

## PART I

# TRAINING IN DAMAGE-CONTROL

by

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*Damage Control School, Stamshaw*

The need for damage-control training of some sort has been apparent ever since men first went down to the sea in ships, whether in merchantmen or in ships of war. A battle with the elements was always possible; wind, sea, and fire did not wait to declare war formally, and the knowledge that these dangers were present kept alive some form of damage-control training, often under the title of seamanship, even during long periods of peace.

In the Royal Navy, some of the general drills, such as "Out collision mat," did help to train men to deal with damage, but others, for instance "Away all boats, pull round the fleet," in days when nearly all boats were power-driven, had not much direct value, except to give healthy exercise to the men and practice to the officers in taking charge.

The First World War reflected the lack of realistic damage-control training. During the latter part of that war, and between the two World Wars, attempts were made to introduce more realism into exercises at action stations which were damage-control exercises, though not called by that name. By 1939, however, only senior officers and a few ratings on the verge of pension remained who had seen any action damage; there were few records available of previous experience, and the vast majority of officers and men had no practical experience of what to expect.

### **Need for Realistic Training**

Without experiencing action damage, it is difficult or impossible to assess its effect on many men. Apart from the physical shock, the mental effect on a man suddenly plunged from familiar surroundings into a nightmare of twisted steel, choking smoke, darkness, and swirling water or raging fire, with shattered messmates round him, is liable to be so drastic as to paralyse his power of coherent thinking. If, however, he has thought out beforehand what to do in just such an emergency as has befallen him, he will find himself carrying out those actions, under the guidance of his subconscious mind, in rather the same way as a player has been known to score the perfect try while suffering from concussion, remembering nothing at all about it afterwards. Damage-control training should have as its ultimate goal to train men so thoroughly and under such arduous conditions that they will react correctly to the damage they observe, even when bemused and bewildered, will not be afraid of fire or flood, nor imagine the ship is going to capsize because she has a heavy heel.

The lack of experience of damage, and even of exacting exercises, had an adverse effect on the development and provision of damage-control gear. There was no real cry from the Fleet for improvement, because the weaknesses of the gear provided were not fully revealed, until it began to be used in real earnest after 1939. As more and more ships were damaged, the inadequacy of much of the pumping, counter-flooding, leak-stopping, and fire-fighting material became obvious. Proper training, both at sea and in damage-control

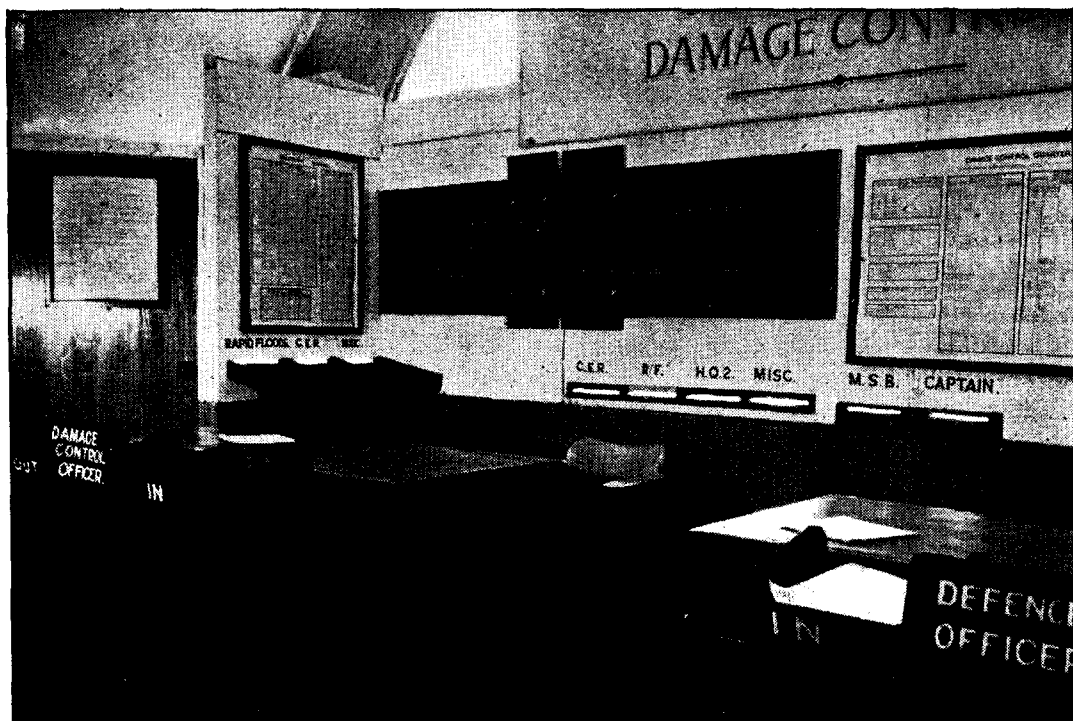


FIG. 2.—D.C.H.Q. MOCK UP. "SUPERB" CLASS CRUISER

and fire-fighting schools would have found out many of the weak spots before the supreme test of war.

As an example, it was well known to be a major operation to transport the old submersible pump to the supposed scene of damage, with the ship on an even keel, all lights burning and ventilation intact, but the exercise was carried out painstakingly in most ships until the pump could be got to most compartments fairly quickly.

