destruction prior to final withdrawal. Here they had been immobilised and essential parts hidden. At Ischia, a similar state of affairs existed among the large fleet of M.A.S. boats based there. One Beach Repair Party successfully recommissioned, or saw that the Italians did so, the majority of these boats, including some floating cranes desperately needed by the Army for unloading and salvage work in Naples. At this time could be seen the unusual sight of stokers enjoying daily hot baths in the natural hot water springs, a pleasure normally enjoyed only by wealthy tourists.

Subsequently, Ischia was chosen as the site for an advanced Coastal Forces base, the organisation of which, which had not been anticipated, fell to the lot of the Staff of Flag Officer Western Italy. Just one example of the need to be prepared for the unexpected, which usually occurred more frequently than the expected, in the life of a planner.

Port Repair Parties

Some improvement over earlier arrangements was effected by phasing the arrival of Port Repair Parties. The parties were split, an advance section with limited ready use stores and equipment, mostly lorry borne, arrived early in the proceedings by L.S.T., to be followed a day or two later by follow-up sections with the bulk of the stores and all heavy equipment under the supervision of members of the party.

Co-operation with the Naval Salvage Section and the Army

It is appropriate, at this point, to refer to other sections of an assault force whose work is closely allied to that of the above Naval parties.

Salvage and Wreck Dispersal. The handling of incapacitated ships and craft in deep water, (i.e., away from the beaches themselves) and the clearances of wrecks is a job handled by the Salvage and Wreck Dispersal Vessels, who come under the jurisdiction of the Force Salvage Officer. The occasions calling for co-operation between his Staff and the Craft Recovery Organisation are too obvious to call for special mention.

R.E.M.E. Beach Recovery Sections. On the Army side, the closest co-operation was necessary between the Naval Beach Parties and the R.E.M.E. Beach Recovery Sections. These latter were responsible for the recovery of drowned vehicles for which purpose they were far more effectively equipped than the Naval parties ever were for the job. Whilst each had his own job to do, and did it, it was obviously desirable for mutual assistance to be given; a drowned vehicle might well be the cause of a craft casualty if left stranded on the beach approaches. The R.E.M.E. equipment, if available, often filled the gaps in the less complete and effective Naval equipment. But a soldier driving a bulldozer was not encouraged to "push off" stranded craft. He meant well but usually caused considerable harm to the craft.

Water-proofing vehicles

All vehicles landed in the early phases over beaches had to be waterproofed in accordance with Army instructions, to enable them to "wade" ashore. Waterproofing imposed a limit on the speed and range of a vehicle; it was carried out in stages by or under the supervision of the Army with materials supplied by them. All vehicles had to be de-waterproofed immediately after landing. Special vehicles destined for beach use, i.e., the Le Tourneau Crane Tractor, were specially treated for prolonged running.

Supplies

For supplies, the Navy generally depended on its own sources of supply. But there were exceptions:—

- (i) *Food and Water.* All Naval parties ashore drew Army rations from the local D.I.D.
- (ii) *Fuels and Lubricants.* In addition to drawing supplies for Naval vehicles from Army P.O.L. Depots, dumps of P.O.L. were supplied on the beaches by the Army for use by craft unable to refuel from tankers. In emergency, other supplies were made also; for example, at Salerno, when 100 Octane spirit for C.F. craft ran short, R.A.F. stocks of aviation petrol were made available and ferried out in D.U.K.W.'s
- (iii) *Stores.* Considerable assistance was given, often "under the counter," by each Service to the others. A regular item drawn from R.A.O.C. was bottled acetylene and oxygen.
- (iv) *Vehicle spares.* Although the Navy was responsible for day-to-day maintenance of its own vehicles, R.E.M.E. carried out all major repairs, supplied spare parts and made replacements of unserviceable vehicles.

Fuel

Intricate organisation was entailed in arranging the movements of the large number of escorts with the numerous convoys converging on the central Mediterranean prior to "Husky." They were all moving according to an exact schedule and the systems of relief of escorts for refuelling had to be most carefully worked out and adhered to.

The ships bringing the minor craft carried ready use supplies in cans on the upper deck and all craft tanks were filled before sailing. Subsequent supplies for them and for major craft and ships, remaining in the area or unable to return to base without refuelling, arrived by tanker in the first follow-up convoy. Replenishment tankers were sent forward when requested.

Because of the fire risk, the quantity of ready use fuel carried as upper deck stowage was severely limited, and motor fishing vessels used as small fuel carriers acted as "milkmen," who made a "milk-round" of their customers in the assault area daily. The salient difficulties were that Malta was the only base with sizeable stocks, the tankers were limited in number and being of British, U.S.A. and French origin it was no easy matter to ensure that they all carried the appropriate hose connections. Such minor incidents as the arrival of 30 tons of water mixed with 300 tons of 100 Octane petrol upset the C.F. programme to no mean tune ! Lack of clear markings on lubricating oil drums caused some confusion.

