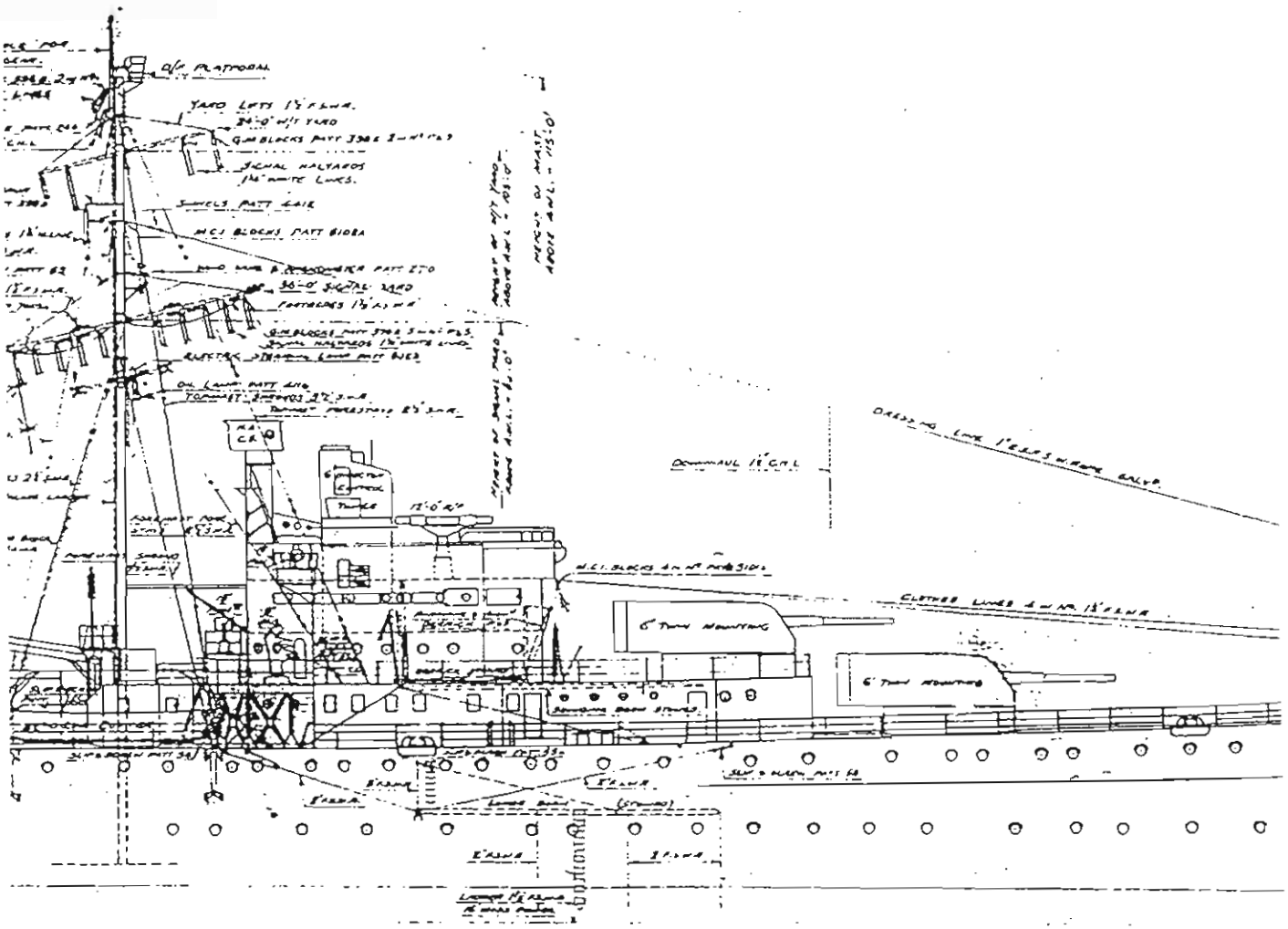
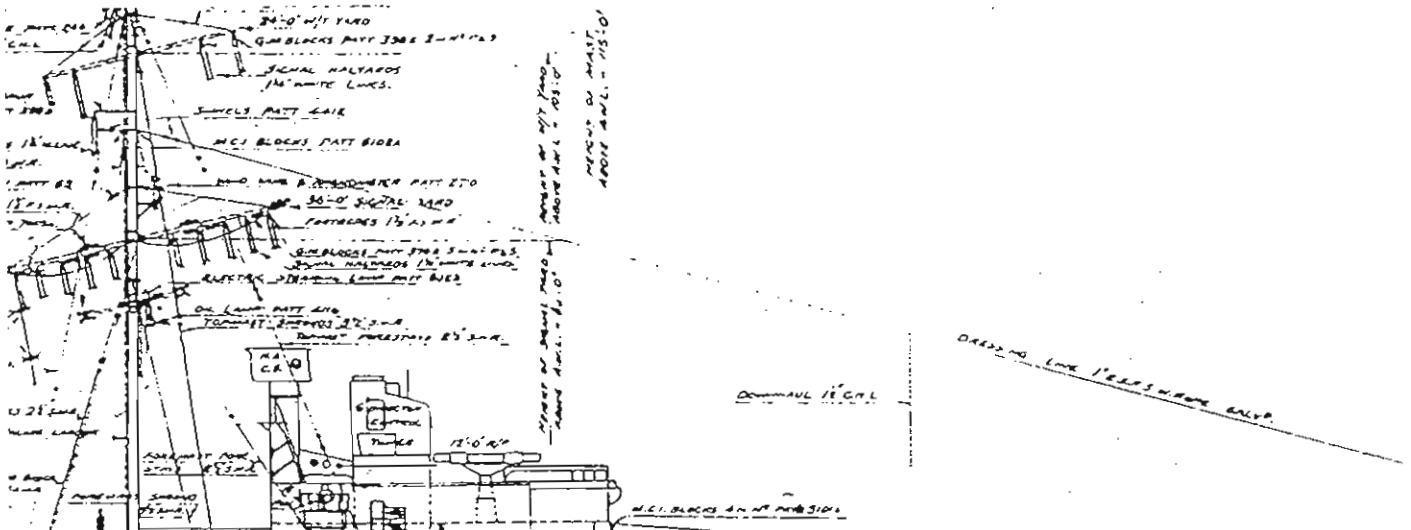
HMAS Sydney (1934-1941)

possible and probable causes of her loss



by

W.J. Olson



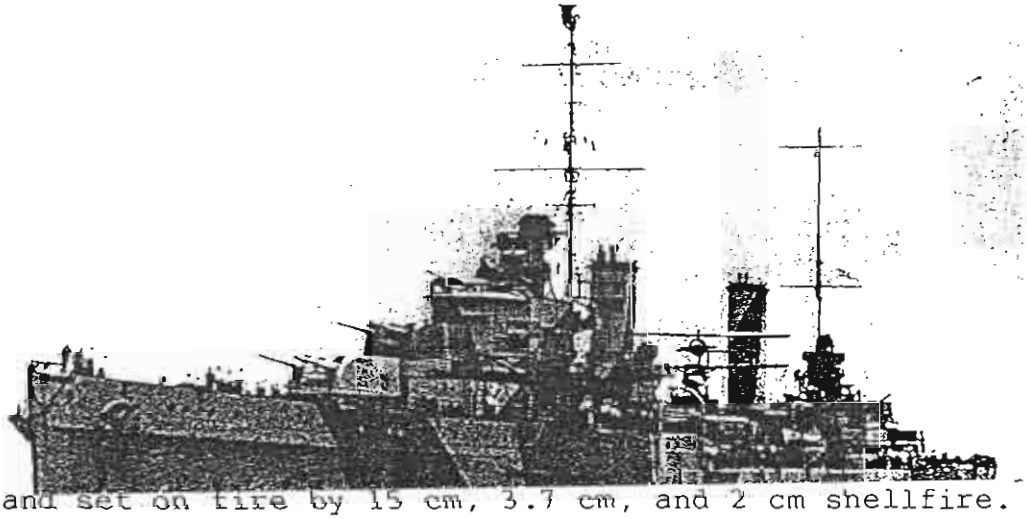
INTRODUCTION

On the 19 November 1941, the light cruiser H.M.A.S. SYDNEY was returning to Fremantle after escorting the troopship ZEALANDIA to the Sunda Strait. At approximately 1655 Hrs she sighted a merchant ship about 100 miles west of Shark Bay. The merchantman was in fact a German auxiliary warship, disguised as the Dutch motorship STRAAT MALAKKA.

The SYDNEY, under the command of Captain J. Burnett, closed to within 1,500 yds of the supposed Dutchman before Fregattenkapitan T. A. Detmers ordered the KORMORAN to be de-camouflaged. In the short, sharp engagement that followed, the SYDNEY was severely damaged and set on fire by 15 cm, 3.7 cm, and 2 cm shellfire. She was also struck forward by a single contact torpedo. The KORMORAN however, was struck by several 6 inch shells, set on fire, and disabled.

Unable to save his ship, Detmers abandoned and scuttled the KORMORAN at the scene of the action. The SYDNEY limped away to the south east and was last seen as a glow on the horizon shortly before midnight.

The SYDNEY and her entire complement were not seen again.



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The purpose of this paper is to ascertain the possible and probable causes of the loss of H.M.A.S. SYDNEY.

When last seen, the SYDNEY was on fire in at least two places. The German survivors ex KORMORAN claimed that the cruiser's bridge structure was still burning, and that there was another fire burning amidships when she steamed away from their immobilised ship. They also claimed that due to torpedo damage, the cruiser's bow was very low in the water and that occasionally her propellors could be seen. While some thought that they saw the cruiser sink, others, after they had abandoned ship, saw the enemy warship sail away. Indeed some became dismayed and even angry that the cruiser did not return to rescue them.

Detmers however, was under no illusions about the condition of his opponent. He knew that he had inflicted serious damage on the cruiser, but he had not destroyed her. He kept a wary eye on her throughout the evening, and ensured that his remaining serviceable guns could be manned to defend his ship should the cruiser return.

Although the fires on the SYDNEY were reportedly seen to flare up and then gradually fade away, there was no definite indication that she had sunk. The Germans heard no explosion, and many, including Detmers, were astonished when they later heard that the Australian cruiser had failed to return and was presumed to be lost.

Clearly, the SYDNEY had been badly damaged in the engagement, but would this damage have been sufficient to cause her loss?

Without a surviving eyewitness of her sinking, and without the luxury of a visual inspection of the wreck of the SYDNEY, we can only speculate. However, we do have enough supporting and circumstantial evidence to arrive at certain conclusions:

Firstly, we have the interrogation notes of the survivors from the KORMORAN. These notes and summaries provide a record of the eyewitness accounts of the action, and of the damage allegedly inflicted upon the SYDNEY. While some of these 'eyewitnesses' offered information that was exaggerated, or based on hearsay, after careful scrutiny, a reasonably reliable account of the action can be produced. From this account, we can establish what sort of damage the SYDNEY sustained.

Secondly, we have an enormous number of known instances where other warships suffered similar damage and were saved, or without good fortune, lost. Because of the very active role Royal Navy cruisers played in the Second World War, it is possible to study the effects of battle damage on these warships. Indeed, it is possible to narrow the study even further, and concentrate on the major damage sustained by cruisers of the Leander and Modified Leander class.

