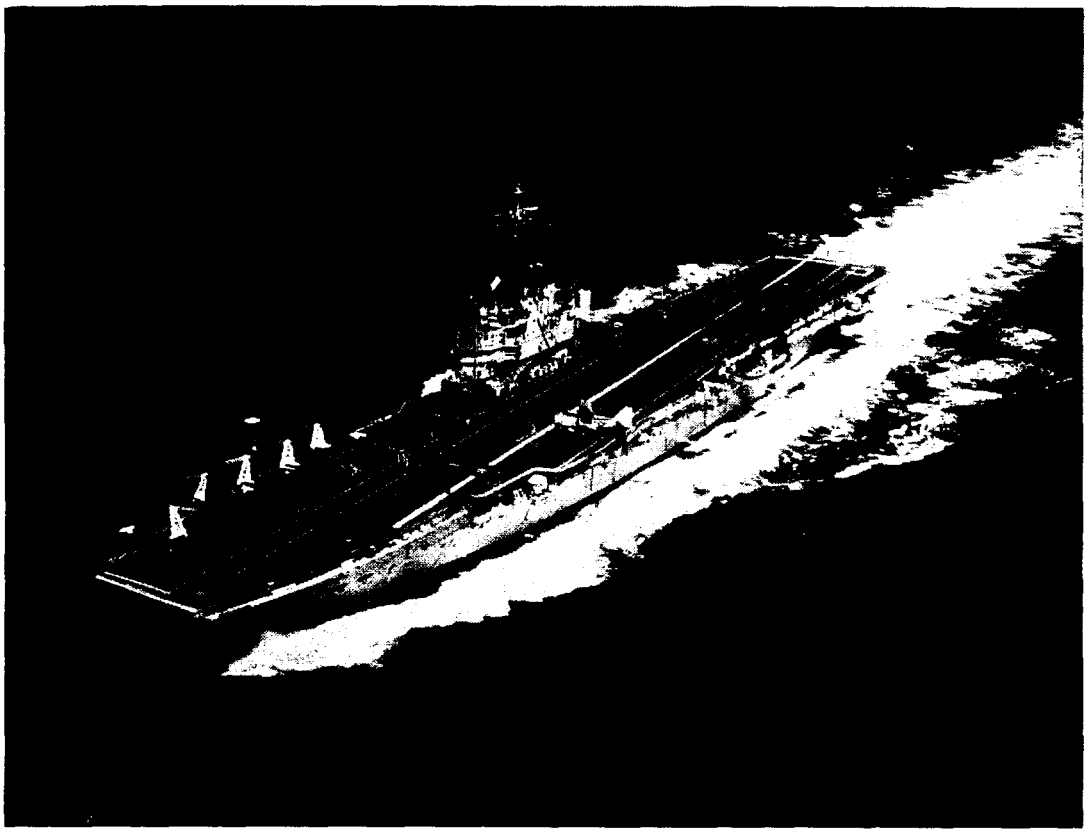


H.M.S. CENTAUR

H.M.S. CENTAUR

1960—1962

BY

COMMANDER S. F. BARTON, A.M.I.MECH.E., M.I.MAR.E.

