

H.M.S. "KING GEORGE V"

Steaming of ship, Trincomalee to Tokyo Bay

January 16th to September 4th, 1945

REPORT FROM THE ENGINEER OFFICER

Action organisation of Engine Room Department

Under high degree action conditions the position was as follows :—

The Department worked in three straight watches with very few exceptions, these few having important daywork duties. One watch steamed, the other two remaining at their damage control stations. If first degree was in operation, all personnel were at instant alert and if this lasted for a considerable period there was a tendency for them to become tired, generally disinterested and in some cases, exhausted. Under these conditions the ship's ventilation was on enclosed circulation below the weather deck causing rapid increase in staleness and humidity. This is considered a most important point for future policy as the safety of the ship was definitely jeopardised after about 8 hours. Fortunately this situation rarely materialised either because the Japanese did not have the initiative or else lacked the necessary material to keep up a continuous state of attack which would have demanded a high degree of damage control. At second degree, 50% of the damage control personnel were allowed to relax at their damage control sections. In actual fact, the rest and recuperation which they got from this was very small due to the bad ventilation of the ship generally which deteriorates rapidly under action conditions. Periods of over three days under these conditions were comparatively rare but personnel generally were fatigued after this time.

Trincomalee

During the ship's stay of three weeks at Trincomalee in December-January, 1945, a determined drive on steam leaks was made in "A," "B" and "X" units, every steam valve being repacked. "A" main feed pump, which had given trouble over the previous six months through worn bearings, was found to have a bent shaft. H.M.S. *Tyne*, when endeavouring to shrink on the pump turbine rotor, bent one spare shaft and H.M.S. *Resource* was only partly successful with the second spare shaft. This shaft, however, was not fitted until arrival at Sydney in February, and the pump was therefore out of action during the first operational period.

Palembang operations

The ship left Trincomalee for operations off Palembang on 16th January, 1945. During this period no major trouble with the machinery was experienced, but the necessity for a definite routine for servicing the machinery, especially the auxiliary machinery, was demonstrated. It also proved that the number of engine room artificers and mechanics carried, namely 52, was definitely required, although the number allowed by complement in peace-time is 40. In the fuelling area repairs to brickwork, pumps, etc., took place.

Although this was the first operation that the ship had done under tropical conditions, the ratings stood up to the trying conditions down below very well

and sickness was remarkably low in spite of action conditions, repairs to machinery, etc. The average temperatures of the various machinery compartments were as follows—"A" engine room 109°, "B" boiler room 110°, "X" boiler room 130°, "Y" boiler room 112°—these being the hottest compartments. Unlike the American Navy, there are no special damage control personnel and the bulk of these parties come from the Engine Room Department.

Sydney

The ship proceeded to Sydney via Fremantle and arrived on 11th February, 1945. A period of 17 days was spent replenishing and self refitting, the chief repairs being several major steam joint leaks, one very large one in "A" engine room, cleaning of boilers, assembling "A" main feed pump, changing evaporator coils and repairs to a diesel generator which became defective whilst at Sydney. The shortage of important stores and spare gear already began to make itself felt although the Royal Australian Naval authorities gave limited but willing and generous help.

The feed water consumption of the ship had always been high since leaving Liverpool in July, 1944, where the major reconstruction refit was carried out. It was decided to water pressure test one of "B" boiler room boilers for superheater tube leaks. These were brought to light under test in rather an alarming degree. This boiler had its superheater tubes re-rolled and they were reasonably tight under a 400 pound per square inch water pressure test.

This was a rest and replenishment period and as much leave as possible was given, namely three days to each watch. The routine for the remainder of the time was as follows—watch ashore left the ship at 1315, standby watch at 1630, half the duty watch of chief and petty officers after supper if work permitted. There were usually important repairs going on which meant long hours into the night for some of the duty watch and also for some of the more specialised ratings not really on duty. The period in Sydney was considered to be insufficient to rest the ratings properly but the sailing of the Fleet could not be postponed.