With the knowledge of what sort of damage similarly constructed warships could absorb, and what they could not,

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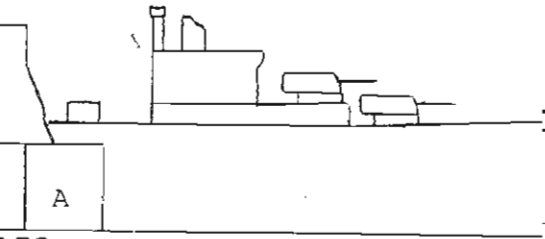

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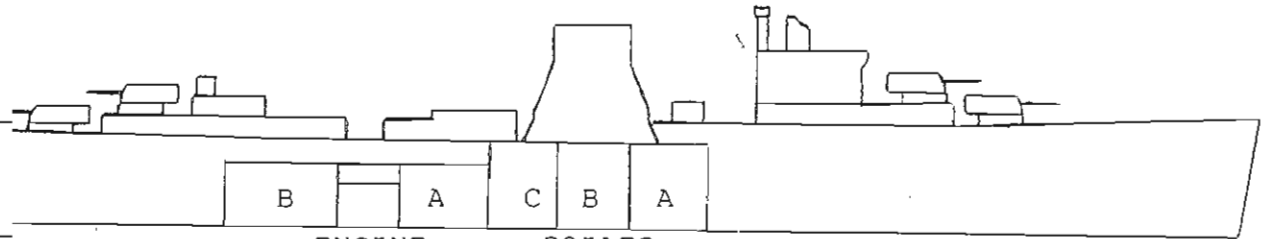
MS

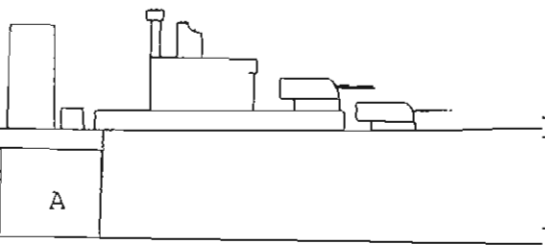
LEANDER CLASS



ENGINE ROOMS

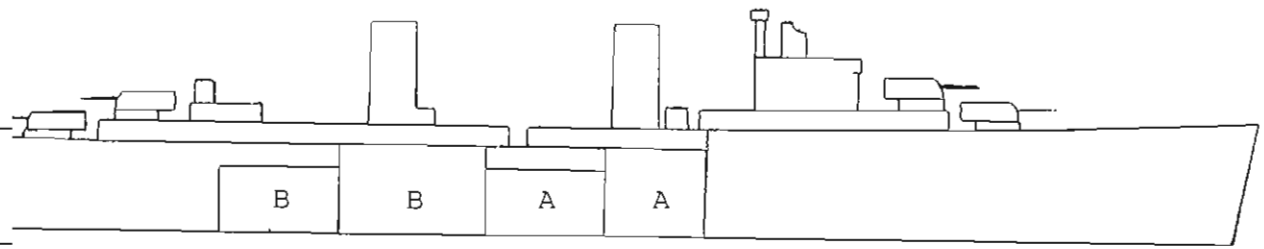
BOILER ROOMS

DER CLASS



B.R.

MODIFIED LEANDER CLASS



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rooms were separated.
ander class consisted of five vessels: LEANDER, ACHILLES,
NEPTUNE, and AJAX.
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, and PHAETON.
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respectively.

But before looking at these case studies, it is first desirable to gain a basic understanding of how a ship floats, how her stability can be affected by flooding, and the measures that can be taken to reduce the danger associated with the loss of stability. Additionally, we will have a brief look at how these ships were equipped to deal with fire, damage, and flooding.

'A ship's ability to float depends on two factors, her weight and her buoyancy.'(1)

A ship's displacement (weight) is determined by the volume of water displaced by the ship's hull. The weight of the ship is equal to the weight of water displaced. The buoyant volume of a ship is the volume of the entire watertight part of the hull. The portion of the buoyant volume below the waterline is called her buoyancy, and the portion above the waterline is called her reserve of buoyancy. A ship flooded by a volume of water equal to, or greater than, her reserve of buoyancy will sink.

Freeboard is the term given to the height between the waterline and the highest continuous water-tight deck. Thus, ships with a high hull, such as the County class of cruisers, have more freeboard, and a larger reserve of buoyancy, than ships with a lower hull, such as the Leander class of cruisers.(2)

How a ship floats is determined by her stability. Basically, the stability is governed by the size and shape of the submerged part of the hull, and the centre of gravity of the ship. As a ship rolls or lists, or her displacement increases (ie from flooding), her degree of stability changes. Wind and wave motions acting upon the hull produce a certain amount of roll in a ship, and the ability of the ship to return to an upright position is determined by her stability.

The centre of gravity is determined by the distribution of weight. The greater the weight of the superstructure and above-water fittings, the higher the centre of gravity. The greater the weight of the machinery contained in the hull below the waterline, the lower the centre of gravity. A ship with a broad hull, and low centre of gravity, has good stability, and will roll and recover quickly. A ship with a narrow hull and a high centre of gravity has poorer stability, and will roll and recover at a slower rate.

However, a warship needs to have a stable gun platform, and a ship with a slower roll provides this. But the design also needs to incorporate a sufficient margin of stability to keep the ship stable when damaged or partly flooded. So a balance must be struck between good stability and a slower rolling motion.

'Flooding can cause the loss of a ship by reducing the reserve of buoyancy, causing her to sink, or by reducing her stability, causing her to capsize.'(3)

A good example of this was the torpedoing of the destroyer H.M.S. KELLY, on the 9 May 1940. The torpedo detonated on the port

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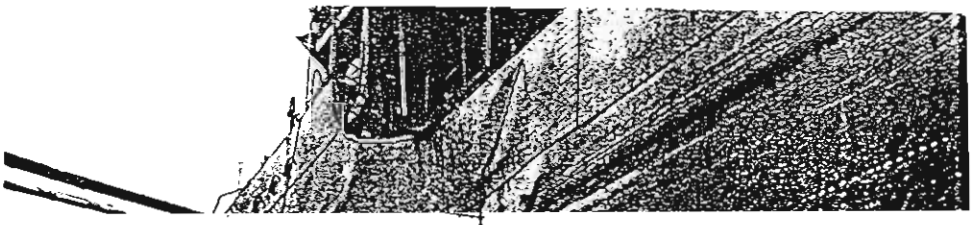
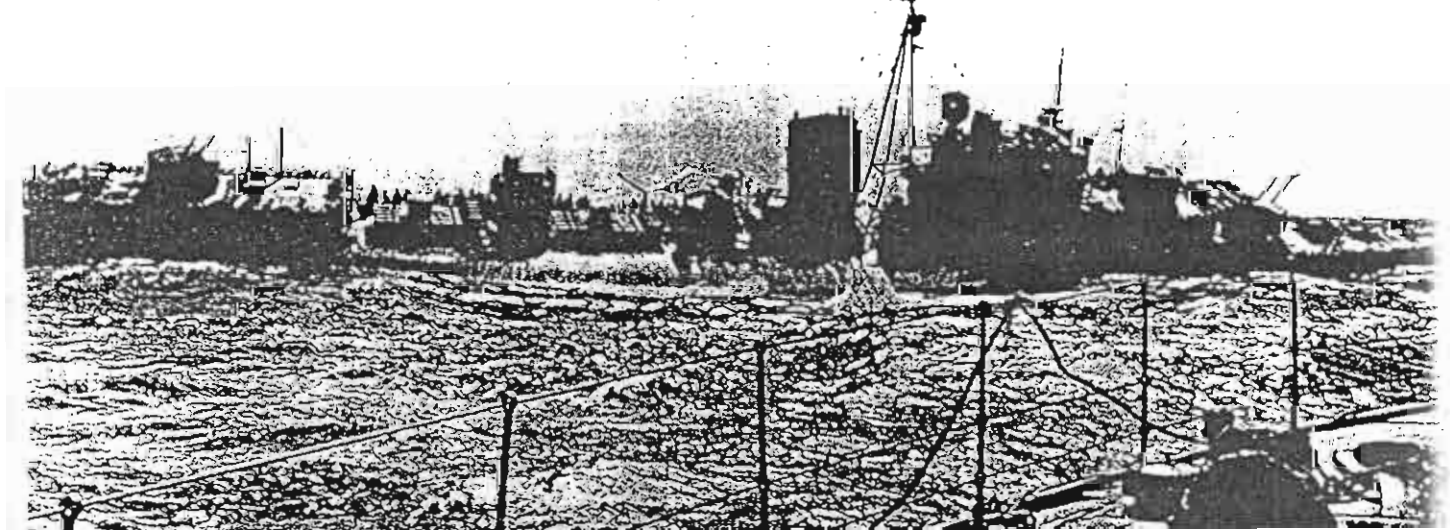
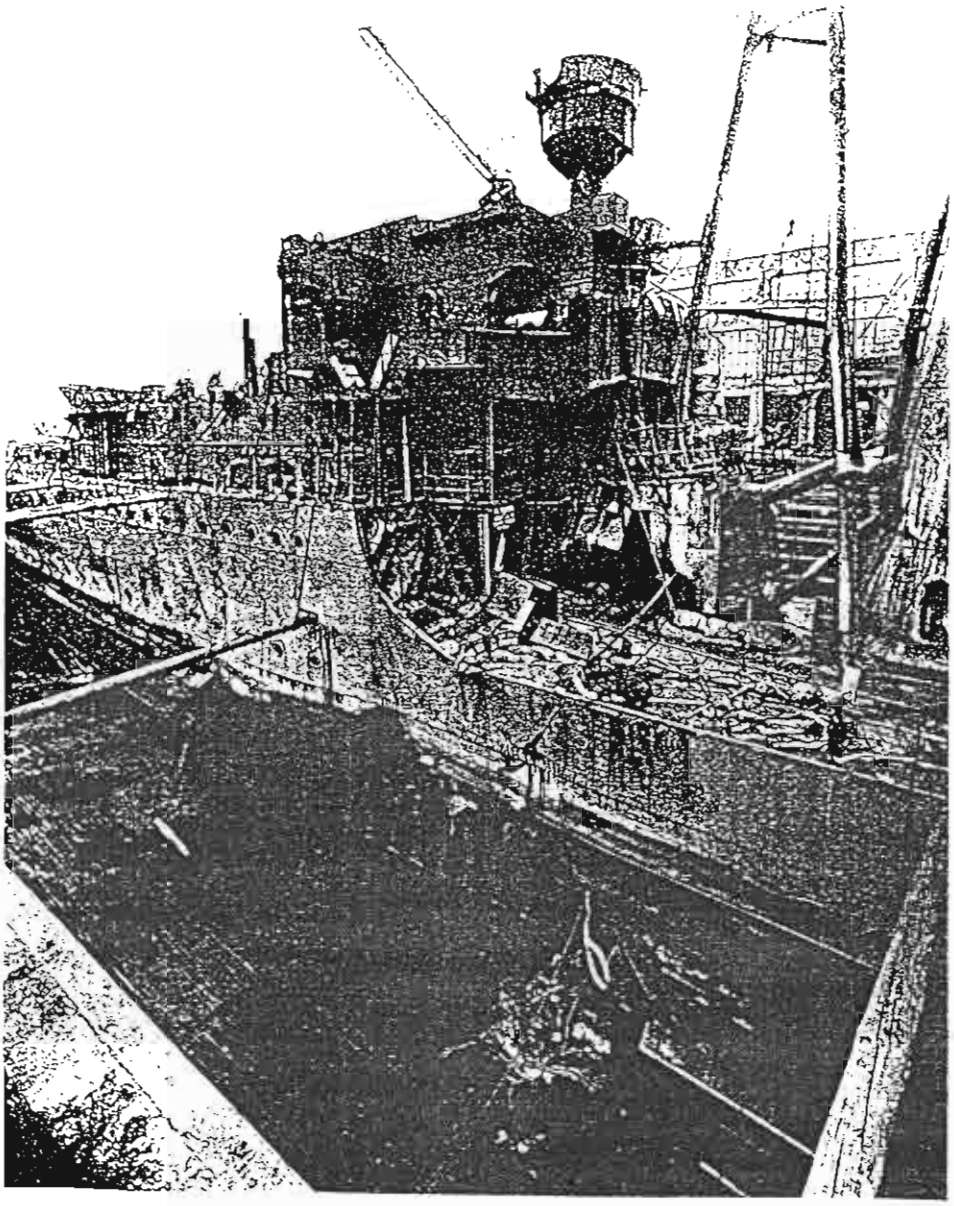
H.M.S. KELLY UNDER TOW AFTER BEING TORPEDOED 9/5/40

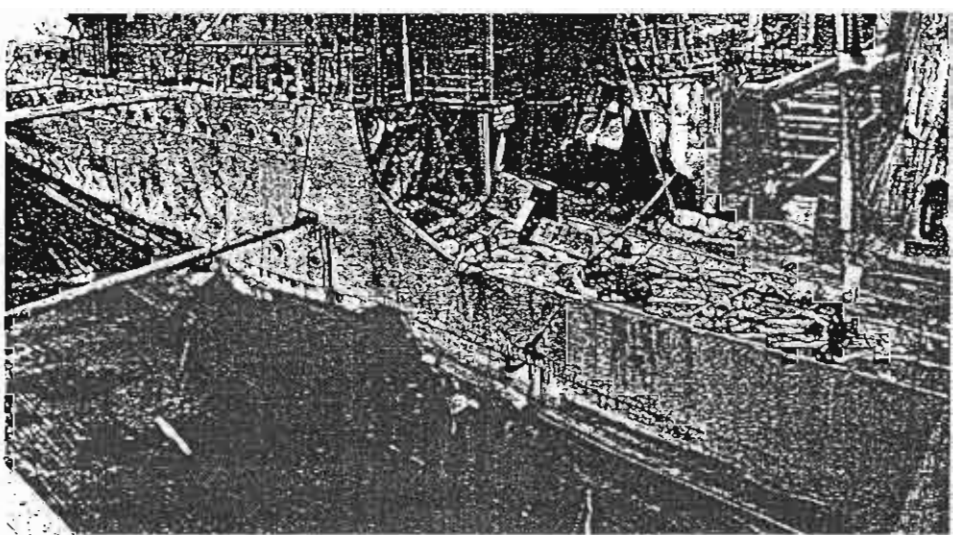
IN DRYDOCK THE TORPEDO HOLE IS REVEALED







ANOTHER VIEW OF THE KELLY PRIOR TO REMOVAL OF HER SUPERSTRUCTURE TO FACILITATE HER REBUILDING.



the KELLY's sluggish movements and recognized the imminent danger of capsizing. He calculated that he needed to remove at least 10 tons of topweight to preserve stability.' But everything loose had already been ditched,'and all that remained was the ship's company who were all huddled on the upper deck.' As their aggregate weight was more than 10 tons, Mountbatten kept a skeleton crew and had the remainder transferred off the ship.