Had the exercise been tried with the ship listing, with oil on the deck, perhaps in darkness or smoke and heat, it would soon have been realised that the pump was far too heavy and cumbersome to be of any use after damage, unless by a lucky chance it happened to be already in the damaged area but had itself escaped damage, and an insistent demand for a handier pump, would have arisen from the Fleet. As a result of this fool's paradise, the heavy submersible pump was, in 1939, still the only portable pump supplied to ships, and no even moderately handy pump was made available till many ships had found, by bitter experience, and reported, that the big submersible was of little use in war. The time that elapsed while a suitable type of portable pump was found, tested, mass produced, and supplied to ships abroad, was naturally long.

Similarly, had peace-time exercises been more exacting, the need for more-easily-understood drawings of systems and incident boards in damage-control headquarters and bases might have been discovered. This need was partly hidden by the high standard of technical training of the long-service rating. The great expansion of a navy during war results in the majority of any ship's company being inexperienced, and it becomes even more important to simplify drawings. This led in 1942 to the production by the Damage Control School of the three-dimensional type of drawing for incident boards, whereabouts diagrams, and other drawings which it is essential that an untrained man should be able to read. The average officer, accustomed from childhood to read a conventional ship's drawing, may find it difficult to appreciate that they are by no means obvious to the ordinary man.

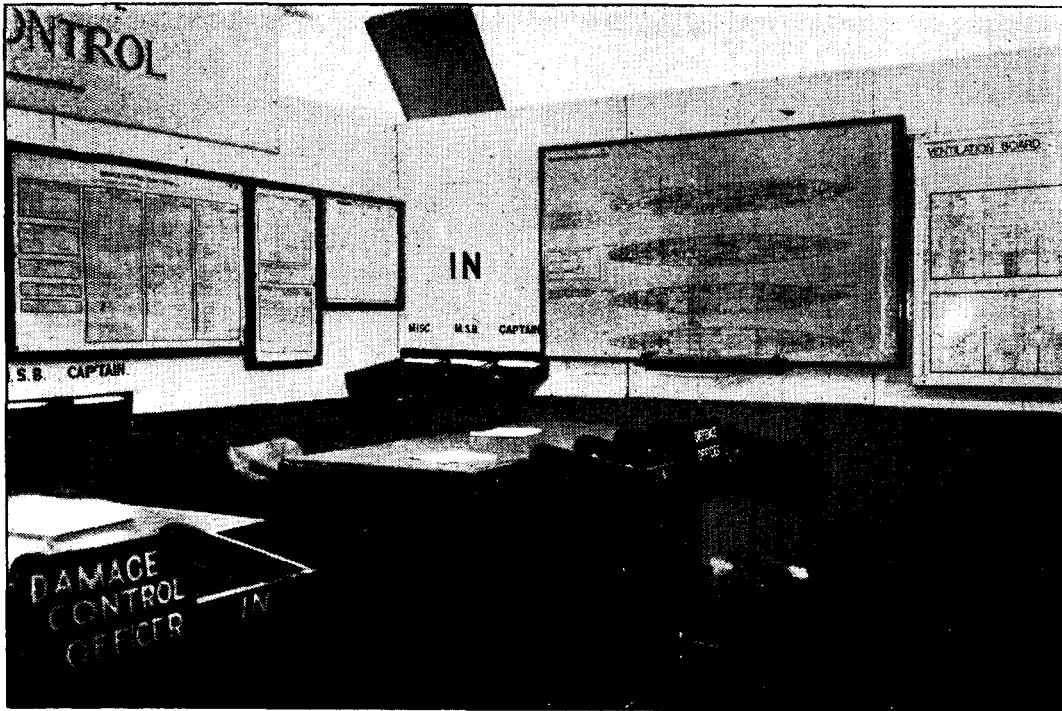


FIG. 3.—D.C.H.Q. MOCK UP. "SUPERB" CLASS CRUISER

### The First School for Damage-Control Training

One of the most important changes in naval training after the outbreak of the Second World War was the introduction of the Damage-Control Course. The step was noteworthy because it made good a long standing deficiency in Service training. While excellent schools for engineering and weapon training had long been established, nowhere was there taught a basic requirement of naval warfare, namely the means of reducing to a minimum the effect of damage by enemy action, in order to ensure that ships not only reached the battle area, but remained in it, with their offensive power preserved to the maximum possible. The old schools did consider this subject for their particular weapon or machinery, but not for a ship as a whole. It was included in the very comprehensive term "seamanship," and was largely handed down by oral tradition at sea. Several unpleasant disasters in the early days of the second war followed those experienced in the first one. These emphasised the necessity for greater attention being paid to the defensive aspect of fighting a ship, and a new section of the Department of Naval Equipment was then set up in the Admiralty to deal with damage-control. This section, known as D.N.E. (D.C.), recommended that, in addition to considerations of equipment, active steps were also necessary to improve the training of personnel in damage-control.