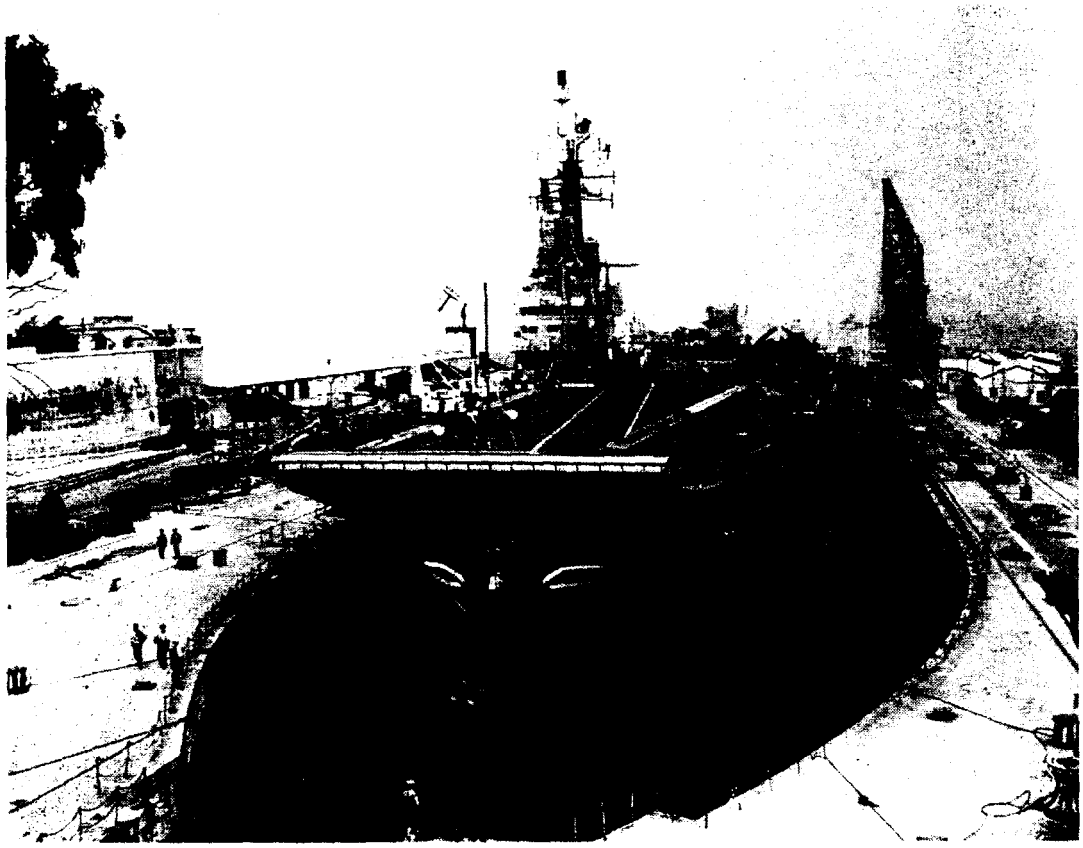
Ships Programme

The high-pressure life of the present commission of H.M.S. *Centaur* is fairly typical for an aircraft carrier, starting off with a very full refit the pace of which increased to the usual final crescendo before completion. Unfortunately after ten days of trials the presence of an overdose of steel shot, used in a dockyard shop for cleaning the hydraulic piping for the arresting gear, made itself felt. This entailed a further stay in the dockyard to clean the system and repair the damage to the arresting gear.

Eventually the work-up period with its anxieties, mistakes and frustrations was behind us, and we were preparing for an official visit to U.S.A. and Canada, when without warning we rushed off to Kuwait.

The period spent at sea in July and August in the Persian Gulf is no recruiting material. Conditions of heat were unpleasant, and, in spite of drinking fantastic quantities of water and eating outrageous numbers of salt tablets, people still collapsed from heat exhaustion.

Eventually the ship with an exhausted engine room crew, arrived at Devonport—not our home Port—for what was called a ' quick docking '. This was to mean scrape and paint the bottom only—no examination or defects



INTERMEDIATE DOCKING—GIBRALTAR

were to be undertaken. Having arrived with certain major defects which required dockyard assistance, noises of distress were made in appropriate quarters until this realistic policy was modified. Once the dockyard was given the authority to take on the work, it was done with a will.

Off to sea again, and after a short spell in the Mediterranean we passed through the Suez Canal for a self-maintenance period in Mombasa. Here again the fates were not with us, as there was an operational requirement to reduce notice for steam and this detracted from the value of the self-maintenance period. On Boxing night there was an urgent recall and we sailed once more in the Kuwait direction. However, the mere threat of *Centaur's* speeding north was this time sufficient to quell the incipient troubles and we turned east to Hong Kong.

The ship's programme now became more regular and the few disruptions of a very minor nature did not prevent us arriving at Portsmouth for leave and self maintenance.

After 'Shopwindow' and various other exercises, we went back to the Mediterranean for docking at Gibraltar. Here the fallacy of not checking underwater clearances, etc., during the Devonport docking was shown up in all its stark reality. Had the rudder clearances been taken in Devonport, it could have been estimated that the pintle bearings of the rudder would require re-bushing in Gibraltar and provision could have been made for a slightly longer docking period. As it was, confirmation of our suspicions was only obtained at Gibraltar and time would not permit rectification of this defect until a later date.

During the 19 months since refit the ship has steamed a distance of 100,000 miles, with steam on main engines for 6,250 hours, giving an average seagoing speed of 16 knots. Three per cent of this time under way has been at 200 r.p.m. or over, i.e. 70 per cent full power and above.