The KELLY was saved, and subsequent calculations by her designer revealed that if Mountbatten had not removed the bulk of his crew, the ship would have indeed capsized and sunk.(4)

Flooding when caused by battle damage, or collision, will normally be confined to one side of the ship, causing her to list. A list reduces the stability of a ship by changing the size and shape of the submerged part of the hull. In addition, the flood-water increases the ship's displacement, altering the centre of gravity. List also reduces the safety and fighting efficiency of a ship for a number of reasons:-

a) Speed and manoeurability are reduced.
b) The list may introduce blind arcs of fire for the ship's armament when firing at minimum elevation over the high side of the ship.
c) The list may raise the armour belt on the high side clear of the water, thus exposing the thinner keel plates. If the list is towards the enemy, the armour belt may be submerged. Additionally, the upper deck is exposed to plunging fire.
d) The efficiency of certain machinery, such as pumps, is reduced.
e) As the angle of list increases, it becomes more difficult for personnel to move about the ship, and to carry out their duties. (5)

The quickest means of correcting list is to counter-flood wing compartments on the opposite side of the list by admitting sea water to them. The best method however, is to transfer fuel-oil to the fuel tanks on the opposite side of the list. But this is a slow process and not practicable under action conditions when a list has to be corrected rapidly.

Flooding forward, or aft, in a ship can also affect the trim of the ship. However this does not endanger the stability and fighting efficiency to the same extent as does list. Normally, a ship floats with her fore and aft plane parallel with the water, though a ship for various reasons may be trimmed down by the bows, or stern. But if due to damage or flooding, the freeboard at the low end is so little that the forecastle or quarterdeck is awash, the safety of the ship become threatened. As with the correction of list, transferring fuel-oil from the tanks at one end of the ship to the other, is the preferable form of remedial action. But when speed is essential, flooding is the only option. In this

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On the 31 March 1941, the Dido class cruiser H.M.S. BONAVENTURE was torpedoed by the Italian submarine AMBRA. She was hit in both engine rooms, and the rapid flooding of her machinery spaces, coupled with the loss of power, hindered efforts to save the ship. She sank within 5 to 6 minutes of being hit.

Every ship carried within its complement, a damage control organization, which was specially trained and equipped to deal with most shipboard contingencies. When circumstances demanded it, its personnel would be closed up at strategic stations within the ship to deal with damage as soon as it occurred. In addition, equipment for fire-fighting, repairing damage, and stopping leaks was stowed at various positions throughout the ship to enable damage control measures to be implemented quickly. Emergency battery powered lighting was also provided, which automatically turned on should the main lighting system fail.

Fire-fighting relied primarily on the firemain system whereby a network of piping supplied sea water under pressure to various points and hydrants throughout the ship. The system was divided into sections so that damage to one part of the system would not put the whole of the system out of action. Canvas hoses would then be employed to bypass damaged sections of pipe. In addition, the pumps which supplied the system with water were located around the ship so as to prevent the complete failure of the system through a single hit or explosion.

These pumps were dual acting, in that they could be used for supplying water to the firemain, or alternatively, used for pumping out flooded compartments. The pumps were either steam driven or electrically powered, but both types were reliant on the production of steam from the ship's boilers. (The latter type used electricity supplied by the turbo generators) Early war experience forced a re-think of this policy when some cruisers were lost due to the inability of their crews to combat fire and/or flooding, due to a total loss of steam through damage. As a result, diesel generators were progressively fitted to those ships not so equipped so as to provide an emergency supply of electricity for damage control in the event of a complete loss of steam.

H.M.A.S. CANBERRA was a good example. She was not fitted with diesel generators, and after suffering a complete loss of power as a result of damage received on the night of 8/9 August 1942, her crew were reduced to fighting the numerous upper deck fires with buckets of sea water. Little could be done to fight the below deck fires as there was no steam available to operate the pumps. Uncontrolled flooding also took place as again the pumps could not be operated.(6)

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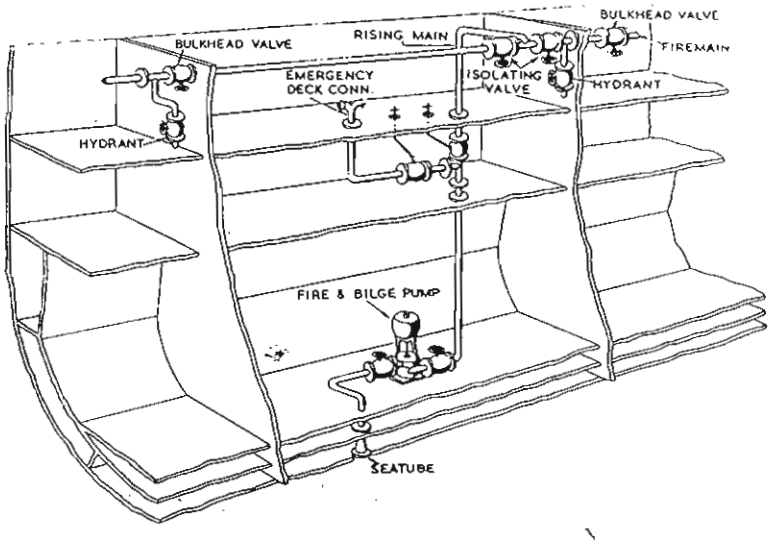
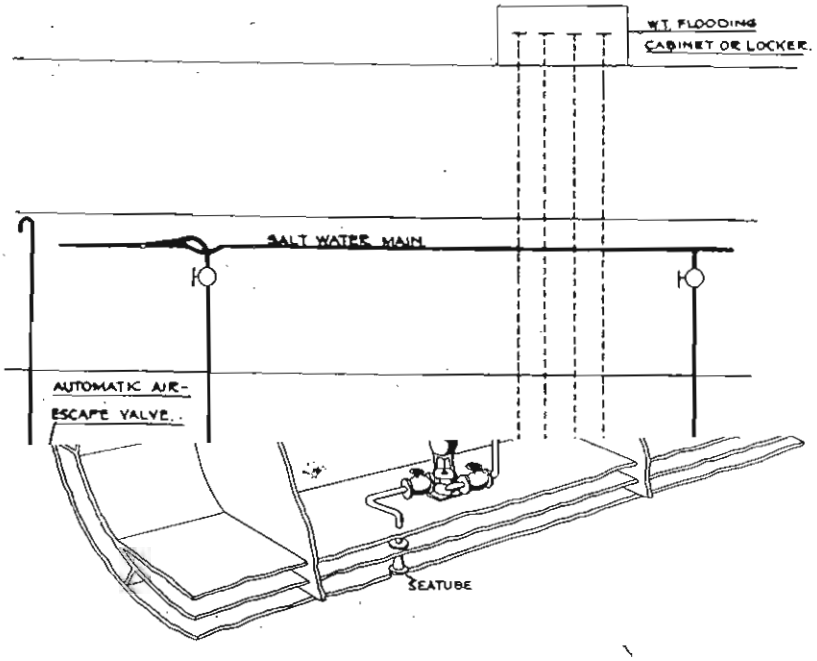


ABOVE: TYPICAL ARRANGEMENT OF THE FIREMAIN (SALT WATER) SYSTEM

BELOW: TYPICAL ARRANGEMENT FOR THE SPRAYING AND FLOODING OF MAGAZINES AND SHELL ROOMS



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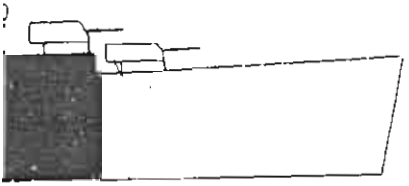
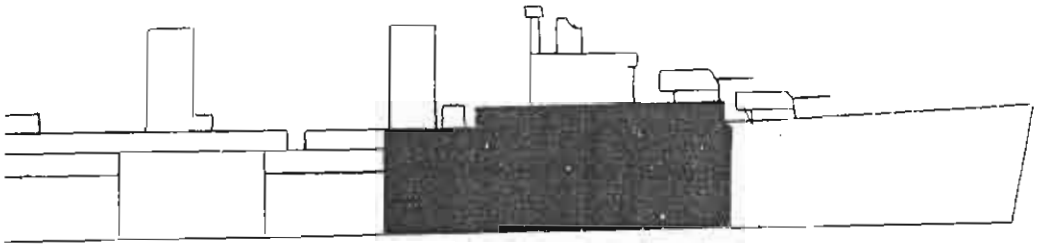


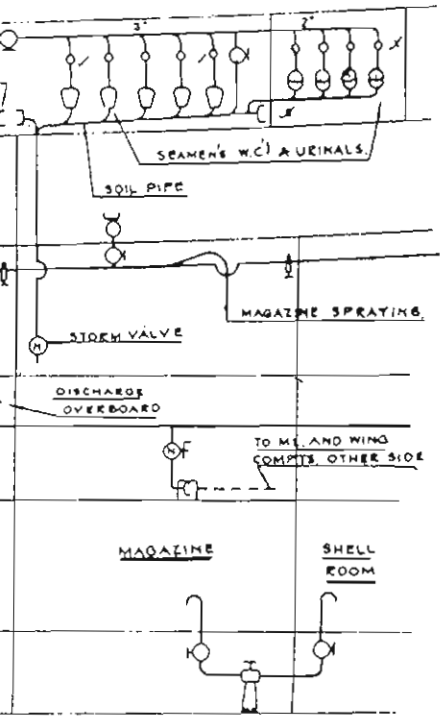


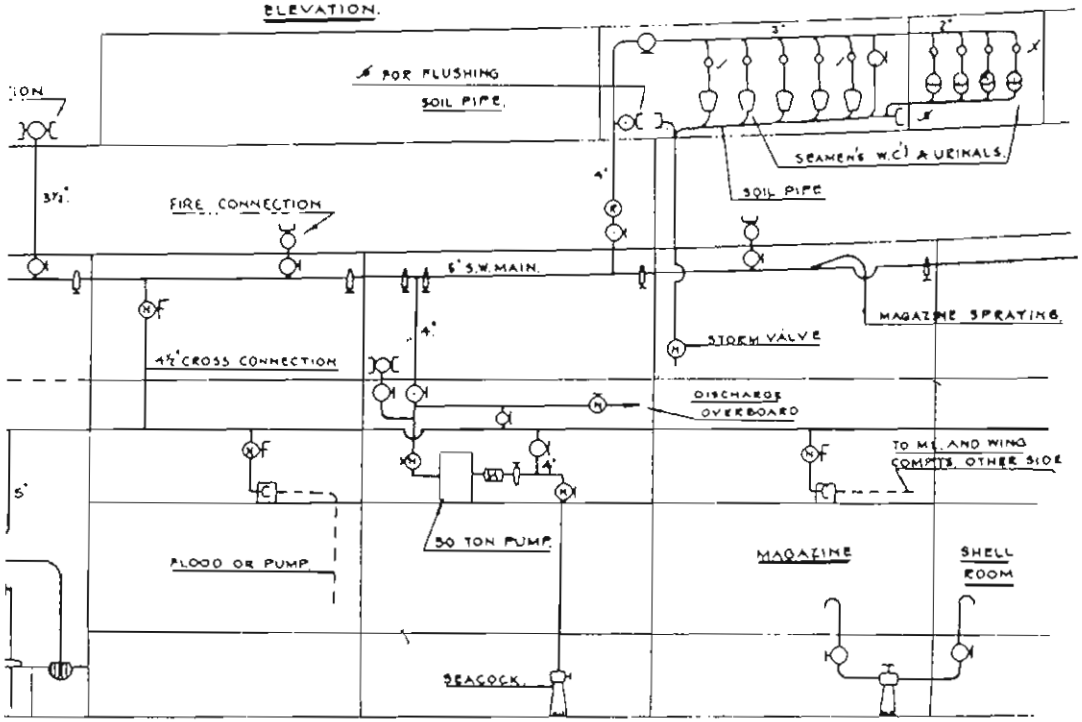
SERVICE

ODIFIED

BELOW: DIAGRAM OF THE SALT WATER SERVICE

THIS IS REPRESENTATIVE OF THE MODIFIED LEANDER CLASS (ABOVE)





above these compartments to enable foam to be directed down through the compartment to the bilges.