Approval was then given for a school to be opened, where officers from shore and sea appointments could be instructed in this important defensive requirement. Captain D. C. Hill, R.N., was appointed to start and command this School and to frame a course of instruction. He was assisted at first by a nucleus staff of a Commander (E) and a Naval Constructor. The length of the course was to be one week, this being the maximum time that officers could reasonably spare from active service in war-time. London was chosen as the most suitable centre having the best railway facilities, and since voluntary application was to play a large part in providing students considerations of accommodation and recreation were also of importance.

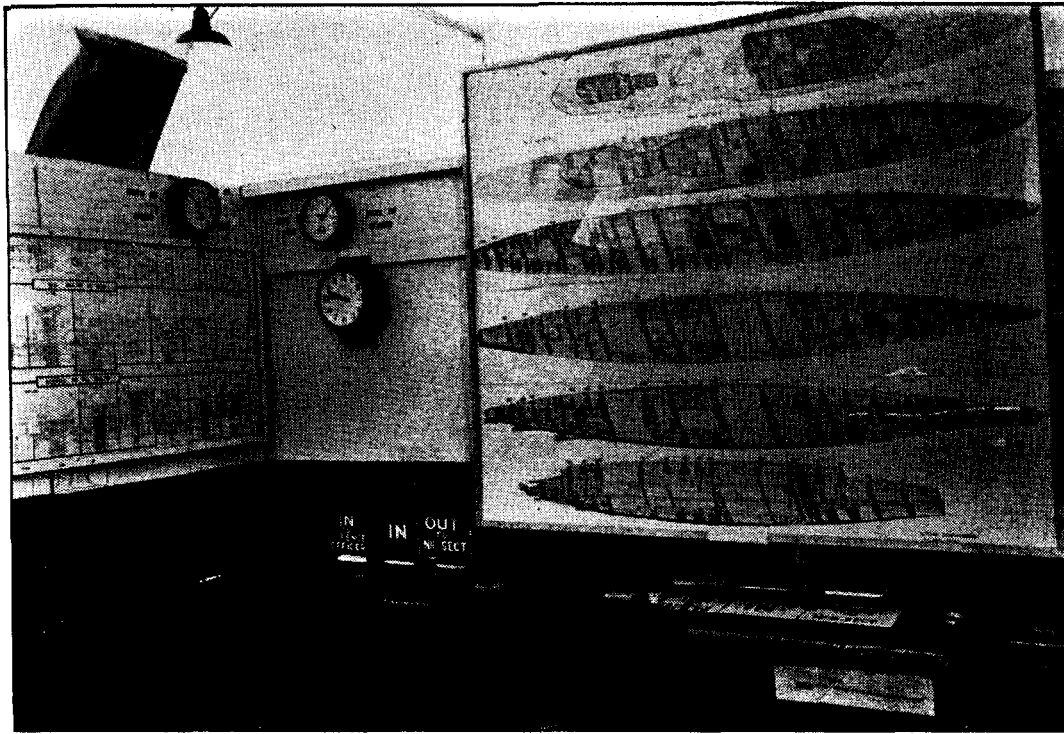


FIG. 4.—D.C.H.Q. MOCK UP. "SUPERB" CLASS CRUISER

#### West Kensington—1942

A very suitable building, requiring little modification, was found in West Kensington, just outside Baron's Court tube station, and under the shadow of one of our famous public schools. This building was requisitioned from the Historical and Psychological Society in the summer of 1942. Work was begun for erecting demonstration tanks and furnishing lecture rooms and offices. Orders were placed for the building of special scale models of battleship, cruiser, and aircraft carrier classes for tank demonstrations and experiments in the buoyancy and stability of ships.

Planning a syllabus of instruction was no easy task. To condense into a course of one week the many aspects of this very large subject in such a way as to produce a balanced course suitable for officers of all ranks and departments, serving in every class of ship, presented many difficulties. One of the chief aims of the course was to dispel the prevailing and incorrect theory that damage-control was the province of the executive, engineering and shipwright branches only. To approach the subject from the angle of technical detail was clearly impossible.

Lack of general knowledge of ships and their equipment by those serving in them seemed to be the root of the matter and policy was therefore based on the belief that sound ship-knowledge was the basis of effective damage-control. The syllabus was then framed to give all officers, independent of branch, a clearer knowledge of the capabilities and limitations of their ship so that with that knowledge they would develop confidence and ability to make quick accurate decisions in the face of the unexpected. Also, that a stronger "ship outlook" could be developed instead of a "departmental" one.

The course was arranged to give instruction in buoyancy and stability of ships ; water-tight integrity ; shoring and leak-stopping ; fire-fighting ; reduction of fire and smoke hazards ; stowage and dispersal of stores ; machinery



FIG. 5.—MODEL OF "KING GEORGE V" CLASS BATTLESHIP

layout, operation, and repair ; supply and distribution of electric power and electrical repairs ; and last but not least the personnel aspect, which includes organisation and training, and the development of team spirit for D.C. requirements. Subjects were approached from the damage-control aspect, giving the principle applicable to all classes of ship, and avoiding the use of highly technical terms and language.

The necessary preparations having been made and with a small administrative staff of clerks, typists, and drawing office staff to supplement the instructional staff, a C.A.F.O. advertising the School to the Service was issued on 13th August, 1942.