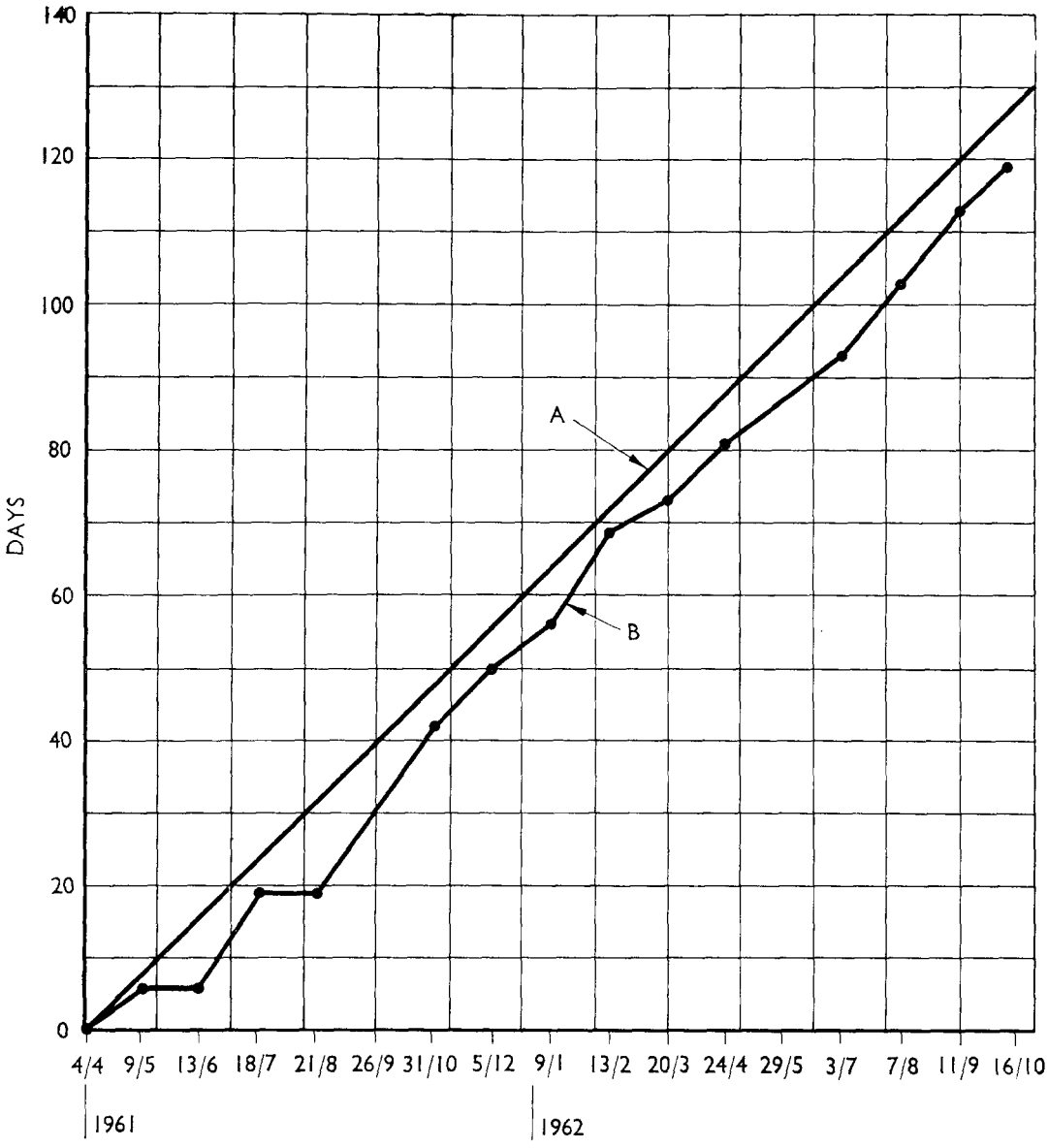


FIG. 1—A—SELF-MAINTENANCE DUE B—ACTUAL NUMBER OF SELF-MAINTENANCE DAYS

Ship Usage/Upkeep

C.A.F.O. 78/62 is of great interest as it gives a fuller picture than its predecessor. From experience during the commission it would appear to be a fairly realistic target, capable of achievement, although quite rightly it sets a fairly arduous task for the Engine-Room Department.

The operational availability of the ship so far this commission up to 30th September, 1962, is 52·1 per cent, comparing favourably with the requirement of 45 per cent. As this figure does not include the work-up period, it is interesting to note that as far as ship availability is concerned this commission, taking into account the work-up period, the figure comes to 63·5 per cent.

Only once during this commission have we actually been called upon to do 30 days continuously at sea, and this was in the Persion Gulf in July/August 1961. Although it was a struggle, it does bear out the maximum continuous usage rate.

The docking frequency has been upheld, and has proved to be a wise insurance, although with so much time under way, (46·6 per cent from 5/4/61 to