As well as fire-fighting apparatus, an assortment of leak stopping equipment was carried in various stowages throughout the ship. This ranged from tapered wooden plugs for plugging small and large holes, to shoring timbers, and leak stopping mats. This equipment could be used for plugging above the waterline holes, and for shoring up damaged or weakened bulkheads, hull plates, decks and hatches. Large holes such as those created by torpedo or mine explosions were usually beyond the scope of the ship's damage control organization. In such cases, the design, construction, and watertight subdivision of the ship usually determined whether the ship would survive or not. The ability to minimize flooding resulting from such large holes depended on the condition, or state, of the watertight doors and openings that allowed access from one subdivision to another.

The highest condition of watertightness was always assumed at Action Stations. (As there is no evidence to the contrary, we must assume that the SYDNEY was in this condition, with all watertight openings closed, when she closed with the merchant ship which proved to be the KORMORAN.) This condition could also be assumed when a ship was moving through waters that could be mined, or where torpedo attack was likely.

The following examples of action damage are intended to give the reader a broad range of the major damage sustained by the Leander and Modified Leander class cruisers during the Second World War. Some of this damage can be compared with that allegedly sustained by the SYDNEY. Where no direct comparison can be made, damage to other classes of British cruiser will be looked at.

One aspect that should not be overlooked was luck. Fortune favoured some ships and men, and saw them survive, but in other cases, fate decreed that they should not.

The first major surface action of the Second World War involving units of the Royal Navy was fought on the 13 December 1939. Commodore H.H. Harwood's hunting group comprising the heavy cruiser H.M.S. EXETER, and the light cruisers H.M.S. AJAX and H.M.N.Z.S. ACHILLES had been seeking, and on this day found and engaged the German pocket battleship ADMIRAL GRAF SPEE. This action subsequently became known as the Battle of the River Plate.

Despite heavy damage to his own force, Harwood managed to inflict sufficient damage on the GRAF SPEE to force her into the neutral port of Montevideo, where she was scuttled.

The EXETER was the first ship to be hit, and she took the brunt of the German fire. She sustained extensive damage from shellfire, and as her construction was similar to that of the SYDNEY, this damage will later be looked at in detail, as it provides an...

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D.C.T. in an attempt to contact the Gunnery Officer, Lieutenant Washbourn, but found there was no reply. Washbourn had been struck on the head by a splinter and rendered unconscious, while the two telegraphists behind him had been killed outright. A third man in the D.C.T. was also killed and two others wounded. The Rate Officer, Gunner Watts quickly summed up the situation and passed control of the guns to the After Control Position. The change not being effected before Captain Parry regained consciousness.

Shortly after, Washbourn came to, had his head wound dressed, then took charge of the D.C.T. and was surprised to find that everything still functioned. Within minutes, and despite the casualties, Director firing was resumed, as the ACHILLES' fire had become ragged and ineffective. This was due to the blast from X and Y turrets, which were firing on a forward bearing, and seriously affecting the personnel in the After Control Position. Both men were being deafened and concussed by the blast and concussion from repeated salvoes. These effects were also causing them to vomit, and as a consequence, they were having great difficulty in directing and controlling the ship's fire.

Due primarily to evasive manouvering, the ACHILLES was not hit again, although it was later discovered that all her W/T aerials had been shot away. Presumably this was caused by splinters from the same shells which had caused the damage to the bridge and the D.C.T.

The AJAX however was struck twice while steaming ahead of her consort. The first hit was from a base-fused 11 inch shell which struck aft at about 0725 Hrs. It pierced the upper deck and passed through 3 cabins, including that of Captain Woodhouse, before penetrating the lobby of X turret, killing 4 and wounding 5. The shell then deflected upwards, passing through the working chamber below the turret, where 2 more men were killed, before exiting and exploding in Commodore Harwood's cabin. The shell's base plug was blown aft, striking the trunk of Y turret, and jamming the turret. The shell itself, and splinters from its passage and explosion, cut through electrical cables, fire mains, and fuel oil pipes. Fires from the explosion, as well as electrical short-circuits, were started, and could not be immediately extinguished due to lack of water in the firemain and/or damaged hoses. The magazine and shell rooms were not abandoned and flooded, but there was some anxiety about the cordite charges in the hoists being touched off. They were immediately removed and thrown overboard.

Thus, one hit had put both X and Y turrets out of action. The second hit sustained by the AJAX was from what was assumed to be an 11 inch shell, which struck the mainmast without exploding. The topmast was brought down, bringing with it the W/T aerials.

The EXETER lost her aerials also, so by the end of the action, all 3 cruisers had lost the ability to transmit messages until

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The AJAX however was struck twice while steaming ahead of her consort. The first hit was from a base-fused 11 inch shell which struck aft at about 0725 Hrs. It pierced the upper deck and passed

inch shells, some of which penetrated the cruiser's hull before exploding, whilst others struck the forward superstructure, damaging the bridge, and starting a fire in a storeroom which caused considerable damage to radar equipment.

The AJAX then turned to engage two other ships that had been sighted in the moonlight, but the Italians fled behind a smoke-screen. With no chance of catching them, and with water entering the hull through damaged plates, the AJAX broke off the chase and returned to finish off the disabled destroyer. The search proved fruitless however, and Mc. Carthy decided to return to Malta to have the AJAX's hull damage patched, and to disembark the 13 dead and 23 wounded.(9)

On the 28 and 29 May 1941, H.M.S. ORION was involved in the evacuation of troops from Crete, and during the operation was subjected to constant air attack. At about 0530 Hrs on the 29, she was attacked by Ju-87 Stuka dive bombers and was near-missed by a bomb which landed in the sea abreast Y turret. Hull plating in the vicinity was damaged causing local flooding. The after 6 inch magazine was also flooded, putting X and Y turrets out of action.

Then at about 0730 Hrs, she sustained a direct hit on A turret from a 1,000 lb bomb. A turret was completely destroyed and the entire turret crew killed instantly. The gun barrels of B turret caught the full blast of the explosion and were bent upwards six inches out of true, thereby putting all four 6 inch turrets out of action. Splinters and shrapnel from the explosion peppered the bridge. Captain G.R.B. Back was mortally wounded by a machine gun bullet during the attack and died a short time later, passing command of the ship to Commander Wynne.

At 1000 Hrs, the ORION received another crippling blow. A second 1,000 lb bomb struck the bridge and penetrated into the heart of the ship before exploding on the armoured deck above the 4 inch magazine. The explosion wrecked the Lower Steering Position , the Transmitting Station, and the Telephone Exchange, and killed over 200 soldiers. (The ORION had taken aboard 1,200 soldiers, and these men had been sent below to clear the decks for action) A great number of key personnel were also killed, and with the Lower Steering Position and all internal communications destroyed, the ship began steaming in circles, completely out of control. One boiler room was untenable, the other two being without lighting. Wynne regained control of the ship from the After Control Position, while damage control parties worked to put out the fires, and a human chain was formed to relay orders to the engine rooms and the hand steering position.

About an hour after being hit, the ORION took on a heavy list to starboard, but despite further air attacks, managed to reach Alexandria. She arrived at about 2000 Hrs, with [illegible] the 13 dead and 23 wounded.(9)

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Casualties were extremely light with 8 soldiers and only 4 crew members being killed. Despite further attacks and two near misses, the PERTH delivered her cargo of troops safely to Alexandria. (11)

Another incident that has particular significance, especially as regards loss of life, is that of the mining of H.M.S. NEPTUNE. On the night of the 18/19 December 1941, the NEPTUNE, in company with the cruisers AURORA and PENELOPE, and the destroyers KANDAHAR, LANCE, LIVELY, and HAVOCK, ran into an uncharted minefield about 20 miles off the coast of Tripoli. The NEPTUNE, like her cosorts, was streaming paravanes, and at about 0040 Hrs detonated a contact mine. Captain Rory O'Conor immediately ordered full astern, but promptly struck another mine with the NEPTUNE's stern. The explosion wrecked her propellors and steering gear, immobilising the ship.

The AURORA and the PENELOPE also detonated mines with their paravanes, but managed to extricate themselves from the field. The AURORA, badly damaged from the explosion, set sail at reduced speed for Malta, escorted by the destroyers HAVOCK and LANCE. The PENELOPE, only slightly damaged, remained to assist the NEPTUNE, which was being prepared by her crew for towing.

The drifting NEPTUNE however, struck and detonated a third mine and started listing to port. The destroyer leader KANDAHAR, then entered the minefield in an attempt to rescue the NEPTUNE's crew, but she too struck a mine, which blew off her stern.The PENELOPE then attempted to close the stricken NEPTUNE, but was ordered by O'Conor to keep away.

At about 0400 Hrs, the Neptune drifted onto a fourth mine which exploded under her bridge. Within 5 minutes, she rolled over and sank.

Being close to the enemy coast, and with dawn approaching, it was deemed that the risk of re-entering the minefield to pick up survivors was too great. The PENELOPE and the LIVELY reluctantly departed, leaving the crippled KANDAHAR to assist the NEPTUNE's survivors if possible.

The destroyer JAGUAR, under the command of Lieutenant-Commander Tyrwhitt, returned the following night to find the KANDAHAR still afloat and undisturbed by the enemy. The rough sea prevented her being towed to safety, and she was sunk after her crew had been taken off. 8 officers and 157 men from the KANDAHAR were rescued, but of the crew of the NEPTUNE, there were none to be found.

It transpired that some survivors from the NEPTUNE had tried to swim to the KANDAHAR, but had failed in the attempt and drowned. Only 2 Carley floats were seen after the sinking of the NEPTUNE. An air search failed to find these 2 floats, or any survivors, and it was feared that the cruiser had been lost with all hands.

However, some time later, after an exchange of P.O.W.'s, a sole survivor [illegible] was able to confirm what had [illegible] the ship.

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On the 28 February 1942, H.M.A.S. PERTH, in company with the American heavy cruiser U.S.S. HOUSTON, was enroute from the Javanese port of Tanjong Priok to Tjilatjap, via the Sunda Strait.

Reports indicated that the Sunda Strait was still open, and was clear of Japanese warships. Accordingly, after the PERTH had cleared the minefields protecting Tanjong Priok, Captain H.M.L. Waller ordered a relaxation of readiness from first to second degree of readiness.

Both ships were zig-zagging at 22 knots, with the PERTH leading the HOUSTON by 1,000 yds. They had almost reached the entrance to the Strait, when at 2306 Hrs, a vessel was sighted about 5 miles ahead, close to St. Nicolas Point. The ship was challenged but her reply was incorrect. The challenge was repeated but the other ship turned away, revealing the silhouette of a Japanese destroyer.

The PERTH went to Action Stations as the course was altered to open A-Arcs. Waller gave the order to open fire, but as the ship swung to starboard it was seen that they had run into the middle of a Japanese invasion force. With enemy vessels to port and starboard, Waller ordered divided control of the guns, so as to engage the targets on both beams. The HOUSTON conformed with the PERTH's alteration of course, with both ships firing rapid salvoes, but the two ships soon became separated in the melee.

Waller ordered frequent alterations in course as targets of opportunity presented themselves, while at the same time offering the Japanese a more difficult target to hit. So skillful was his handling of the PERTH, that after nearly an hour of action, the Japanese had still not been able to score a decisive hit on her. Although in this time the PERTH was struck several times, her speed and fighting ability had not been impaired. At 2326 Hrs, a shell had struck the forward funnel, and a short time later, another hit the flag deck. Then at 2350 Hrs, a shell struck forward on the starboard side, near the waterline, penetrating into the Ordinary Seaman's messdeck before exploding.

Not all of the Japanese shells and torpedoes were wasted however, as many that were fired at the PERTH and the HOUSTON missed the cruisers, but went on to strike other ships of the invasion force.