#### Opening of the School, August, 1942

The School opened on 31st August, 1942, fourteen officers attending the first course. During the next eight weeks, an average of fifteen officers were instructed each week : this number included a high proportion of officers of Captain and Commander's rank. During this period there was a considerable preponderance of engineer officers and the only other branches represented were the executive, shipwright and electrical, with one warrant ordnance officer. This was perhaps to be expected in the face of the prevailing departmental attitude towards damage-control.

The C.A.F.O. advertising the course was re-drafted to emphasize the fact that the course was open to *all* branches of the Service and this, coupled with advertisement by ex-students, began to take effect from November onwards. From this time the number and variety of officers attending the course each week rapidly increased. The rated capacity of the School was being exceeded by Christmas, 1942, but although this strained the resources of the School and Staff the vital importance of instructing large numbers of officers as rapidly as possible in the principles of damage-control was appreciated. The comfortable weekly total of 24 was steadily increased until it was stabilised at 60, when available accommodation unfortunately put a stop to expansion.

The instructional staff was increased by the appointment of a Torpedo Officer and a Shipwright Officer.

The ratio of individual applications to official appointments rose from 1 : 1 to 4 : 1 and steadied at 3 : 1. This perhaps leads one to wonder whether the attractions of the course or a good theatre season in the West End were really responsible for the sudden increase in numbers. However, whether the Course or London was the attraction, it seemed to apply to all ages, since a number of Flag Officers attended, while competition among midshipmen was keen.

### **Instruction of Ratings**

In August, 1943, approval was given to build single-decker damage-control "units" for the instruction of ratings, at Portsmouth, Chatham, Devonport and Rosyth, and one in London for giving more advanced training to selected chief petty officers and petty officers. The last two were never built, as it was decided that a double-decker unit was required for the instruction of the senior ratings, and that Portsmouth was a better place for it than London. It was built towards the end of 1944, and became the nucleus of Damage Control School II.

Instruction in damage-control is now no longer confined to the Damage Control School. Officers from other instructional establishments have been to the School and on return to their own spheres of activity have instituted their own D.C. training there, both for officers and ratings.

One of the earliest places to take this step was the Royal Naval Engineering College, Keyham, now H.M.S. *Thunderer*, where a parallel course is included in the training of engineer officers. Representatives of the Dominion Navies have also visited the Schools, and have started damage-control and fire-fighting schools in Australia and Canada, of which the Australian School is still active. Canadians are sometimes sent to the U.S. Damage Control School, in Philadelphia. A liaison has been established between the U.S. and R.N. schools.

### **Transfer to Stamshaw, August, 1946**

In August, 1946, the building in Colet Gardens was handed back to its owners, and the School moved down to Portsmouth, taking over some of the hutted camp on Admiralty land at Stamshaw, on the west side of Northern Parade and half a mile S.S.W. of Portsbridge. There the Portsmouth Ship Fire-Fighting School was already established, with a large fire-ground, fire-huts, pumping station, and a two-decker mock-up representing part of a ship for practising fighting ship-board fires.

Damage Control School II for the training of "key" ratings was also located in Stamshaw Camp. It possessed a double-decker damage-control unit, consisting of a messdeck, magazine and lobby on the lower-deck, breaker-room and pump room on the platform deck, a large water-tank on the upper deck, and a large pump under the platform deck. On two of outer bulkheads coffer dams are fitted to supply water from the overhead tank or from a pump to various "incidents" representing a good variety of types of damage to bulkheads and also to a leaky hatch, and a bomb hole in the deck. Thus leak-stopping of many kinds, and shoring, can be practised in the unit, together with electrical power and lighting restoration after breakdown, pumping, counter-flooding, and, to a minor extent, fire-fighting. All these are carried out in as near action conditions as feasible, in darkness, smoke, and water. The unit, unfortunately, cannot tilt as the one at Philadelphia does, so the counter-flooding does not have any real effect, and the extra difficulty in carrying out even the smallest operation when the ship has a heavy heel cannot be demonstrated. This is a pity but, even so, considerable realism is achieved by fires, smoke, thunderflashes, and water.

The demonstration models and tanks were brought down from London,

and the number of models has since increased. Admiralty approval has been given to construct a model for every new class of ship built. Illuminated flooding-boards are being made for the larger ships to enable pupils to spot more easily the compartments which are flooded or flooding. Transparent models made of Perspex are on order for some smaller types of ship. It is hoped to place chemicals in the compartments to colour the water as it enters, preferably red if the water is supposed to be entering due to damage, and black if being allowed to enter for counter-flooding. Students should then be able to see clearly which compartments are filling and why.

Seven different marks of lolling-box have now been made each designed to demonstrate some particular point about the stability of ships, simple enough for the lowest brow to understand.