Sydney to Manus

The ship left Sydney on 28th February with the port diesel generator and "A" main feed pump once more out of action. On the way to Manus all boilers were shut down in turn (*i.e.*, 8 boilers in 8 days, each being reflashed on completion) and an inspection from the furnaces was made for signs of water from leaky superheater tube ends. There was evidence of leakage in all boilers. The ship was 11 days at Manus, including exercises. During this time "A" engine room main steam joint was rejoined as it still leaked on leaving Sydney in spite of a previous test. "A" main feed pump was re-assembled and trial run. While at Manus, after the water pressure testing of all boilers on passage from Sydney, "A" superheaters were opened out and the tube ends re-rolled. Two E.R.As., the only two whose size would permit entry into the S/H drums were working in a cylinder 9 feet long by 18 inches diameter, at an angle of 70°, for approximately 17 hours a day under extremely unpleasant conditions of heat and humidity. "B" boilers were found to be in the same condition and Fleet assistance was called for and the work proceeded on a watch-keeping basis. "B" boilers, even after re-rolling, were still leaking badly and the worst tubes were re-rolled again by the ship's staff, Fleet assistance having been dispensed with as the ship proceeded to sea for exercises. The number of tubes re-rolled amounted to approximately 1,000.

On arrival at Ulithi further tests were carried out on "B" boilers, the results being reasonably satisfactory. During the stay the remainder of the boilers

were water pressure tested and all showed signs of leakage, though not as bad as in "B" boiler room.

First operations off Sakishima Gunto

On 18th of March, the ship left Manus for Ulithi where she arrived on 20th March, leaving again on the 23rd March for operations off Sakishima Gunto. The port diesel was repaired and ran a successful trial.

There are 6 steam dynamos and 2 diesel dynamos in the ship, all of which are important when the ship is in full action state as the armament causes a very high electrical load. "A" main feed pump soon showed that there was something seriously wrong with the alignment of the pump and remained out of action; it also had developed a serious water leak.

Major repairs were carried out to two H.P. air compressor armatures. The armatures were removed to the workshop and binding wires rebound. Electrical repairs generally were continuous, the other large ones being the hull and fire pump motor bearings and repairs to their starters. The climate was trying and average temperatures for compartments were hotter than on the Palembang operation. Sickness again was remarkably low.

Leyte

The ship returned to Leyte for the period 23rd April to 1st May. There was a large number of defects and repairs to be made good such as steam and water leaks, defects to main and auxiliary machinery, the changing of one set of evaporator steam coils. This threw a very large amount of work on the engineer officers and ratings and consequently it was necessary to remain in three straight watches as for steaming. All boilers in "A" and "B" units, four in number, were cleaned. The normal time allowed for cleaning two boilers was 56 hours but owing to the amount of maintenance work to be carried out, the work had to be rushed and the four boilers were cleaned in 72 hours. At one period, conditions of heat humidity became so bad that work had to be stopped owing to fatigue of the boiler party.

After cleaning, water pressure tests revealed heavy leakage again in "B" superheaters.

It was considered unsafe to roll the tubes again owing to the danger of splitting them (after the previous three rollings). "Manganesite," a jointing compound was painted on to try to fill the leaks. This is an unheard of practice but had to be resorted to owing to the high feed water expenditure. The conditions of work were even worse than at Manus and Ulithi.

After closing up, high pressure air was put on the boilers to try and squeeze the compound into the leaks. This entailed special fittings having to be made by the ship's staff. This replenishment period was carried out in the most unpleasant tropical conditions so far experienced, and made working conditions almost intolerable.

Second operation off Sakishima Gunto

On leaving Leyte the ratings generally were physically tired. The ship returned to the Sakishima Gunto area for operations when conditions and the amount of maintenance work required increased owing to the general shortage of spare gear. Domestic water rationing, which was always in force, became more of a hardship to the ship's company owing to the increase in feed water losses and the falling output of the evaporators due to the number of hours they had run and consequent scaling up of their steam coils.