During the running battle, the PERTH had steamed in a wide circle, in an attempt to protect the stern of the HOUSTON.(Her single rear turret being out of action) By midnight, the PERTH had almost completed this circle, and with the 6 inch and 4 inch magazines almost empty, and all torpedoes expended, Waller decided to alter course and make a run for the Strait. Just as the ship had steadied onto the new course, and whilst making 28 knots, a torpedo struck her on the starboard side in the vicinity of the forward boiler and engine rooms. It appears that the explosion destroyed the bulkhead dividing the two rooms, as both compart-

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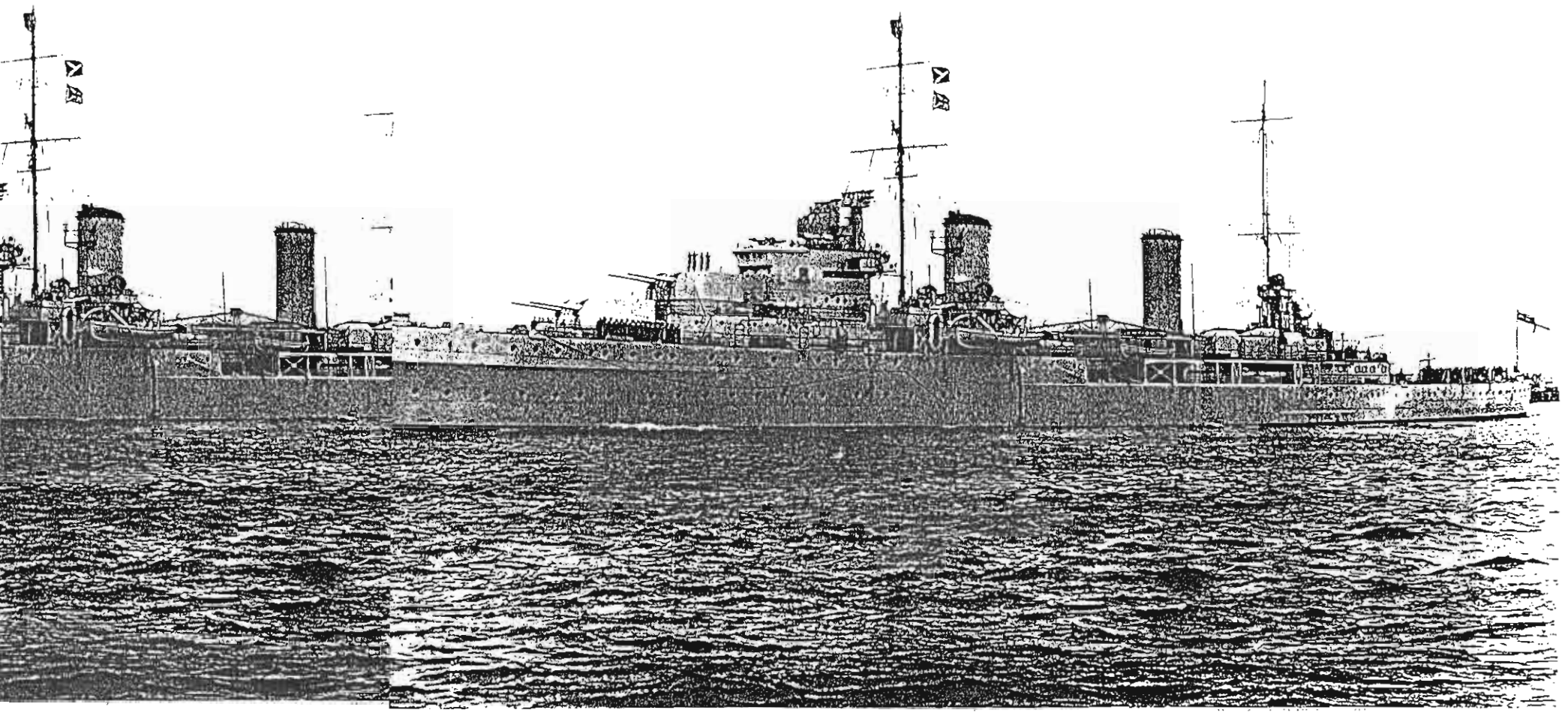

TH 1939

H.M.A.S. PERTH 1939

The PERTH was still under fire from numerous Japanese warships and was being struck repeatedly. But despite the damage from torpedoes and shellfire, the electrical system was undamaged, allowing the order to abandon ship to be broadcast through the entire ship via the Tannoy system.

Within minutes of the order to abandon ship being given, a third torpedo struck well aft on the starboard side, damaging the propellor shafts, and flooding the after 6 inch magazine and shell rooms. This was followed quickly by a fourth torpedo which struck forward on the port side. All electrical power failed as either the ringmain was cut by damage, or short-circuited by flood water. But the loss of power was of little consequence as at approximately 0025 Hrs, the PERTH righted herself, then heeled over to port and sank by the bows.

One of Waller's last orders was for the engines to be left on Half Speed Ahead, to take the ship away from the men already in the water so that they would not be dragged under when the PERTH sank. This order was complied with, although Lieutenant(E) Gillan, in charge of the after boiler room, ensured that the boilers and the oil fuel pumps were shut down before the boiler room was abandoned. This was done to reduce the risk of fire before the ship could be abandoned.

Another man's actions that should be noted were those of Torpédo Gunner Smith. Before he abandoned ship, he went aft and removed the primers from the PERTH's depth charges, and made them safe. Had he not done so, the primed charges would have exploded when they sank with the ship, killing many of the men in the water.

These men's actions saved many lives but even so, loss of life was great. Even when the ship had been abandoned, many were killed in the water either directly or indirectly by torpedo explosions and shellfire. Of the PERTH's complement of 682 officers and men, 353 were lost with the ship. 329 survived only to be captured by the Japanese. At the end of the war, only 229 returned home to Australia, the remainder dying whilst prisoners of war.

The HOUSTON was also sunk during the engagement, going down at about 0045 Hrs. Of her complement of 1,015 officers and men, 655 were lost with the ship.(14)

H.M.N.Z.S. LEANDER's active participation in the war ended abruptly on the night of the 12/13 July 1943. In company with the American cruisers U.S.S. HONOLULU and U.S.S. ST.LOUIS, she formed part of Task Group 36.1 which had been ordered to intercept a fleet of Japanese warships making a 'Tokyo Express' run into the Kula Gulf, off New Georgia.

Just after 0100 Hrs, the two fleets clashed head-on, exchanging gunfire and torpedoes. Shortly after fire was opened, the HONOLULU, leading the LEANDER and ST.LOUIS, was [illegible] by flood water. But the loss of power was of little consequence as at approximately 0025 Hrs, the PERTH righted herself, then heeled over to port and sank by the bows.

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Transmitting Station, Low Power Room, Forward Dynamo Room, and the Main Switchboard. 5 oil fuel tanks were destroyed and 2 others ruptured.

The ship was plunged into darkness as all lighting and communications failed. B boiler room had to be evacuated, but C boiler room was undamaged, although minor flooding occurred. Supply air and fuel oil to the boilers was immediately stopped, as the safety valves threatened to lift. Damage control parties quickly went to work and some power and lighting was soon restored. Steam was raised again in C boiler room, and by cross-connecting, the 2 boilers were able to supply steam to 2 of the engines.

With a heavy list to port, the LEANDER, escorted by the U.S. destroyer RADFORD, slowly made her way to Tulagi where she was temporarily repaired and fitted with a cement patch to allow her to proceed to Auckland. A complete repair and refit was deemed necessary and on the 30 November, she sailed for the United States as it was not possible to do the work locally, or in Britain. Due to the extensive amount of work required, the LEANDER was not ready for service again until September 1945, and took no further part in the war. (16)

The more fortunate of the Modified Leanders, and the sole survivor of the class, was H.M.A.S. HOBART. On the evening of the 20 July 1943, The HOBART, under the command of Captain H.A. Showers, and in company with the heavy cruiser H.M.A.S. AUSTRALIA and 3 U.S. destroyers, was struck on the port quarter by a contact torpedo. The ships had been proceeding at 23-25 knots (the HOBART was making revolutions for 27 knots), when they were sighted by the Japanese submarine I-GO11, at a range of 10 miles. Commander Tagami fired a salvo of torpedoes, and was extremely fortunate in obtaining a hit on the HOBART, which was steaming astern of the AUSTRALIA.

The explosion tore a huge hole in the hull plating just aft of Y turret, causing extensive structural damage, and almost severing the stern. Steering was lost, and the electrical system failed, plunging the ship into darkness. Emergency lighting came on as the ship lost way as a result of the increased drag. The E.R.A. in charge of the after port engine shut off the supply of steam as the turbine started to race. The ship took on a list of 3 degrees to port, and trimmed by the stern, but trim was eventually restored by the pumping of several hundred tons of fuel oil from the after, to the forward tanks. The emergency diesel generators were started, and full lighting restored, while damage repair parties assessed the damage.

The port inner shaft and propellor had been blown off, and the starboard inner shaft badly damaged. The propellor of which, fell off the following morning. Steel hawsers were secured around the

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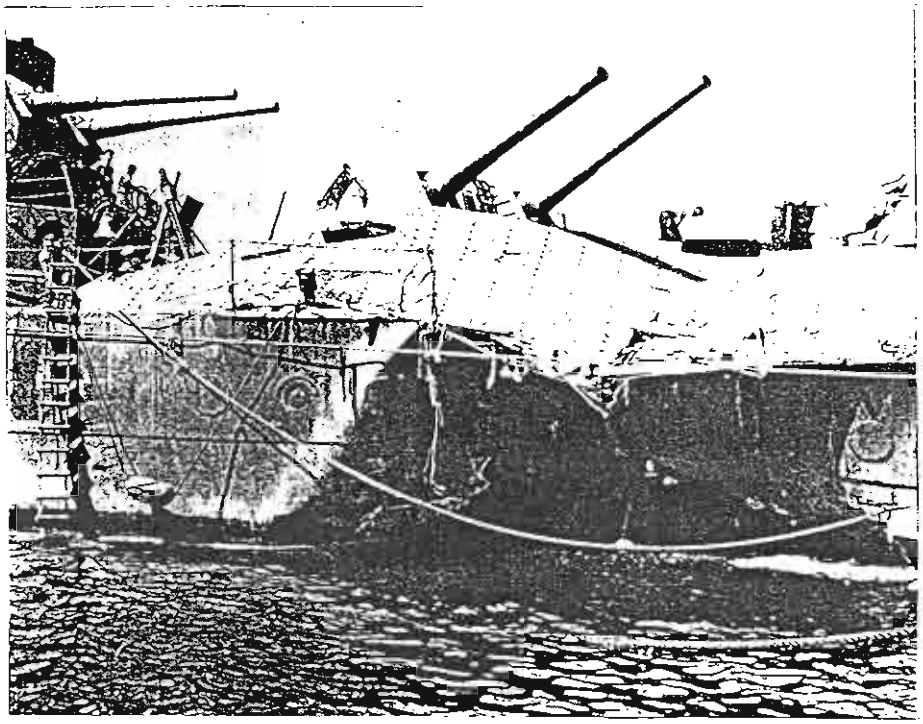
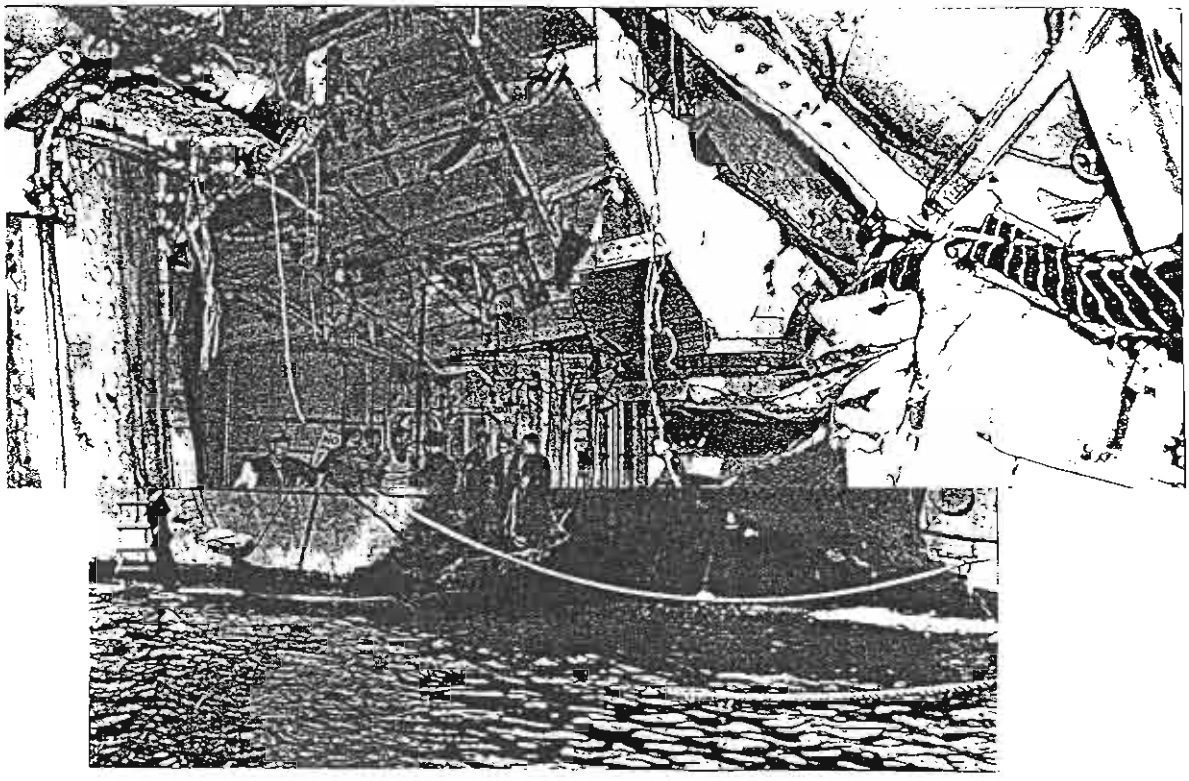


ABOVE AND BELOW:
TORPEDO DAMAGE TO H.M.A.S. HOBART

THE EXPLOSION HAS BLOWN IN THE HULL PLATING
IMMEDIATELY ABAFT Y TURRET AND TORN OPEN
THE QUARTERDECK IN THE VICINITY.
THE CURVED STRUCTURE TO THE IMMEDIATE LEFT
OF THE BOTTOM PHOTO IS THE BARBETTE OF
Y TURRET



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The soundness of the design of the Leander and Modified Leander class can be seen from these examples. The LEANDER and the HOBART were both struck by single torpedoes, and despite severe damage and flooding, survived. The NEPTUNE and the PERTH both suffered multiple underwater explosions and sank, but in neither case did the structural integrity of the hull fail. Both of these ships were observed to capsize and sink due to loss of buoyancy. The NEPTUNE detonated 3 mines and stayed afloat for approximately 3 hours before detonating a fourth mine, and sinking in minutes.