One hut has been converted into a mock-up of the damage-control headquarters and three section bases of a *Superb* Class cruiser. The Staff Control Room at one end of the hut contains two incident boards, one of which is marked beforehand to depict the damage incurred, corresponding to the messages from Captain, engine-room, main switchboard, patrols, pumping, flooding, and fire parties to the D.C.H.Q. and Bases already prepared on chits. The other is used to record the damage as reported back to the Captain. A pumping and flooding board, ventilation board, water-tight door and hatch board, firemain, suction main and oil fuel suction board are fitted in the Staff Control Room, as well as in the D.C.H.Q. The Section Bases have incident, ventilation and water-tight door and hatch boards for their parts of the ship, with a good overlap on to the next section. Exercises in this hut are proving extremely valuable to both officers and "key" ratings course. No telephones are fitted, so no training can at present be given in the very important art of telephony, except to two or three men during runs in the unit, which is connected by telephone to a section base and D.C.H.Q. in two of the buildings. Telephoning can, however, well be practised on board, at sea, or in harbour, and it is more valuable for men to get used to the idiosyncracies of the equipment of their own ships.

### **Defence and Damage Control Officers**

The longest course now held is for Defence Officers and Damage Control Officers. It lasts six weeks, includes practical as well as theoretical work, and visits to laboratories and experimental stations where problems of shock, contamination of oil fuel, testing of materials, and model tests of hull forms are carried out. Under-water cutting and welding is also demonstrated by divers in a glass-fronted tank. About a week of the course is devoted to stability, and officers are able to experiment with floating floodable models of their own ships, and get to know their stability characteristics thoroughly. Damage reports and the examples of typical damage for the particular class of ship are studied, and based on them officers prepare damage exercises for their ships. Exercises for cruisers can be tried out in the mock-up. Practical leak-stopping, shoring, pumping and electrical work in the unit, a full fire-fighting course, embracing maintenance of gear as well as putting out fires in smoke and darkness and taking charge as Defence Officer or Damage Control Officer of "key" ratings during exercises in the mock-up are included in this course, as it is found that having done the actual job himself gives an officer more confidence. Training methods, starting with simple film strips and a training model of a destroyer for new entries are discussed, elaborated, and tried. The damage-control qualifications required of various rates are explained and methods suggested of encouraging and helping officers and men to get to know their ship. Organisation is dealt with more fully than is possible during the week's course.

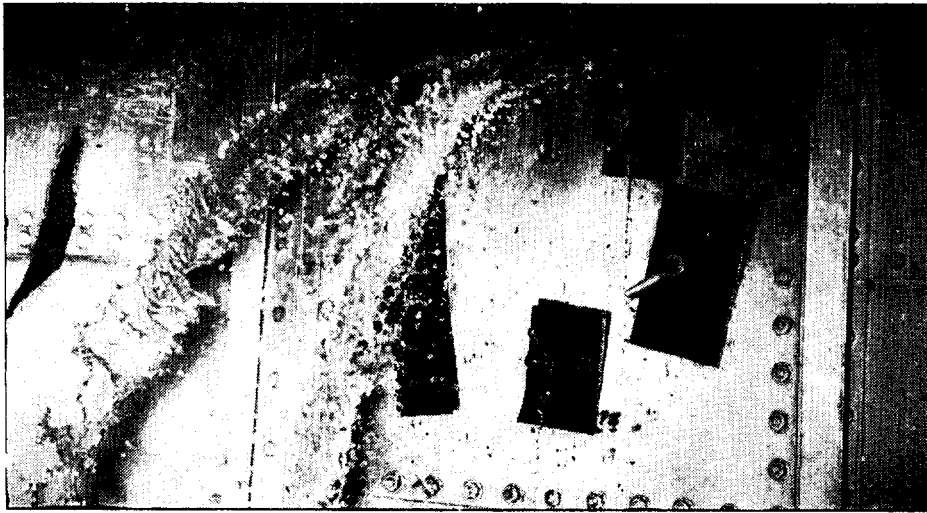


FIG. 6

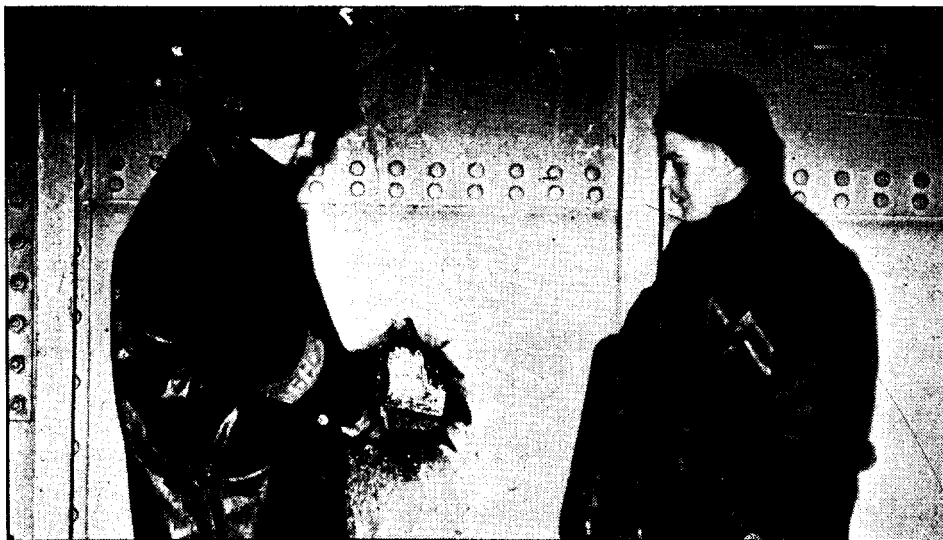


FIG. 7



FIG. 8  
LEAK STOPPING WITH WEDGES, PLATES, AND SPLINTER BOX



The week's Officers' Course has been extended to include a fire-fighting display, an exercise in the mock-up and a run in the unit.