The mental strain on officers and staff responsible for evaporator maintenance to say nothing of the work required to keep them running, was very large. Fortunately no evaporator broke down seriously, but, if one had done so, it would have meant restricting the fresh water to bare essentials, *i.e.*, drinking

and cooking purposes. The stock of water remaining both for steaming and domestic purposes was insufficient for more than twenty-four hours with one of the two sets of evaporators out of action.

During the latter Sakishima period a large amount of work on boiler brickwork was carried out in the fuelling area. In addition to the normal brick repairs to sprayer cones, etc., five out of the eight boiler back slope brick walls were completely renewed. This was accomplished by working in three straight watches and by relieving some of the leading stokers and stokers on damage control sections by royal marines.

The double bottom party was worked very hard during this latter Sakishima period, preparing to fuel ship and then fuelling other ships. There are a large number of oil fuel tanks in the ship including eighteen wing oil fuel tanks. The latter have to be run down to double bottom tanks by admitting sea water. The sea water replaces the oil for underwater protection when the oil has been displaced. Pumping out sea water ready to receive fuel has to be done in a safe area, in other words, near the fuelling area.

The return to Sydney

The ships left the Sakishima area on 26th May *en route* for Guam and Sydney. The passage from Sakishima to Guam and from Guam to Sydney was done at twenty-four knots. This caused the remaining three boiler brickwork back slopes to become defective and the brickwork generally showed signs of the need of urgent repair. The boilers were kept usable by shutting one down in turn and going into the furnace when cool enough to do hasty repairs by patching. This was accomplished by the bricklayers working in wooden clogs and asbestos suits. On arrival at Sydney, three of the eight boilers had burnt brick casings, the temporary repairs having been unable to keep pace with the increasing defective brickwork.

Sydney

The ship arrived in Sydney on 5th June and remained there until 26th June, 1945, when the ship left for exercises. During this period four days' leave was given to each watch. A large amount of work was required during this replenishment period to make the ship ready for sea once more.

Important items were :—four boilers to clean, evaporator coils to change, a large amount of stores to get in, various steam leaks to repair, some of them large, and general machinery routine cleanings and examinations. In addition the lubricating oil was changed to U.S. lubricating oil which entailed very careful cleaning of all machinery systems and required the major operation of handling approximately 14,000 gallons of oil by ship's staff. The same short leave was given as in the previous Sydney replenishment period. More assistance from shore was given this time, C.S.W.'s department giving a large amount of help in the boiler rooms and elsewhere. Sixty per cent. of the boiler brickwork was renewed by a local Sydney firm. Repairs to "A" main feed pump were undertaken by a local Sydney firm and ship's staff. The pump was lined up and a new shaft fitted. It took all the replenishment period to complete "A" main feed pump as it required a large amount of patience and checking to discover the fault. A serious defect occurred to No. 1 dynamo five days before the end of the replenishment period which necessitated opening the machine up and fitting the spare rotor in lieu of the damaged one. This was accomplished before sailing by working day and night, ship's officers and ratings being assisted by C.S.W. ratings in accomplishing this quick repair. Electrical repairs were carried out on two hull and fire pump armatures.

The engineer officers in particular worked very long hours during this replenishment period.

Operations off Japan

The ship left Sydney on 28th June for operations off Japan with the U.S. Third Fleet. This period was the longest the ship did under continuous steaming conditions and lasted until 27th August when the ship anchored at Sagami Wan near Tokyo Bay.

Shortly after leaving Sydney "A" main feed pump became defective once more through the shaft again becoming bent. The material and heat treatment of the shaft were suspected as being the cause. This pump has remained out of action ever since.

"X" main feed pump became defective by the shaft becoming bent and out of alignment; this occurred shortly after that in "A" boiler room. Repairs were unsuccessfully attempted.

This meant that during the operations the two starboard steaming units depended on one large capacity pump each; a failure of either would have meant easing that particular shaft down to a speed equivalent to seventeen and a half knots. The thought of this and the consequent effect on the British Pacific Fleet were constant worries to those concerned.