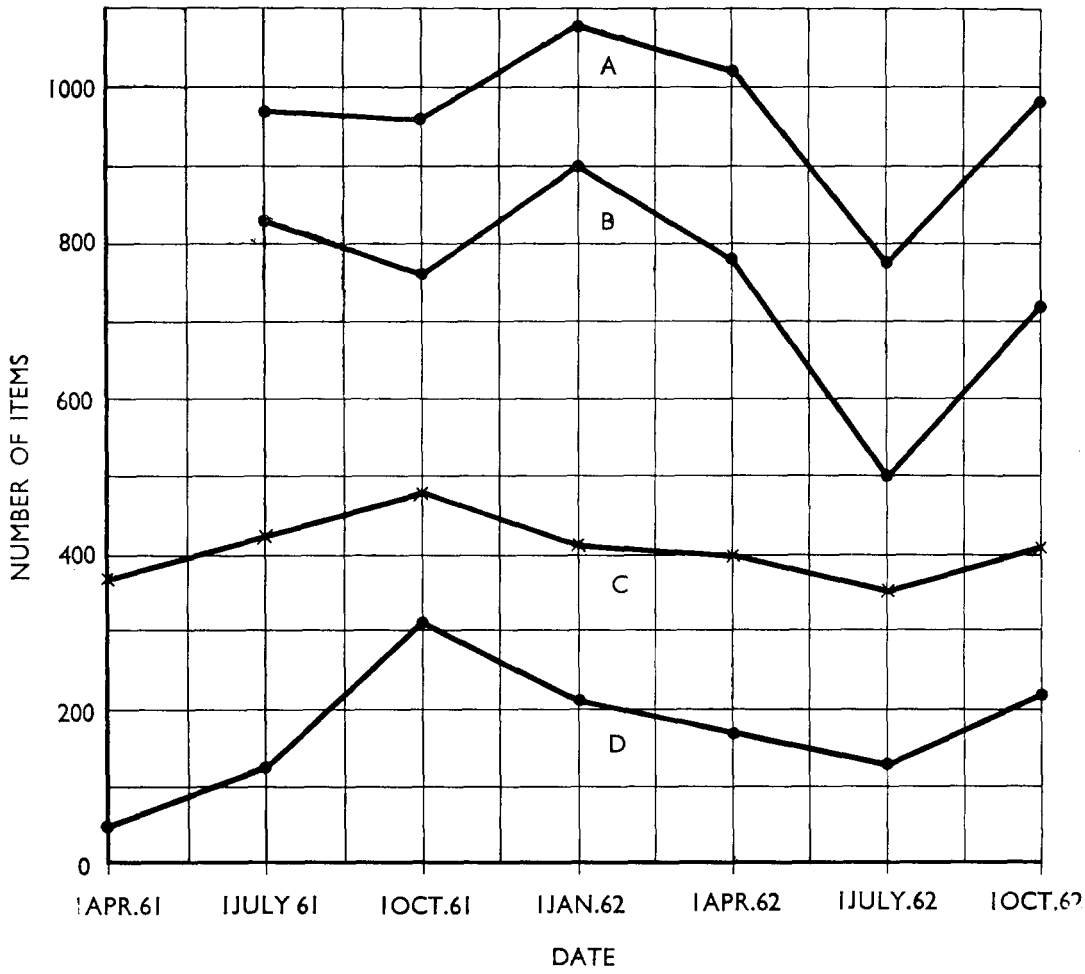


FIG. 2—A—TOTAL NO. OF DEFECTS ARISING DURING PRECEDING QUARTER, PLUS ARREARS
B—TOTAL NO. OF DEFECTS REPAIRED DURING PRECEDING QUARTER
C—PLANNED MAINTENANCE DUE FOR PRECEDING QUARTER, PLUS ARREARS
D—PLANNED MAINTENANCE OUTSTANDING

30/9/62) the bottom compositions on both docking occasions were in good condition and very free of marine growth.

The refit period of 24 months, which it is noted is under review, might well be extended, provided, and only provided, that major items of work are undertaken by H.M. dockyards during docking periods, or extended self-maintenance periods, when leave is given to the ships company. At the present moment such assistance is only given after considerable administrative effort, as no provision appears to be made for ' unprogrammed ships '. If such provision could be made, much administrative labour would be saved, and the refit interval might be extended in many cases. The notable exception to the above occurred during the recent docking in Gibraltar, when an exceptional amount of work was undertaken and completed by that dockyard, with the minimum of ships staff administrative effort.

The maintenance period of eight effective working days in every 35 is a very practical arrangement, unfortunately, as will be seen from FIG. 1, we have never yet achieved out correct figure. This has been due mainly to operational requirements. It is a concrete fact that eight days after 35 days is not satisfactory, as defects tend to grow so much worse if neglected, and if a complete unit cannot be shut down for maintenance, it is frequently impossible to rectify steam leaks which then deteriorate out of all proportion to the extension of time.

Another and perhaps unavoidable hazard of self-maintenance periods is that they usually include public holidays, e.g. Christmas at Mombasa, Chinese New Year in Singapore, Easter in Malta, Whitsun in Portsmouth and August Bank Holiday in Gibraltar.

Planned and Breakdown Maintenance

The curves in FIG. 2 give a running account of the planned maintenance and defect position quarterly. This analysis only considers the number of items, not the amount of work involved in each, consequently its value is limited. It does however give a relative picture and consequently trends can be determined.

Curve ' A ' shows how the defect rate rose in the last quarter of 1961 due to the hard running and low-self-maintenance periods during the Kuwait period, since when the defect rate dropped, until the rise to a more normal level on October 1st 1962. Curve ' B ' follows a similar pattern, keeping a fairly constant lag of 200 unrepaired defects per quarter.

The higher output per man during the bad period in 1961 was due to the fact that in order to keep the ship going, men had to work for much longer hours, with a consequential physical deterioration, combined with some reduction in morale. However these points were most carefully watched and recovery was complete after leave on return to the United Kingdom.

The planned maintenance curves ' C ' and ' D ' show a similar pattern and it might well be argued that the outstanding planned maintenance which achieved its peak on October 1st, 1961, had a large bearing on the peak of defects by January 1st, 1962.