Although the Course can no longer offer the theatrical and other attractions of London, it remains quite popular. Work is still going on, rather slowly for lack of material, on the new ward-room and officers' cabins. These look across the water to Horsea Island and Porchester Castle, and, when the gardens are laid out, the view should be attractive.

Up to the end of March, 1948, over eight thousand officers had been through the School, in London or Portsmouth, including not only those from the Royal Navy and Dominion Navies, but over three hundred naval officers from the United States, Holland, Norway, Denmark, France, Poland, China, Greece, Portugal, and the Argentine. These figures include substantial numbers of Supply Officers, Medical Officers, Schoolmasters, Chaplains, Special Branch Officers and Royal Marines. Constructors under training attend, and eighteen high-ranking N.F.S. Officers did the course before going to take charge of fire-fighting at the major ports.

The Course as it now stands is very intensive and could with advantage be spread over a fortnight, if officers could be spared for so long.

In addition to the week's course for officers of any rank and branch, a junior officers' course, which also lasts a week is held. It is rather more practical and is attended by Acting Lieutenants (E) *ex-Thunderer*, executive Acting-Sub-Lieutenants and Acting-Sub-Lieutenants (S) during their courses, and Second Lieutenants Royal Marines during their seamanship training, before going to sea.

### **Damage-Control Qualifications**

Damage-control qualifications, based primarily on ship-knowledge and varying according to branch, have been introduced for all sea-going ratings. They are of three standards "A" for able seaman, stoker-mechanic, or equivalent rate, "B," 60% for leading rate, and "B" 75% for petty officer. These qualifications should be obtained at sea.

The "key" ratings' course at the Damage Control School is intended for chief petty officers and petty officers who have qualified fully at sea.

On return to sea, after satisfactorily completing the fortnight's course, they should be capable of instructing junior ratings in damage-control.

The course is firmly based on practical work, and it is found that all branches, stewards, cooks, and writers, as well as the seamen and mechanical ratings, enjoy it, benefit by it, and nearly always say that they wish it were longer. After working up gradually from dry shoring and dummy leak-stopping to leak-stopping and shoring against a small static head, and then against pump pressure, learning how to counter-flood, to use portable pumps and to rig emergency lighting and power, each man takes part in at least two combined runs in the Unit, in which he has to do these things under as near action conditions as possible, in smoke and darkness or with a fire in the compartment. Technical ratings are never given their correct jobs, a shipwright, for example, will have to do electrical repairs or pumping. All take part in an exercise in the mock-up, which further helps them to grasp the control system for defensive measures. The run in the Unit is controlled from a distant Section Base, to which the Section Leader inside the Unit reports; the Section Officer in the Base reports in turn to D.C.H.Q.

Apprentices of many branches, engine-room, electrical, ordnance, and shipwright, are drafted to the School for a week's course before going to sea.