Conditions down below were as unpleasant as on the Sakishima operation.

Repairs to the auxiliary machinery became more frequent and were often lengthened by the necessity of making parts owing to the lack of spares.

The work of the double bottom party increased owing to the large number of destroyers fuelled in addition to fuelling ship. At one period the double bottom party worked almost continuously for 48 hours. It became possible to split this party into two by the substitution of seamen for stokers on two damage control sections. Figures for fuelling ship and fuelling destroyers are as follows:—

Fuelled ship	...	...	...	19 times.
Total	...	...	...	24,448 tons.
Fastest fuelling	...	...	...	1,210 tons pumping rate 1,050 tons/hr.
Ships fuelled	...	...	...	30 destroyers, 1 cruiser, 1 U.S. destroyer.
Fastest fuelling destroyer	...	...	...	<i>Napier</i> at 185 tons/hr.

The D.B. officer and D.B. party spared no efforts in improving fuelling speeds and methods.

The water problem was just as acute. A distiller of the port set of evaporators became defective through a salt water leak. This was kept down to a reasonable salinity by the addition of sawdust.

A slightly better stock of water was obtained by a strike period and more rigid water rationing. Repairs were undertaken which lasted twenty-four hours. These were carried out in a hot part of the harbour machinery room. A very great setback to carrying out repairs while at Sydney was the lack of shore lighting and heating. This meant that steam always had to be maintained with one boiler and four out of the eight dynamos had to be kept running. The chance of proper maintenance was very small and when an opportunity did occur it meant long hours for the small dynamo staff. During the operations opportunities for minor repairs had to be taken in the fuelling area under very unhealthy conditions. Interesting figures of running dynamos are as follows:—

Ship left Trincomalee 16th January, 1945, entered Sagami Wan 30th August, 1945. No of days, 227.

Dynamo (steam)	...	No. 1	No. 2	No. 3	No. 4	No. 7	No. 8
Days ...	...	194	213	209	209	195	211
Per cent. running time	...	85%	94%	96%	93%	86%	93%

Summary

The following figures of the ship's mileage, hours underway, etc., are tabulated for interest.

	Period	Miles Steamed	Time under Way	Time not under Way
Trincomalee to Sydney ...	27 days	13,266.3	(566 hrs. 21 mins.) 23 days 14 hours 21 minutes	3 days 9 hours 39 minutes
Sydney	16 days	Replenishment Period		16 days
1st operation—Sakishima Sydney to Sydney	99 days	22,225.7	(1,792 hrs. 15 mins.) 74 days 16 hours 15 minutes	24 days 7 hours 45 minutes
Sydney	20 days	Replenishment Period		20 days
2nd operation Sydney to Tokyo	66 days	21,716.3	(1,432 hrs. 13 mins.) 59 days 16 hours 13 minutes	6 days 7 hours 47 minutes
Total	228 days	57,208.3	157 days 22 hours 49 minutes	70 days 1 hour 11 minutes

The damage control defects mounted up over these long periods at sea and the staff available was always behind hand in consequence.

The evaporating capacity was shown to be lamentably insufficient for operations of the kind undertaken in the Pacific.

The operations showed that the engine room complement of stokers is too small for ships of the class. *H.M.S. King George V* was twenty-two stokers over the allowed complement.

It is suggested that part of the guns' crews should be manned by stokers so that more stokers would be available under non-action conditions and particularly in harbour. In addition more engine room artificers would have been a great help in keeping abreast of the many defects that developed. Accommodation would have to be made for these extra ratings.

If these extra ratings had been available, especially artificers, many defects would have been put right before they became major ones, by routine examinations, etc. A further disadvantage which was present until comparatively late in the operations was the short notice for steam required for eight boilers when in the fuelling area. In many cases repairs to pumps which were partly defective could not be undertaken in the time available.

The amount of maintenance required for electrical machinery and equipment was heavy and was far in excess in relation to the number of engine room personnel carried for this purpose. This threw a very heavy strain on these ratings and their work was generally carried out under very unpleasant conditions.