The PERTH was struck by 2 torpedoes before Captain Waller gave the order to abandon ship. She then sank inside of 30 minutes, helped on her way by 2 more torpedoes. Waller had given the order to prepare to abandon ship after the first torpedo hit, but the PERTH appeared to be in no danger of sinking. When she was struck, the forward boiler and engine rooms flooded immediately, causing the ship to list to starboard. But when these compartments were fully flooded and in direct communication with the sea, the list disappeared. The ship righted herself, but with a proportionate loss of buoyancy. Waller's order to prepare to abandon ship was more likely prompted by the fact that the PERTH had lost her speed and manoeuvrability, and was now a much easier target, with another torpedo hit inevitable.

Clearly, the single most decisive blow suffered by the SYDNEY was the torpedo hit under her forward turrets. While none of her sister ships provides a good comparison of a single torpedo hit forward, one of the Dido class cruisers does. The Dido's were of a different design, and mounted 3 turrets forward (Designated A, B, and Q turrets), but they were of a similar size, tonnage, and general layout to the Modified Leanders.

H.M.S. PHOEBE was torpedoed on the 23 October 1942 by a German U-boat. A single contact torpedo struck her on the port side, immediately below Q turret, blowing a 40 by 30 foot hole in the hull plating abreast Q magazine, and causing serious structural damage. Immediate and progressive flooding occurred, encompassing B and Q turret magazine and shell rooms, the 2 pdr. and torpedo warhead magazines, Numbers 1 and 2 Low Power rooms, Numbers 1 and 2 Transmitting Stations, the Main Switchboard, ..., and the forward oil fuel tanks. An initial list of 6 degrees to port was corrected by counter-flooding, which created a 4 degree list to starboard. A turret could not be fired due to structural damage, and speed was reduced to 6 knots. (This speed compares favourably with the estimated 5 to 7 knots that the Germans claimed that the SYDNEY was making when she steamed away) The PHOEBE survived this torpedo attack, but was out of service for 8 months.(17)

It is perhaps noteworthy that the PHOEBE was struck by a 53 cm (21 inch) torpedo with a 280 kg warhead, whereas the SYDNEY was

the order to abandon ship. She then sank inside of 30 minutes, helped on her way by 2 more torpedoes. Waller had given the order to prepare to abandon ship after the first torpedo hit, but the PERTH appeared to be in no danger of sinking. When she was struck, the forward boiler and engine rooms flooded immediately, causing the ship to list to starboard. But when these compartments were fully flooded and in direct communication with the sea, the list disappeared. The ship righted herself, but with a proportionate loss of buoyancy. Waller's order to prepare to abandon ship was more likely prompted by the fact that the PERTH had lost her speed and manoeuvrability, and was now a much easier target, with another torpedo hit inevitable.

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certainly would have hindered efforts to save the ship, but would they have been the deciding factor in the sinking of the SYDNEY?

The most obvious contributing factor would have been a large on-board explosion, such as that of a magazine blowing up. And the SYDNEY had a number of locations where an explosion could have occurred,causing the ship to founder. These are:-

1) The forward 6 inch magazine and shell rooms.
2) The after 6 inch magazine and shell rooms.
3) The 4 inch magazine.
4) Torpedo warheads, on unfired torpedoes in the port tubes.
5) Depth charges. (stowed in a rack on the stern)

If any of these exploded, they, in conjunction with the damage and flooding caused by torpedo and shellfire, would, or should, have been sufficient to sink the ship. The question is, how do we know what happened, and what actually caused the ship to sink, when there were no witnesses or survivors?

The answer perhaps lies with the German description of the engagement, and what they saw of the SYDNEY as she steamed away.

The German Gunnery Officer, Skeries, claimed that his opening salvoes were aimed at the cruiser's bridge and gunnery control. (D.C.T.) After 3 salvoes, these targets had been effectively destroyed, or sufficiently damaged, to allow him to change target to the cruiser's engine room. It is difficult to establish where Skeries directed his fire, but the fact that the SYDNEY steamed away after the battle, indicates that not all of her boilers and engines had been hit. Again, the answer lays with the German statements. The uncontrolled fire burning aft of the forward funnel, and the direct hit on the aircraft, indicates that some of the German fire, if not all of it, was directed at the machinery spaces between the funnels. This would have given the KORMORAN's gunners a point of aim from the waterline to the upper deck, and from the forward funnel to the after funnel. Contained in this area was the forward boiler room, forward engine room, and the after boiler room. The after engine room,being aft of the second funnel, was possibly not fired at.

After 2 salvoes, the SYDNEY resumed firing with her main armament, forcing Skeries to counter this threat to the KORMORAN. It is not clear how many salvoes were fired at the SYDNEY's 'engine room', but shortly after she re-opened fire, Skeries had to change targets again, and engage the cruiser's turrets. On being struck by one of Greter's torpedoes, the SYDNEY altered course towards the KORMORAN. While this manoeuvre was occurring, Skeries directed his fire against the fore part of the cruiser, principally at her forward turrets and bridge.

As the SYDNEY passed astern, her rear turrets were seen to be undamaged, but pointing away from the KORMORAN, indicating a failure of power to these turrets. This may have been caused by local

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increased, and was last seen as a glow in the darkness.

Clearly, there had been no direct hits on the SYDNEY's magazines, as the resulting explosion would have been observed. However, the uncontrolled fires burning on the bridge and amidships may have reached a magazine some time after the action had been broken off. To ascertain if this was possible, it is necessary to look closer at these two large fires to see if they could have spread to a magazine, or possibly the depth charges, or unfired torpedoes.

Shortly after the engagement began, fire broke out on the SYDNEY's bridge and forward superstructure. This fire burned for the duration of the action and was still burning when the ship was last sighted. The amount of gunfire (15cm, 3.7cm, and 2cm) directed at the forward superstructure would have seriously hampered any efforts to control this blaze. Fire-fighting equipment, including the firemain and hoses, would most likely have been damaged or destroyed, and fire-fighting personnel would probably have been killed or wounded.

Immediately below the forward superstructure was the 4 inch magazine. This was situated below the waterline, and was fitted with flooding and drenching arrangements, in case the magazine was threatened by fire. While this magazine should not have been directly threatened by the fire burning several decks above, the possibility of the fire spreading cannot be ruled out. But if the magazine was in danger, it could and should have been flooded to safeguard the ship. Additionally, the flooding associated with the torpedo hit adjacent to this magazine, may have extended to it and thus removed the threat of explosion.

However, the possibility that this magazine was not flooded,and subsequently exploded as a result of heat, or fire reaching it, cannot be ruled out.

For the same reasons, the forward 6 inch magazine and shell rooms, located forward of the 4 inch magazine, may have been touched off by heat or flame. But with these rooms, the likelihood that they would have been flooded by torpedo damage is much greater, therefore the risk of them exploding is much more remote.

The fire amidships also burned for the duration of the action, and was also seen to be still burning when the SYDNEY was last sighted. This fire was started as a result of shellfire but was possibly fuelled by petrol leaking from the fuel tanks of the ship's aircraft. Some witnesses claimed that this aircraft was hit by a 15 cm shell and blown over the side, but others claimed that it exploded aboard ship.

A fully fuelled Walrus carried 122 gallons of petrol,(19) and it would be fair to assume that a good proportion of this amount would have been leaked or spurted over the upper deck, adding to the fire. All the ship's boats, with the exception of the port and

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in their tubes would have produced an explosion of sufficient magnitude to destroy the hull structure in the vicinity. And this, coupled with the flooding forward, would have been sufficient to cause the loss of the ship. However, as the evidence produced at the inquiry into the loss of H.M.S. HOOD revealed, 'The effect of fire round a warhead would possibly lead to an explosion but it would have to be a fire of fierceness and duration and the result would be comparatively mild.' (20) It was also noted that the explosion of two warheads would produce an all round, almost instantaneous flash, coupled with a loud noise. Whilst some of the KORMORAN's survivors claimed that they saw the flames on the burning cruiser flare up, no noise from an explosion was heard.

The likelihood that the after 6 inch magazine or shell rooms exploded is equally possible, but also remote. A base-fused shell fired in the second phase of the engagement could possibly have penetrated the after part of the SYDNEY, and started a fire that could subsequently have touched off the after magazine or a shell room. However, the chances that these compartments were flooded by this stage are much more likely.

It should be remembered that the SYDNEY was down by the bows, and if, as the Germans claimed, her propellors were occasionally to be seen out of the water, something would have to have been done to correct the trim of the ship. As we have seen, one method was to transfer fuel oil from the forward tanks to the stern tanks. But this was a slow process, and not practicable when the ship was under fire and the trim or stability had to be restored quickly.

The SYDNEY had broken off action and was attempting to steam away. The prime consideration would have been to get out of range of the German guns as quickly as possible. To enable this to occur it would have been desirable to restore the trim of the ship quickly, to get the propellors back in the water to provide thrust. The quickest means available was to flood the after magazine and shell rooms. This would have restored some trim, as well as removed the risk of explosion should one of the German shells plunge into the stern.

The possibility that these compartments were in fact flooded, is supported by the lack of return fire from the SYDNEY's after turrets. Even without power, these turrets could have been trained and the guns elevated, by hand, and then the guns fired by the turret batteries. But if their magazine and shell rooms were flooded, they would be limited to firing only what was left in the shell and cordite hoists.

The possibility that the SYDNEY's depth charges exploded, blowing off her stern, is also possible, but not supported by evidence, as no fire or explosion was observed on the cruiser's stern. That the depth charges were in fact a danger to a ship's safety in a surface action is shown by the actions of Captain

burning cruiser flare up, no noise from an explosion was heard.

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3) The possibility that torpedoes exploded in their tubes is very unlikely, but cannot be ruled out.
4) The possibility that depth charges exploded is also very unlikely, but cannot be ruled out.

The other aspect of the amidships fire that warrants closer scrutiny, is that of the smoke.

All witnesses described it as thick black smoke. So dense was this smoke, that when the SYDNEY turned behind it, she became obscured. Some thought that the cruiser was deliberately laying a smokescreen, while others thought that the smoke was merely the result of the fires. Either, or both, of these opinions may have been correct.

Laying a smokescreen was a relatively simple matter. Each boiler was equipped with separate sprayers for the purpose. On receiving the command to make smoke, these sprayers would be turned on, feeding cold fuel oil into the furnace. Incomplete combustion of this oil led to,large quantities of heavy black smoke being emitted from the funnel. This smoke would hang low above the surface of the sea, permitting the ship to turn behind it and become obscured from observers. Smoke cannisters and floats stowed at the stern of the ship could be used to augment this screen.

While it is possible that the SYDNEY did in fact lay a smoke-screen, one of the more reliable witnesses(21) thought that the smoke was the result of the fire amidships. The fact that the smoke was thick and black indicates the probable presence of fuel oil in the fire. Some fuel oil would have been released from the fuel tanks ruptured by the torpedo explosion, and this oil, as well as water, would have been hurled into the air and onto the ship,by the blast. But the duration of the fire and smoke indicates that a larger quantity of oil may have been fuelling the fire.

Such a quantity of oil would have been available in the forward boiler and engine rooms, and an oil fire in either of these compartments would have created an effect consistent with what the Germans described. Thick black smoke would have been generated and emitted from the fan trunks, engine room vents, and the funnel. Such smoke would vent from the area around the base of the forward funnel and the area between the funnels, and would have the appearance of being generated by the upper deck fire.

A boiler or engine room fire could have been started as a result of 15cm shells,either entering these compartments, or exploding against the hull. The SYDNEY's boiler and engine rooms were protected by a belt of armour 3 inches thick, secured to the 1 inch hull plating. At 1,500 metres, the German 15cm shells would have had no difficulty in penetrating 4 inches of steel and wreaking havoc within the machinery spaces.(22) It would appear that Skeries opted to fire nose -fused shells so as to cause the maxim-

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-ed, a flash back of the boilers would again possibly occur.