Experience showed that the amount of high priority signal traffic prevented all but a few signals reaching "Q" staff at rear H.Q. Without regular fuel reports a good deal of crystal gazing was required to ensure adequate fuel supplies in the assault area whilst avoiding endangering the few precious tankers in the forward area before it was absolutely necessary. It was obvious that dependence on fuel signals must be eliminated and that logistic support must be based on the following lines :—

- (i) Estimate carefully the fuel and lubricant expenditure with an allowance for losses and unforeseen demands.
- (ii) Make out a tanker timetable to meet these estimated requirements.
- (iii) Place fast tankers at strategic points available to be called forward at high speed to the assault area in any emergency. In such cases, the signal would have the highest priority grading.

Shore tankage. The enemy seldom left installations intact. Stocks left behind, if any, could not be used till they had been tested. There was always a paramount need to set up temporary tankage and/or rehabilitate existing tankage. This involved major construction problems in which the U.S. Navy "Seabees," U.S. Army and British Army assisted on many occasions, and was undertaken at Bizerta, Augusta, Taranto, Corsica and many other places. The Royal Navy's contribution was negligible, as neither the men nor materials could be made available in spite of repeated applications. What occurred at Naples provides an example of inter-Service co-operation, this time also inter-Allied. It was necessary to provide fuelling facilities in Naples sufficient for destroyers, and shore storage to which tankers could discharge without delay in turn round. At the Italian fuelling base nearby at Pozzuoli, the break-water which also formed the fuelling quay, had been extensively demolished. Of the underground tankage, a proportion was still intact but incomplete; the pumping station and staff were still available. A U.S. Army Pipeline Company rapidly erected a new line of piping from the tanks along a wooden jetty, which only required minor repairs, and completed the tank installation; thus providing berths from which destroyers could fuel alongside. The line on the old oiling quay was sufficiently repaired to enable large tankers to discharge to it by means of floating hose, after one wreck had been cleared. The completed installation was operated entirely by the Italians.

Manufacture of urgent requirements by local resources

The existence of local factories capable of functioning or of being made at least partially operative, was utilised fully for the manufacture of gear required urgently, the supply of which from normal sources proved difficult or subject to long delays. The scale of such work rose at times to the value of a million sterling a month.

The supply of power and co-operation of the local inhabitants were necessary

prerequisites of the above. The former, although the Army's responsibility, was at times only forthcoming as the result of the efforts of Naval parties. To quote Naples once again, two Naval Electrical Officers succeeded, utilising entirely Italian labour, in getting one diesel generator in a local station operating in a few weeks, followed shortly by the second set, both of which had been extensively damaged by Allied air raids some 12 months previously. During all this time the sets had been fully exposed to the weather. This result was achieved in spite of almost nightly enemy air raids, during one of which the new roof was again removed. Naples was normally supplied from a distance by the grid on which the Army were working, but this supply proved most unreliable due to the inferior Italian material employed. Another standby source of supply was arranged from some Italian submarines secured alongside in the harbour, utilising the street tram circuits for transmission to the users. The supply of fuel to power stations was a problem to be met jointly by the Army and the Navy.

Water supplies were equally essential, and normally made by the Army. But for weeks at Castellemare the only supply available was that provided by the Base Engineer Officer utilising his trailer fire pumps, until the normal machinery was repaired by the Army.

Security

The problem of the maintenance of security added enormously to the planning difficulties encountered. All personnel concerned were classified "XO" or "YO." Those in the "YO" category knew that an operation was to take place. A small number of these knew the objective and date, and were classified "XO." All discussions and meetings were on "XO" and "YO" levels, and care had to be taken to ensure that no one of a lower or unclassified category was present.

The provision of oiling hose connections for the South of France landings provides an outstanding example of security measures. British ends were made at Ferryville, the U.S. at Taranto, and the French at Naples. The whole were married by British Naval ratings in a locked shed at Naples, boxed up and sealed to be opened with the operation orders. 450 multiple connections had to be manufactured and distributed in this way.

PREPARATIONS FOR OPERATION "NEPTUNE"

Considering all the difficulties that had had to be overcome, the Naval Repair and Recovery Parties up to this time might well have claimed "the impossible we do at once, miracles take a little longer." In the process, they had learnt many lessons, however, and a nucleus of planning staff, port repair parties and M.L.R.Us. were returned to U.K. in November, 1943, to prepare for the invasion of Normandy. The number of experienced personnel who could be spared was all too small, since Commander-in-Chief, Mediterranean, had to perforce retain sufficient of them to meet his own future requirements to complete the Italian campaign and carry out the landings in the South of France. It is not intended to render an account here of these events, concerning which a separate story may well be written, and we will in the next article return to Norfolk House, where the staff of the Allied Naval Commander Expeditionary Force (ANCF) was well advanced with plans for Operation "Neptune."