Main Engines

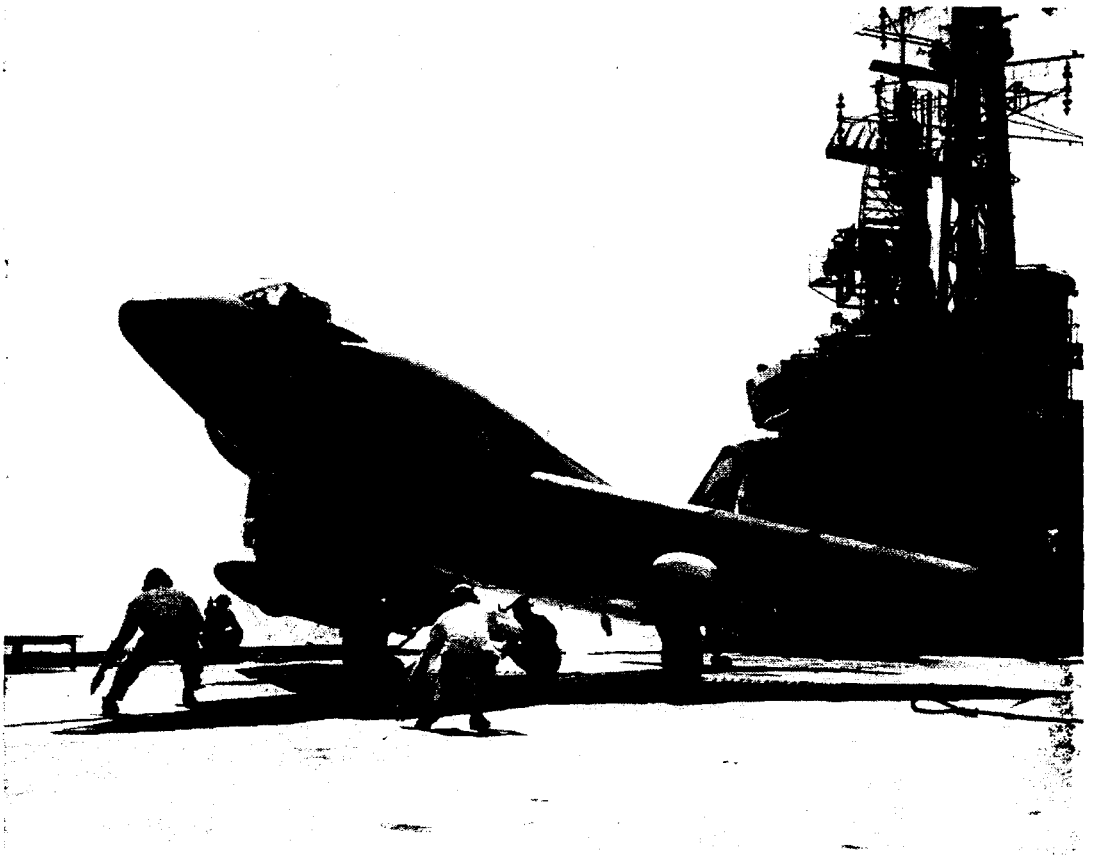
(*a*) The main engines have given very little trouble although the limitations on the L.P. exhaust temperatures when running astern occasionally cause slight anxiety. However, when five minutes' warning is given to the Command there has never been any embarrassment.

(*b*) An Admiralty instruction of March, 1962, stated that these engines should not be run ' ahead ' at less than 80 r.p.m. Before the receipt of this instruction it was found that the ship will steam for long periods at 60 r.p.m. This speed was maintained on 9th and 10th March, 1961, for seven hours with a steady inlet bend temperature of 350 degrees F.

(*c*) The only embarrassing incident was during the work up period, after it has been represented to the Captain that the ship's maximum speed while operating two steam catapults was of the order of 24—25 knots; in order to be kind to the machinery one night, the distance covered being unimportant, the speed called for was 50 r.p.m. The Engineer Officer's embarrassment can be imagined when it had to be reported to the Captain that this speed was too low! This speed had been maintained for three hours, by which time the differential expansion gauges indicated that the axial clearances were being absorbed. The speed was then increased and clearances became normal.

Boilers

Considering the hard treatment they receive the boilers have stood the strain very well, but they usually exceed 1,000 steaming hours before the three-monthly clean is due. Every attempt is made to clean on the 1,000-hour period rather than the three-monthly, as they then become unacceptably dirty. We find that cleaning is more effective with a fully worked-up ships staff using our own resources rather than a T.C.V. which is of course invaluable for tanks and bilges. Two boilers can be cleaned quite effectively in two days, one for preparation and one for washing.



RAISON D'ETRE

Boiler Controls

After a considerable amount of effort by the ships staff, most ably taught and helped by Mr. D. J. Strong, B.Sc., of the Director of Marine Engineering Department, during the work-up period, the automatic control equipment worked fairly satisfactorily. Unfortunately, since then the situation has deteriorated due to lack of time for uninterrupted diagnosis owing to pressure of the more fundamental defects. The situation now is that we are back to hand control.