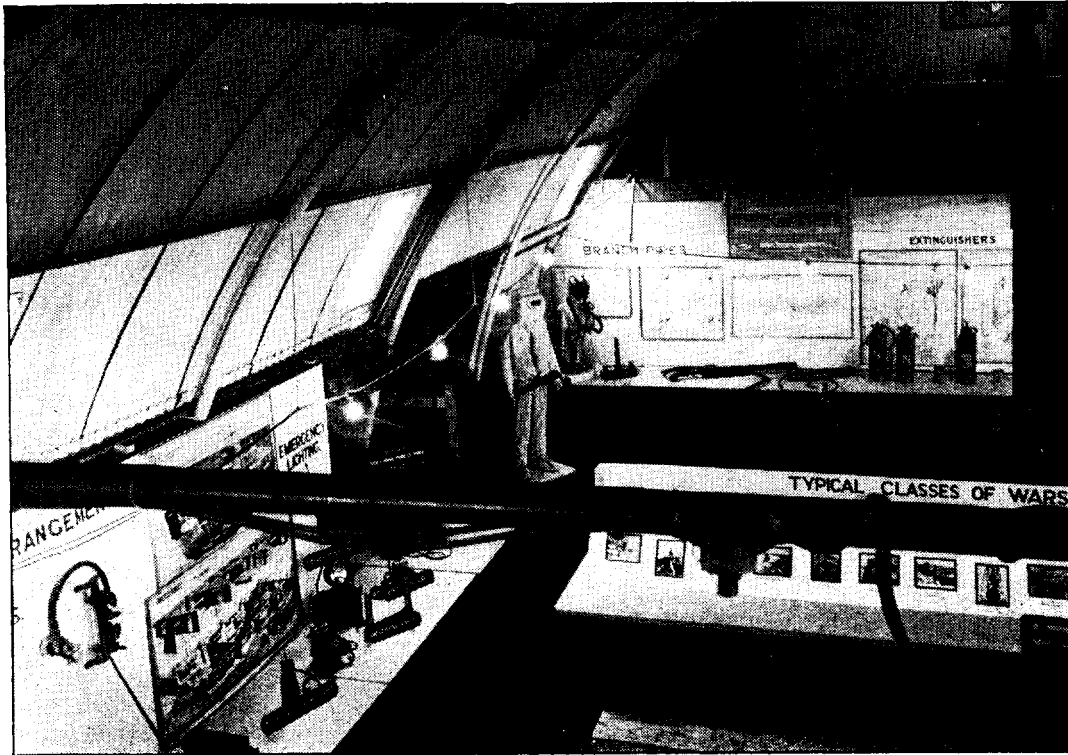


FIG. 9.—PORTSMOUTH DAMAGE-CONTROL UNIT

Ideally they should acquire ship-knowledge for a couple of years at sea to help them to understand what the course is about, but once they have scattered to different ships it is difficult to ensure that they all go through the same course, so the drawback of their ignorance of ships is accepted.

In order to facilitate damage-control training in the Service as a whole, a film and a number of instructional film strips have been made, in collaboration with the film section of the Director of Training and Staff Duties at the Admiralty.

Three large semi-cylindrical corrugated iron huts of the Romney type have been erected, at Portsmouth, Devonport, and Chatham, where ships can send their damage-control teams to practise shoring and leak-stopping in a single-decker damage-control unit. Each unit consists of a section of ship, containing a couple of compartments, with coffer-dams on one bulkhead, which supply water to the various holes in the bulkhead representing different types of damage (shell holes, splinter holes, leaky rivets, strained butt straps, leaky angle irons) or leaks from faulty maintenance through cable glands or valve spindle glands.

Each hut also houses a lecture room, in which can be shown films or film strips, a display of damage-control and fire-fighting gear, and a lolling-box in a tank for demonstrating simple problems in stability.

An instructor is available for showing the films or film strips, and the lolling-box, or for lecturing, but the intention is that most of the instruction should be given by the chief petty officers and petty officers of the ship, who should have done the "key" ratings' course. To instruct in any subject is the most thorough way to learn it, and the ship's petty officers will learn by teaching, but the most important advantage of the scheme is that they will learn to work with their ratings as a team. It would be better still could they work together



FIG. 10.—PORTSMOUTH DAMAGE-CONTROL UNIT

in their proper setting, the ship, but it is not usually practicable to practise wet leak-stopping on board.

All New Entries receive a grounding in damage-control at their training establishments, but it is not to be expected that they can understand very much at this stage.

#### Sea-Training in Damage-Control

Sea-training is all important. It begins with individual ship-knowledge, a man first learning his way round the ship, then the relative positions and the shapes of all compartments till, if led blindfolded to a compartment the man can say at once, when unhooded, not only where he is but which are the adjacent compartments, without reading the tallies on the bulkheads. Next he learns the positions of doors, hatches, ventilation valves flaps and openings, fire main valves and hydrants, fire-fighting and damage-control appliances, magazine flood and spray valves and handwheels, rapid-flood seacocks and valves, scuppers and standpipes, suction main and valves, in his own section of the ship at least. In carriers, knowledge of the petrol systems should have a high priority because of the fire and explosion risk if they are damaged. The ideal to aim at is to be able to find all the openings and valve-wheels in any compartment in the dark.

Competitions in ship-knowledge can be organised between section teams, or more easily between watches who work in the same section. "Quizes," "Brains Trusts" or the "Blindfold" game have all been found to arouse interest.

Training and simple exercises in the use of all damage-control and fire-fighting gear, including breathing apparatus, portable pumps and fans, and emergency Diesel-generators and electric supplies should follow. Meanwhile the engine-room and electrical departments can carry out exercises in power