While the engines were placed below the waterline, the boilers sat a little higher, and were thus vulnerable to close range shellfire. Shells or splinters striking the boilers or steam pipes would have filled the compartment with superheated steam, again causing serious burns or death and possibly starting a fire. This had occured to the Town class cruiser H.M.S. SOUTHAMPTON when she was bombed on the 1 January 1941. One, but possibly two, bombs penetrated the upper deck and exploded on the protective deck above the forward boiler room. The deck split, and the superheater pipe was blown off one of the boilers. The room was filled with superheated steam and had to be abandoned. Shortly after, an uncontrollable fire started, and this coupled with another fire raging aft, led to the SOUTHAMPTON being abandoned and then sunk by torpedoes. (The fires could not be fought due to the permanent loss of power and water for the firemain.)

It is noteworthy that the PERTH suffered similar damage to her forward boiler room,(see example) but she was more fortunate in that no fire resulted.

If the SYDNEY's forward boiler room did catch fire as a result of shells or splinters breaching the hull and entering the compartment, (and the German statements support this scenario) there may have been another possible outcome that should not be overlooked. While a boiler room fire may not have directly threatened the safety of the ship, an uncontrolled fire of long duration may have generated enough heat to threaten the 4 inch magazine.

Even without the possibility of fire in the boiler or engine rooms, there is another aspect that has equal, or even greater significance: that is the actual damage caused to the SYDNEY's hull by the German shells.

If base-fused shells were employed, entry holes at least 6 inches in diameter would have been drilled through the hull, with the shell exploding inside the ship. Splinters from these shells would have cut through everything in their path, including bulkheads, and the hull plates on the other side of the ship. However, if nose-fused shells were employed, and the evidence points to this being the case, quite large holes would have been blown in the armour belt and hull plating.

Large or small, these holes would have caused flooding to occur, by permitting sea water to enter the hull. While smaller holes could be adequately dealt with by the damage control organization, larger holes would have been more difficult to plug or repair. Additionally, this sort of damage to the hull plating around a boiler room may not have been accessable to damage repair parties. Burst steam pipes , or the presence of fire, could force the evacuation of the compartment, allowing uncontrolled flooding to

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Even without the possibility of fire in the boiler or engine

H.M.S. EXETER came under fire from the GRAF SPEE at approximately 0617 Hrs on the 13 December 1939. Only minutes before, the EXETER had gone to action stations, and all boilers flashed up to provide full speed. The damage control organization had closed up, but no amount of peace-time training could have prepared them for what was to come.

The EXETER, being the main threat, initially received the attentions of both of the GRAF SPEE's 11 inch turrets. The Germans achieved a straddle with their third salvo, and one shell, bursting in the sea just short of the EXETER,riddled her with splinters. The damage caused by these splinters was superficial but widespread. The starboard torpedo tube crew were almost wiped out, and 2 other ratings killed when splinters pierced the 3 inch hull plating. The holes caused local flooding, and in addition, electrical cables were severed, communications damaged, and fires started. The gun ready lamps and the fall of shot hooter circuits were also cut, hindering the work of the D.C.T. personnel. Both funnels, the searchlights, and the starboard aircraft were riddled. The Walrus having it's fuel tanks holed, allowing petrol to spray over the after superstructure.

Shortly after, the EXETER sustained a direct hit which luckily failed to explode. The base-fused shell pierced the deck just abaft B turret, tore through the sick bay, then exited through the hull on the port side, causing more local flooding.

The German Gunnery Officer, Fregattenkapitan Ascher,had found the range, and now decided to switch to nose-fused shells, to inflict more damage on the lightly armoured cruiser. His second direct hit landed on the front of the EXETER's B turret. The explosion tore off the armour plate and sent a hail of splinters through the wheelhouse, and the front of the bridge. B turret was knocked out and most of the gun crew killed. However the damage caused to the bridge by splinters was more crucial.

All the bridge personnel, with the exception of Captain Bell, the Torpedo Officer, and one other officer, were either killed or wounded. The wheelhouse, below the bridge, was wrecked, and all communications with the Lower Steering Position and the engine room were lost. With the bridge effectively isolated from the rest of the ship, Bell made his way aft, to take control from the After Conning Position. In the meantime, the EXETER was technically out of control as no message could be passed to the After Position, although she was still firing back with A and Y turrets.

The Air Defence Officer, who had escaped injury in his position above and abaft the bridge, managed to pass an order via the damaged voicepipe to the Lower Steering Position, to steer 275 degrees. Shortly after, this order was amended to 'port 25' by the Torpedo Officer, when it was realised that if the EXETER maintained 275 degrees, A-Arcs would close and prevent Y turret from firing.

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damage to the catapults. A chain of 10 men was formed to relay the helm orders from the After Conning Position to the After Steering Position.

Shortly after Bell had regained control of the ship, Ascher scored another 2 direct hits. The first, bursting on the sheet anchor, tore a 8 x 6 foot hole in the hull plating just above the waterline. Splinters from this shell, as well as near misses from the same salvo, tore through the forecastle, cutting through bulkheads, and starting fires. The second shell also struck the forecastle, blowing a 12 x 12 foot hole in the deck abaft the cable holder.

Despite the heavy damage, the EXETER was still steaming at full speed, although she was slowly flooding forward, and this flooding would eventually reduce her speed to 18 knots. Most of this flooding was caused by shell and splinter damage, although some was caused by water gushing from the shattered firemain and riddled fire hoses. Fire parties were reduced to fighting the numerous fires with buckets of sand, whilst the smoke from these fires gave the impression that the Exeter was worse hit than she actually was.

As a result, the GRAF SPEE switched targets and turned her main armament on the AJAX and the ACHILLES. Shortly after, the Germans, realising that the EXETER was manoeuvring to fire torpedoes, swung their 11 inch guns back onto her. Minutes later, an 11 inch shell struck the forward superstructure. It entered the Navigating Officer's cabin, exited through the Armament Office, killing 5 telegraphists in the process, and then exploded on the barrel of the S-1 4 inch gun, knocking it out and killing several of the gun's crew. Splinters set fire to a ready-use ammunition locker, the contents of which began cooking-off, and sending more splinters and shrapnel flying.

Another shell penetrated the ship's side, as well as 3 bulkheads, before bursting in the Chief Petty Officers flat above the 4 inch magazine. A bad fire started, which could not immediately be fought, owing to the damaged fire main. As the fire threatened the 4 inch magazine, and the adjacent 8 inch magazine of B turret, the decision was made to flood them. However, this was not possible as it was found that the flooding valve spindle had been shot away. Fortunately, water from the shattered firemain had already found its way into the magazines, removing the risk of explosion.

This flooding extended to the Lower Steering Position, and the Number 1 Low Power room, cutting the electicity supply for the compass repeaters. In addition, splinters from the explosion severed many electrical cables, including the ones supplying power to the Transmitting Station. With the T.S. out of action, the turrets were ordered to go into local control, but shortly after, A turret was knocked out by a direct hit, the shell exploding on the barrel of the right hand gun and tearing [illegible] was [illegible]

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With the Transmitting Station and the D.C.T. now useless, and his forward turrets out of action, the Gunnery Officer, Lieutenant Commander Jennings, made his way aft to assist with the control of Y turret. Despite the blast, and the danger of standing in an exposed position, he took up station on the roof of Y turret, where he could spot the fall of shot, and shout corrections to the turret captain via a manhole.(23)

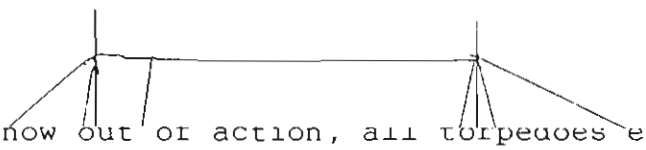
At 0729 Hrs, water entering the hull through splinter holes cut the electricity supply to Y turret, silencing it. With all his main armament now out of action, all torpedoes expended, and with only one 4 inch gun still serviceable, Captain Bell decided to break off the action.

The EXETER was down by the bows about 3 feet, having shipped an estimated 650 tons of water, and was listing nearly 10 degrees to starboard. The whole ship was a shambles, and fires were still burning, sending up clouds of smoke. However the engines were intact, and more importantly, so were her boilers. With steam available for the pumps, the list was reduced by pumping fuel oil from the starboard to the port tanks, however,trim could not be restored due to the volume of floodwater forward. Incapable of making any more than 18 knots due to weakened bulkheads,steered by means of a small boat's compass, and unable to make W/T contact with Commodore Harwood, the EXETER retired to lick her wounds.

It was to be several hours before jury aerials could be rigged, and when Harwood learnt of the full extent of the EXETER's damage, he ordered Captain Bell to make for the Falkland Islands. Enroute, the fires were brought under control and extinguished, while damage repair parties did their best to plug the leaks and shore up the damaged bulkheads.

Of the EXETER's complement of 630, 5 officers and 56 ratings had been killed with another 3 ratings dying from their wounds. 3 officers and 17 ratings were wounded.

The EXETER reached Port Stanley on the 16 December. A preliminary report on her damage proposed that she be left in the Falklands until after the war, such was the extent of her damage. However this proposal could not be accepted by the First Lord Winston Churchill, and the EXETER was made sea worthy enough to be sailed to the United Kingdom for a complete refit.



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The following points are noteworthy:-

1) Flooding encompassed a great deal of the forward part of the ship, as in the SYDNEY, but the EXETER survived. This was probably because her boiler and engine rooms were not damaged and did not flood, thereby preserving sufficient buoyancy and stability to allow the EXETER to remain afloat.
With these compartments intact, steam and electricity could be maintained to keep the main suction and pumping systems operational, thereby permitting flooded compartments to be drained or pumped out. Where this was not possible due to the inability of the damage repair parties to plug the holes to stem the inflow of water, the pumps could be used to control and limit the flooding.
The SYDNEY on the other hand, taking into account the probable damage to her forward boiler and engine rooms, may have had a good percentage of her pumping capacity destroyed or rendered inoperative due to loss of steam.

2) The EXETER's 4 inch magazine was threatened by the fire burning on the decks above it, but battle damage prevented the magazine being flooded. However, water from the shattered firemain found it s way into the magazine, preventing an explosion that would have sunk the ship.

Additionally, it can be seen from this example that shell and splinter damage quite often left the fire parties without any adequate means to fight the fires that usually accompanied such damage. Whole sections of the firemain could be destroyed or holed whilst the canvas hoses were very suseptible to damage from splinters. Such damage to the fire fighting equipment if not discovered and repaired, or bypassed, would lead to minor flooding in the vicinity. This local flooding if left unchecked could cause further damage by shorting out the electrical system, or components as well as increasing the ship's displacement. The pumps, generally capable of delivering 50 tons of water per hour, would continue to supply water to the firemain until such time as they were stopped, damaged, or the supply of steam destroyed or shut off.

If the fires could not be fought or controlled, the damage repair parties could in some cases be prevented from plugging or repairing shell and splinter holes in the hull. While such holes may not immediately threaten the safety of the ship, the accumulation of flood water over a period of time may be sufficient to threaten the stability and/or buoyancy of the ship.

It is quite possible that this occurred with the SYDNEY. There is every likelihood that she suffered shellfire damage to her port (and possibly starboard) side, and if this damage led to the flooding of the forward machinery spaces, this flooding, in con-

stem the inflow of water, the pumps could be used to control and limit the flooding.
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In this case, the SYDNEY could then have reached a stage where she could capsize quickly and without warning.

We thus have two probable causes for the loss of the SYDNEY:

1) The most likely cause, and one that is consistent with the German statements and description of the action, is that torpedo and shellfire damage resulted in extensive flooding, which eventually caused the SYDNEY to capsize and sink.
2) The other likely cause, is that fire or heat eventually caused an unflooded magazine or shell room to explode, causing the ship to rapidly sink. And of the SYDNEY's magazines and shell rooms, the one most likely to have been affected by fire or heat, was the 4 inch magazine.

It is perhaps noteworthy that while the German survivors claimed that they heard no noise from an explosion on the cruiser, magazine explosions could be relatively noiseless affairs. Such explosions on British warships were normally the result of cordite charges igniting.

The 6 inch shells which the SYDNEY fired from her main armament were stored in the 6 inch shell rooms forward and aft, with the propelling charges of cordite stored separately in the 6 inch magazines, also forward and aft. The 4 inch guns however, fired a fixed round, with the cordite charge encased in a brass casing much like an enlarged rifle cartridge. Whilst this form of shell was much safer to handle and store than the individual charges as used in the 6 inch guns, both were likely to ignite if subjected to excessive heat, exposed to fire, or struck by high explosive shell.