Boiler Brickwork

The boiler brickwork has stood up remarkably well, all rear walls having steamed over 13,000 hours, the front walls 4,000 hours and the remainder 7,000 hours; quite creditable figures considering the amount of high power steaming, and rapid power fluctuations that are demanded.

Feed Arrangements

Feed arrangements are not entirely satisfactory, due to the low capacity of the harbour service feed pump and lack of a main feed pump discharge cross-connection. An additional auxiliary feed pump in each unit would overcome this deficiency.

Auxiliary Machinery

On the whole the performance of the auxiliary machinery has been satisfactory. Probably the biggest problem is caused by the Cranes mechanical seals on the suction glands of the main and auxiliary feed pumps. When these are working properly they are magnificent but if not fitted properly in the first instance, or if damaged subsequently, the whole pump has to be removed

from its bed, and stripped before a new seal can be fitted. This fitting requires the greatest care and accuracy and some degree of experience, and the success or otherwise of fitting is not known until after the pump is completely assembled. At this stage, if the initial fitting is unsuccessful it requires at least another 72 hours to fit a new seal. It is understood that these problems are known and that they no longer exist in new design. The emergency suction gland taking two turns of packing is a satisfactory substitute for a damaged mechanical seal, and lasts quite well.

Heat Exchangers

The troubles experienced with aluminium brass tubes in heat exchangers are legion and have been fully reported. The tubes of drain coolers and vacuum refrigerator condensers last from 6—12 months and fail from inlet end impingement attack. Occasionally a ' rogue ' Admiralty brass tube is found, and as they are completely indistinguishable from aluminium brass when new, one has little faith when re-tubing with aluminium brass. As a result, and because of the better resistance to impingement attack of cupro nickel, both drain coolers have been re-tubed in this material, ' A ' in April, 1962, and ' B ' in September, 1962. The slightly poorer resistance to steam erosion is known but this is considered to be less of a danger than the sea-water attack. In this connection should be pointed out the great time saving and greater accuracy of testing heat exchangers using the fluorescene dye and ultra violet ray lamp method. Its superiority over any other method of test is complete.

Evaporators

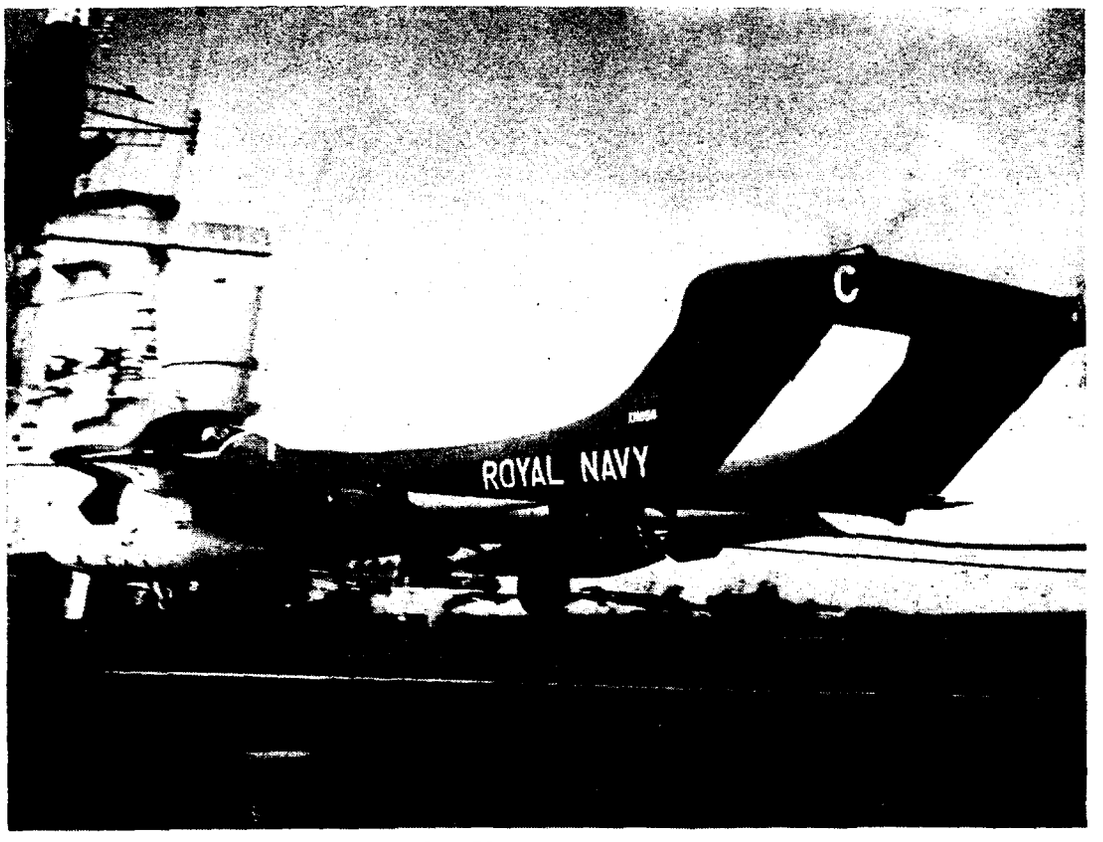
In a ship which has stowage for just under two days' supply of feed water (flying conditions) and only just over one day's supply of fresh water (hot climates) it is easy to see what anxiety is caused if the evaporators are defective. Ferric chloride is a great boon, enabling practically constant running, but in spite of extremely careful attention to the *pH* value of the brine, coils do corrode. However, the fact that since March, 1961, these evaporators have distilled 130,000 tons of water is quite a tribute, but they still have some way to go before refit.