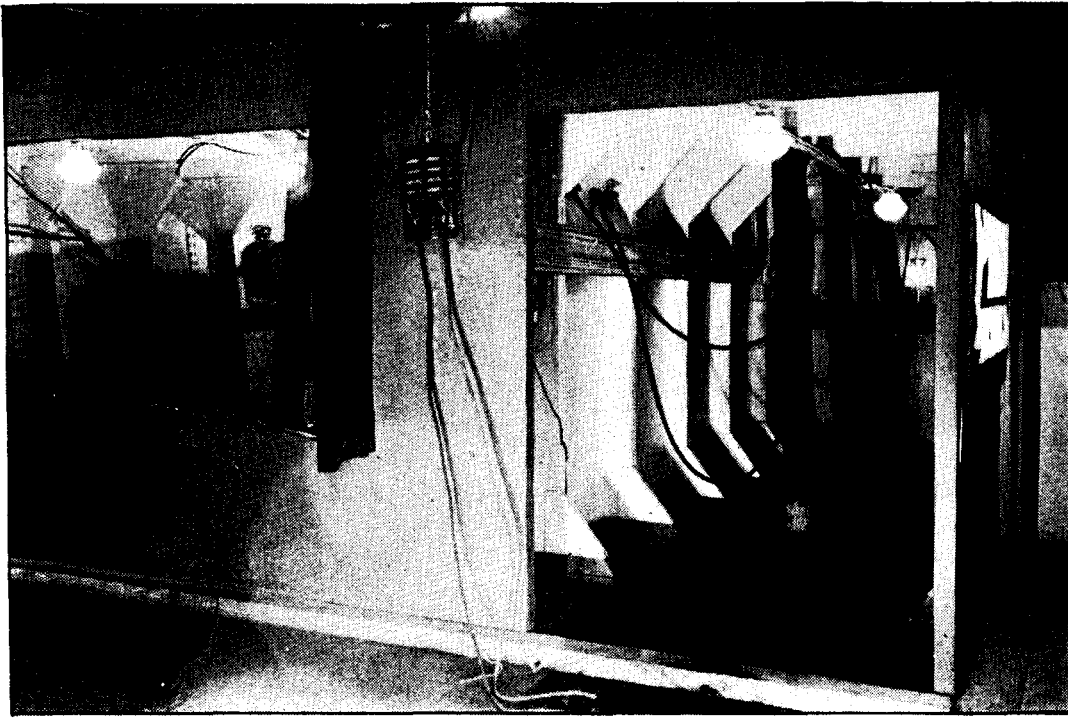


FIG. 11.—PORTSMOUTH DAMAGE-CONTROL UNIT. LEAK-STOPPING AND SHORING

breakdowns. These are infinitely variable and are best carried out with all machinery running and in units, so that there is as little make-believe as possible, and pumps, engines, generators, and motors can really be stopped or cut out without warning, to represent a breakdown. The more reliable machinery becomes, the less practice it gives in coping with machinery breakdowns to those who run it, and the more important do these exercises become.

A scheme, tried in one Fleet carrier during the war which proved successful in making people think, was for one engineer officer to set a machinery damage exercise each week. Answers were sent in by all the other engineer officers, the E.R.A.'s, mechanics and chief stokers, who also took their turn to set an exercise.

Damage-control communication exercises should be carried out as often as possible, starting with simple lessons in the technique of telephoning and in keeping the incident board, and ending in complete exercises with all positions and telephones manned. It is vital for good damage-control that messages be passed quickly and correctly, the incident board records the situation properly, and that information for the Captain is carefully screened, so that he is told all he needs to know, without being swamped in a mass of detail.

Other parties, such as supply and medical also require to carry out exercises in their respective duties.

Then exercises involving all departments can be carried out, one section at a time, with men from another section acting as judges or spies. These men are given chits describing damage or breakdowns in envelopes which they hand over to the patrols, watchkeepers or other men on the spot, at the time stated on the envelope; they may produce boards stating the damage, which they leave displayed prominently in the compartments concerned. In either case they remain to record the action taken, and the time.

Finally, when all parties and sections have been thoroughly exercised separately, a damage-control exercise embracing the whole ship can be carried out.

The first exercise should be started with the ship in the first state of readiness, but later exercises may be started in a lower state, and the ship brought to the first state, by order from D.C.H.Q. when the damage occurs.

This type of exercise requires very careful and thorough preparation. Heads of Departments should collaborate with the Defence and Damage Control Officers in working out the first few exercises at least. Later, any one of these Officers may plan the exercise, and provide the element of surprise for the others, but not till the exercises are going well. In the Home Fleet, one ship is told off to set a damage-control exercise for another. This is an excellent idea for sister ships, but very difficult if the two ships are not identically similar, as to set an exercise for another ship requires the most intimate knowledge of her.

During these exercises, the ship should, as far as possible, be given heel and trim consistent with the damage supposed to be sustained, and be brought back to an even keel again by counter-flooding or liquid or weight transfer. It is valuable to make sure that the machinery and fluid systems work satisfactorily under heavy heel or trim, and to accustom the ship's company to working with the ship heeling heavily. The confidence of the whole ship's company will be greatly increased by seeing how easily she can be brought upright again.

The emphasis which is laid in all the damage-control courses is on the importance of the team spirit, and the practical demonstration of it in the mixed staff and mixed courses at the School, has, judging by reports received from sea, resulted in greater co-operation and a marked absence of "trade-unionism" in ships which have sent most of their officers through the course.

The results of a wider knowledge and a greater awareness of the damage-control requirement became increasingly evident in damage reports during the latter part of the Second World War, and references to improved morale as a result of increased confidence were not uncommon.

### **" To Float, to Move, to Fight "**

The sudden appearance and expansion of the School prompts the query, Why has this aspect of naval training been so long in appearing? The answer probably lies in the fact that in developing the offensive role of our ships the defensive qualities have tended to be neglected. The School's slogan "To float, to move, to fight" reminds us that "offence" must be based on sound "defence" as much in using a ship as in planning an operation.

While defensive training lacks the glamour of training in weapons of attack, there is, to compensate for this, a far more lasting satisfaction in counter-acting damage, saving ships and lives, than in destruction and killing.

With the coming of atomic weapons, with their greater destructive power and radio-active effects, the technique of damage-control may change somewhat, but the slogan still states what is required of it. It seems most likely that damage-control will increase in importance and in scope.

The Damage Control School is dependent for its progress on keeping in touch with experimental work on ship-damage and the advances in design to resist it, on verbal reports from officers and men doing courses, who bring the latest news from sea, on visits by the Staff to ships, and on written reports from ships at sea.

The School is ready and anxious to help all ships and establishments in any way with damage-control training. Nothing less than the co-operation of the whole Service is enough.