The ignition of a large quantity of cordite would produce a large volume of gas which tended to tear a ship apart by the rapid build up of pressure. This gas, when it vented to atmosphere, would produce a bright flame, vast quantities of smoke, and a noise more like a roar than a loud bang. This phenomenon was noted when the battlecruiser H.M.S. HOOD was destroyed by a magazine explosion on the 24 May 1941 while engaging the German battleship BISMARK.

Such magazine explosions were relatively uncommon in the Second World War, and the spectacular and rapid destruction of the HOOD generated a great deal of interest in the precise cause of her loss. The accepted cause being a 38 cm (15 inch) shell fired by the BISMARK exploding in, or adjacent to, the HOOD's 4 inch magazines. The resulting explosion of the 4 inch magazines causing the adjacent after 15 inch magazines to explode, tearing apart the stern of the ship.

It is possible that such an explosion aboard the SYDNEY may not have been audible to the crew of the KORMORAN. There may have been any number of reasons for this, including the background noise of their own ship's uncontrolled fires, or even the explosion of the

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escort to the CYPRIAN PRINCE, which could not stop to pick up survivors due to the risk of being torpedoed herself. The merchant ship arrived at Kirkwall 13 hours later and notified the authorities of the destroyer's loss and the position. When rescue ships reached the area they located a lifebuoy and some orange crates, and these few items provided the evidence that the EXMOUTH had sunk in the vicinity. Unfortunately, of the ship's complement of 175 officers and ratings, there was no trace. All had been lost.

In most cases where the hull is breached, oil fuel tanks are ruptured, and a certain amount of oil released. Over a period of time, wind and wave motion will break up and disperse the slick or patch that is formed. But in some cases, oil will be released slowly, even after the ship has settled on the seabed. This may produce a slick or patch that is visible for weeks, months, or even years. H.M.A.S. PERTH for instance, was still leaking oil 25 years after being sunk. When David Burchell (24) located the wreck of the PERTH in 1967, it was found that oil fuel was still seeping up from the ship, and that on calm days the slick would be spread for miles by the current.

There were sightings of oil during the 1941 search for the SYDNEY, but both were apparently dismissed as not having originated from her.

On the 26 November, an Anson search aircraft, on landing at Carnarvon, reported that oil had been sighted 18 miles off the coast. However no importance was placed on the sighting as it was considered a common occurence. Then on the 28, a large oil patch was sighted by Catalina search aircraft about 5 miles south east of the reported action position. (25) This sighting was relayed by visual signal to two search vessels, but again it appears that little importance was attached to the sighting.

NOTE: H.M.A.S. HEROS may have identified this patch the previous day and this may explain the apparent lack of interest in the sighting on the 28. The HEROS is recorded as having steamed through a large patch of linseed oil.(26)

That no oil, wreckage, or debris was found that could have originated from the area where a badly damaged SYDNEY could have gone down, indicates at least two possibilities: firstly, that the search may not have been thorough enough to find such an oil slick or debris field, which may also have included survivors; or, that the SYDNEY did not break up prior to, or after, her sinking.

If she had sunk as a result of a magazine explosion, the resulting hull damage should have released a sufficient quantity of oil (from ruptured tanks) that in theory, should have produced a slick large enough to have been visible to searching aircraft.

Additionally, such an explosion probably would have broken the ship in two. In such cases, a reasonable amount of wreckage and debris would be released from the bowels of the ship to form a

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NOTES

1 MANUAL OF SEAMANSHIP Volume 2 BR 67 (2/51), H.M.S.O. London page 496

2 This low freeboard became apparent during trials of the lead ship, H.M.S. LEANDER. In heavy seas and swell, she developed a heavy roll, (a feature common with all ships of the class) which resulted in a very wet ship. In May 1933, the LEANDER, on passage to Devonport, had her boats, which were stowed on the upper deck, damaged by waves. The freeboard of the ship could not be increased, so to provide the boats more protection, it was decided to extend the side plating below the 4 inch gundeck, and to reposition the boats to forecastle deck height.

3 Raven, A. and Roberts, J. BRITISH CRUISERS OF WORLD WAR TWO, Arms and Armour Press, London 1980 page 9

4 Poolman, K. THE KELLY, William Kimber, London 1954 page 131

5 MANUAL OF SEAMANSHIP Vol 2 BR 67 op.cit. page 504

6 Ross, W.H. LUCKY ROSS, Hesperian Press, Victoria Park 1994 pages 223 and 226

7 The ACHILLES was actually engaged in Concentration Firing with the AJAX. This involved both ships firing on the same target, using the same spotting corrections, and firing together to obtain a concentration of fire. The AJAX relayed the range, deflection, and firing orders to the ACHILLES so that both ships could fire as one.

8 The EXETER had her aerials broken as a result of her masts whipping. As a result of this experience, it was decided to remedy the problem by incorporating small loops in the aerial runs to provide a small measure of slack.

9 The damaged destroyer, which proved to be the ARTIGLIERE, was being towed to safety, when she was sighted later in the morning by a search aircraft. Cruisers, including the SYDNEY, were despatched to intercept the two destroyers. On being sighted, the towing destroyer slipped the tow and made off at speed, whilst the ARTIGLIERE was closed, and sunk by gunfire from the heavy cruiser H.M.S. YORK.

10 Cunningham, A.B. A SAILOR'S ODYSSEY, Hutchinson and Co. Ltd. London 1952 (reprint) page 384

11 Jones, T.M. and Idriess, I.L. THE SILENT SERVICE, Angus and Robinson, Sydney 1952 (reprint) pages 116 and 117

12 Cunningham, A.B. [illegible]
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3 Raven, A. and Roberts, J. BRITISH CRUISERS OF WORLD WAR TWO, Arms and Armour Press, London 1980 page 9

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5 MANUAL OF SEAMANSHIP Vol 2 BR 67 op.cit. page 504

6 Ross, W.H. LUCKY ROSS, Hesperian Press, Victoria Park 1994 pages 223 and 226

7 The ACHILLES was actually engaged in Concentration Firing with the AJAX. This involved both ships firing on the same target, using the same spotting corrections, and firing together to obtain a concentration of fire. The AJAX relayed the range, deflection, and firing orders to the ACHILLES so that both ships could fire as one.

8 The EXETER had her aerials broken as a result of her masts

18 That a large warship could be sunk by a single torpedo hit was shown by the loss of the 22,000 ton aircraft carrier H.M.S. ARK ROYAL on the 13 November 1941. At 1531 Hrs, whilst making 18 knots, she was struck on the starboard side amidships by a single contact torpedo. All power and communication-s were lost and the ship took on an immediate list of 10 degrees which increased to 12 degrees within 3 minutes. Captain Maund immediately went below to the engine control room in order to stop the engines and assess the damage. The torpedo had torn open the hull abreast the starboard boiler room, flooding it. In an attempt to correct the increasing list, port compartments were flooded, and the pumping of fuel oil from the starboard to the port tanks commenced. However, within 20 minutes the list had increased to 18 degrees. Fearing the ship would capsize, all ratings not required were ordered to abandon ship. Meanwhile, flooding had extended to the centre boiler and starboard engine rooms. The greatest loss was that of feed water for the port boiler room, and without water for steam, the pumps could not be operated. The destroyer H.M.S. LAFOREY was then brought alongside to provide feed water, and enough electrical power to work the ship's pumps. Steam was gradually raised in the port boilers allowing the LAFOREY to be cast off.

At 1930 Hrs, the ARK was taken in tow by a tug which had arrived from Gibraltar, however a speed of only 1 knot could be made. Attempts were made to supply steam to the port engines, but at 0215 Hrs fire broke out in the port boiler room, destroying all steam production. The list increased to 20 degrees and the LAFOREY was brought alongside again to supply power for the pumps. By 0400 Hrs, the list had increased to 27 degrees, however the boiler room personnel continued to try to steam the boilers. Unfortunately,the boiler uptakes, which were trunked across to the starboard side (the funnel being on that side) became flooded due to the angle of the ship. With no draught for the boilers, the boiler casings became red-hot and the choking fumes forced the abandonment of the boiler room. With all hope of saving the ship gone, all remaining personnel were taken off, and at 0613 Hrs on the 14 November, the ARK ROYAL capsized and sank.

19 Early production aircraft had a capacity of 122 gallons, while later production aircraft had a larger capacity of 155 gallons Andrews, C. and Morgan, E. SUPERMARINE AIRCRAFT, Putnam, London 19 Page144

20 Northcott, M. H.M.S. HOOD, Bivouac Books Ltd. London 1975 Supplement, titled Classified reports on the loss of H.M.S. HOOD: battlecruiser: 24 May 1941

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24 Burchell, D. THE BELLS OF SUNDA STRAIT, Rigby, Adelaide 1971 page 105

25 Australian Archives (Western Australia) K 809/1 SOUTH WESTERN AREA COMBINED HEADQUARTERS LOG BOOK 2 July 1941- 5 May 1942 pages 121 and 138

26 Frame, T. H.M.A.S. SYDNEY, Hodder and Stoughton, Sydney 1993 page 8

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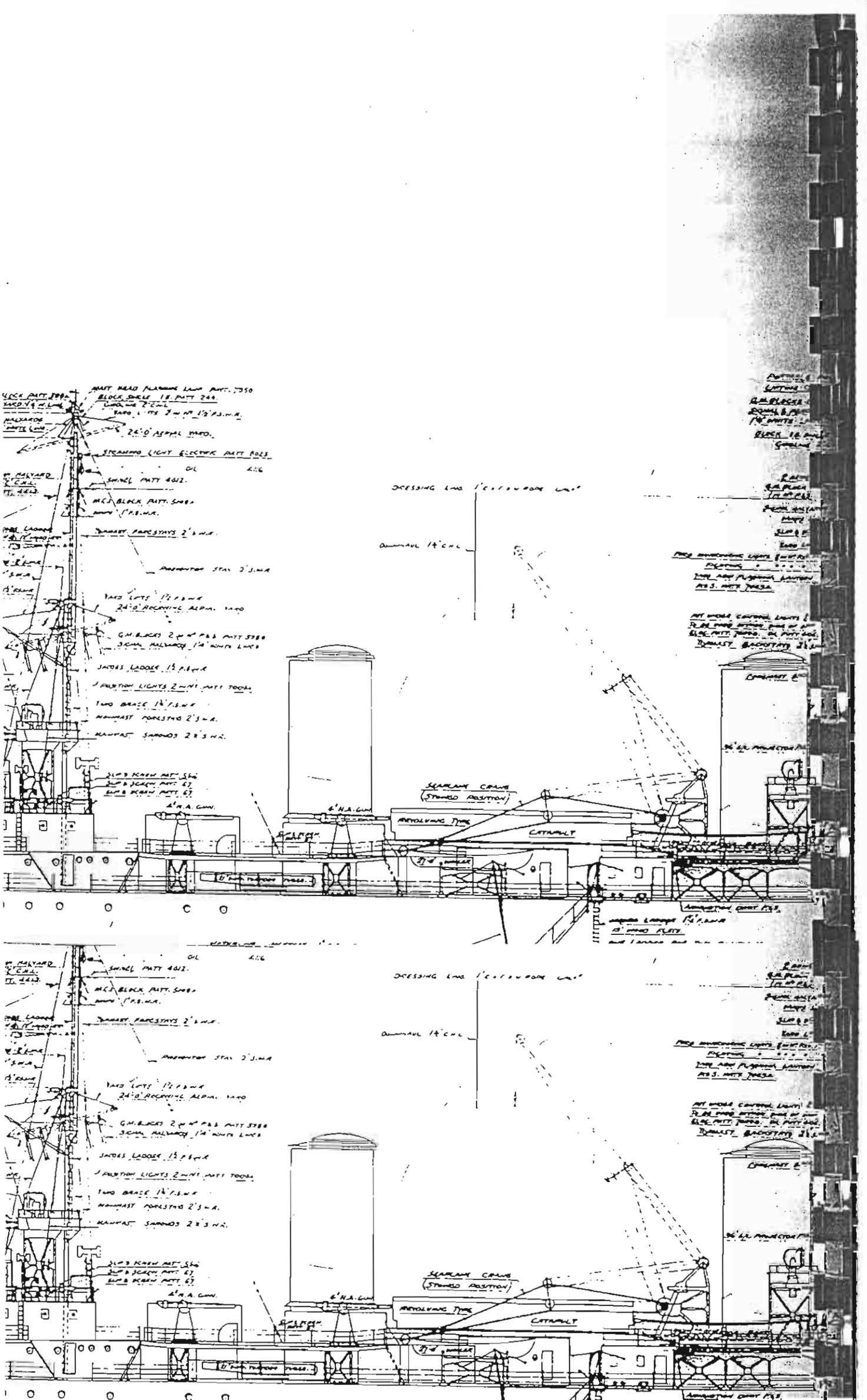
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