Heel at Flying Stations

(*a*) Because of the heel produced when moving even one Sea Vixen from port to starboard it is necessary to keep a pumping and flooding M.(E) permanently closed up during flying stations. In order that the ship be upright for recoveries, it is frequently necessary to have a list of up to 2—3 degrees during the previous launching sequence. Such anticipation can only be made by the Aircraft Control-Room Officer, consequently he gives the instructions whether to have a list of x degrees or to have the ship upright.

(*b*) The method of operation is to flood a wing W.T.C. If a rapid reversal is required the opposite W.T.C. will be flooded. This situation proceeds until these two tanks are full. The tanks used are 9.M.5. and 6, the 9.J.3. and 4 tanks are kept empty and are only used in emergency should the ' M ' tanks be full and there is an urgent requirement to bring the ship upright in order to recover an aircraft.

(*c*) During this performance the W.T.C.s are pumped out as fast as possible, but our rate is only 60 tons/hour which is insignificant, hence we have to resort to rapid flooding. A more convenient system would be to have a 1,000 ton/hour pump, to pump from one M tank to the other.



SEA VIXEN ARRESTING

Flight Deck Machinery

(*a*) The catapults and arresting gear are generally most satisfactory and so far this commission we have launched 3257 and recovered 3284 aircraft. Mathematicians please note some were free take-offs!

(*b*) The wear in the forward lift is causing some anxiety, such wear could well be avoided if the forward lift were provided with keeps, like the after one.

(*c*) The general hydraulic system is served by two pumps, but as there is inadequate accumulator capacity when the bomb lift is in operation, the rest of the services are liable to become starved. It would be a help if a third pump were provided for the sole use of the bomb lift.

(*d*) The L.P. air system also suffers from marginal capacity. As in many other systems, the uses for L.P. air grow and grow, and we have now just about reached the limit. However, if the Whirlwind helicopters are replaced by Wessex, there will be no need for Avgas and its air driven pumps will no longer be used, thus making a great saving.

Hull

(*a*) It is inevitable that a very heavy call on labour is due to the badly run scupper pipes, soil pipes, etc. The cleaning of these is a nauseating task for the shipwrights, and is most unpleasant for the members of the messes the pipes run through. A few of the blockages are inevitably due to negligence on the part of the user, but all departments make a determined effort to keep such negligence down to a minimum.

(*b*) The flight deck itself is becoming badly corrugated, particularly forward by the catapults, and abaft No. 1. arresting wire. A further disturbing

TEAM WORK

by-product of these corrugations is heavy corrosion of the deck and consequent flaking of the E.C. 1490 paint due to the pools of water which remain for long periods. A large flake of this paint bowled down the deck in a Sea Vixen jet efflux can give a man a nasty cut.

Replenishment at Sea

It makes a most refreshing change to serve in a ship where replenishment at sea is the rule. Fuel replenishment in harbour is unpopular with the Engine Room Department as the supply rate is desperately slow by comparison. Fortunately harbour replenishments are very rare.

Having done 65 liquid and 25 solid replenishments under way so far this commission we are still impressed by the high degree of skill and enthusiasm shown by all departments and R.F.A.s in this important ' team game '.

The average pumping rates from various tankers are as follows:—

	F.F.O.	*AVCAT*	
Tide Austral	800	210	Ton/hour
Olna	600	180	,,
Tidesurge	850	240	,,
Tideflow	875	200	,,

These averages are taken from the higher rates, i.e. when embarking 400 tons F.F.O. and 90 tons Avcat.

Personnel

At the beginning of the commission we were two officers underborne. This imposed a serious extra load on all officers during the difficult work-up stage, which was immediately followed by the gruelling period in July-August 1961 off Kuwait under operational conditions. It was not surprising therefore that the

strain began to tell and as soon as the remaining two officers joined, for the next two months we always had two officers sick. Since we have been up to complement the situation has stabilized and the authorized complement is no more than is required to carry out the task.

A determined effort has been made to give officers the widest possible experience inside the ship and, apart from the Senior Engineer, F.D.E.O. and D.C.E.O. who are appointed as such, all officers have had at least two parts of ship and a change is made between flight deck and main machinery officers. This calls for a greater effort on the part of the Senior Engineer and the F.D.E.O., but it has the obvious advantage in widening the experience and knowledge of the junior officers.

The standard, performance, and degree of leadership shown by the officers is quite pleasing, and the enthusiasm and integrity of the team is most marked and far outweighs any minor criticism.

The S.D. officers straight from the R.N.E.C. fitted in extremely well from the beginning and because of their wide experience as ratings were, and continue to be, towers of strength, whereas the G.L. officers usually require a little time to gain experience.

In the majority of cases the standard of written work leaves something to be desired. The ability to set down a series of technical facts in a logical sequence, and then to draw conclusions, appears to present some difficulty.

During the period under review, four Acting Sub-Lieutenants have obtained their Engine Room Watchkeeping Certificates and, because of the amount of steaming done and the diversity of equipment fitted, an aircraft carrier is the ideal training ground for such officers, although these officers did not have a great deal of experience of keeping watch as E.O.O.W. on their own. Two of these officers spent two months in charge of parts of sections belonging to complement officers and performed these tasks quite competently.

Owing to the shortage of sea billets for Shipwright Sub-Lieutenants, one has been borne extra to complement and has done a short familiarization course in the propulsion machinery department. The administrative change which brought the shipwrights into the Engineering Department has produced no problems, and the Shipwright Officer is regarded as a Subhead of the Department in the same way as the Senior Engineer and the F.D.E.O. and this decentralization works effectively. He still works just as hard at upper deck rabbits!

The artificers, engine room and shipwright, are on the whole, of a high standard. There are of course a few whose main short-coming is a lack of sense of responsibility. In general they work very long hours in unpleasant conditions with a high degree of loyalty and skill.

The younger engine room artificers have been criticized because it is felt by the senior members of the department, particularly C.E.R.A.s and S.D. officers, that their skill of hand is not what it used to be. In spite of ' repair by replacement ' there is still a very large requirement for hand fitting and this will continue for a long time yet.

Although the mixed messing has its advantages in the way artificers mix with other members of the ships company and thereby broaden their experience, it has the following disadvantage. The training of the young E.R.A. suffers because he does not learn from mess discussions on current problems and it is felt that a separate mess for E.R.A.s and mechanicians under training with a C.E.R.A. as President would undoubtedly be of advantage in this respect.

The Engineering Mechanic ratings are increasingly being employed on skilled maintenance work. In particular the enthusiasm and application of the young

M.(E) IIs, who seem to be of a much higher standard than previously, is most impressive.

Although the numbers fluctuate slightly, at present we are underborne by 22 L.M.(E)s, although we are overbourne by three men in a combined total of 249 allowed, (CH.M.(E) to J.M.(E) inclusive.) This shortage of 37 per cent of the L.M.(E)s could be most serious in both technical and disciplinary fields were it not for the very high standard of all hands. Although we get by with this dilution, it is not a situation which should be borne with equanimity.

As a result of the foregoing and prodded by exhortations from other authorities, a considerable effort is expended on training at all stages and it has proved advantageous to make this a full time task (apart from watchkeeping) for one officer. The following shows the number of ratings who have passed for higher rate from 1st January, 1961, to 30th September, 1962 :—

E.R.A. I to C.E.R.A.	3—Charge Certificate
Mechanician I to Chief Mech.	1—Charge Certificate
E.R.A. II to E.R.A. I	14—Unit Certificate
Mechanician II to I	4—Unit Certificate
A/E.R.A. II to E.R.A. II	8—Confirmation
Mechanician III to II	6
E.R.A. III to A/E.R.A. II	4
L.M.(E) to P.O.M.(E)	10
M.(E) 1. to L.M.(E)	19
M.(E) II to M.(E) 1.	48
Obtained Auxiliary Watching Certificate	28

Conclusion

To quote a most profound statement from the maintenance sphere : ' It is essential in time of peace to maintain, and if possible increase the reservoir of availability which was originally built into ships so that it may be drawn upon in emergency when repair and maintaince facilities may be negligible '.

This statement may well be paraphrased in the personnel sphere as follows :—

' It is essential in time of peace to maintain, and if possible increase the reservoir of skill, endurance, and loyalty, inherent in our officers and ratings so that it may be drawn upon in time of stress, when time for recuperation, relaxation and recreation may, for a time, be negligible '.

There are three incompatible elements in the life of an aircraft carrier commission :

(*a*) To operate at sea in order to produce enough time for flying, training and exercises

(*b*) To have enough maintenance periods in order to achieve (*a*) without hindrance due to breakdown

(*c*) To have enough recreational visits to foreign ports in order that the ships company will not become too stale to operate and maintain the ship efficiently.

The past two years has been a most interesting and exhilarating experience, made all the more pleasurable by the loyalty and devoted effort of all officers and ratings, together with the consideration shown by those in all other departments in H.M.S. *Centaur*. This good spirit has enabled the Department to surmount the many difficulties and frustrations caused by material deficiencies and failures. It is for these reasons that I am convinced of the validity of the paraphrase and (*c*) above.