H.M.S. EXMOUTH NEWSLETTER

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BY

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Introduction

The purpose of this article is to bring readers up to date with what has been happening to *Exmouth* since the time of Commander G. F. Laslett's Newsletter of May 1971 (Vol. 20, No. 1). At that time, the ship was completing her first refit since conversion in 1968 before being deployed as a normal operational ship in the Portland Squadron.

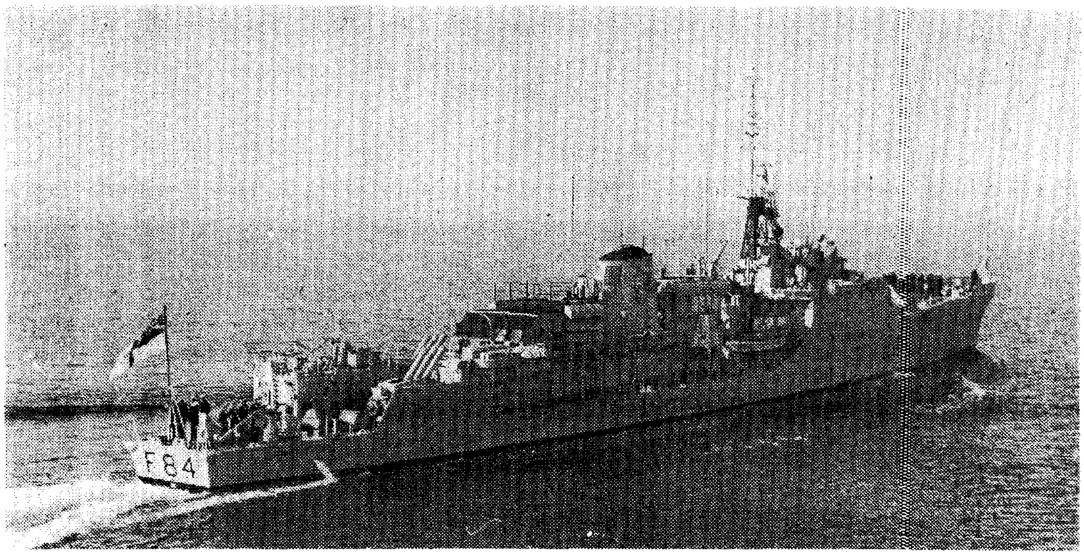

FIG. 1—H.M.S. 'EXMOUTH'

Gas Generator Life

*Provided a blade is not shed in the next hundred hours, the Olympus gas generator will have achieved 3000 hours for the first time afloat. The previous best was 2132 hours by *Exmouth* in June 1970 at which time a second row L.P. compressor blade failed due to corrosion fatigue. These compressor blades have now been changed to shot-peened and polished FV 520 blading. The fitting of Mark 1 Peerless spray eliminators, water washing and WD40 preservation every time the gas generator is shut down for more than four hours has contributed to increased engine life.

As a precautionary measure during the 1972 DED, the gas generator after 1978 hours was subjected to 'heavy' field maintenance by Rolls-Royce engineers; they used a dummy combustion casing to facilitate the replacement of all eight combustion chambers and burners where a number of cracks in the flare attachments and anti-smoke control rings were apparent. A new first-stage row of L.P. compressor stator blades were fitted, the affected areas of corrosion being too deep to be polished out; polishing was, however, effective on the remaining rows of stator blades, and these were subsequently coated with Rockhard lacquer to improve corrosion resistance.

Bridge Control

The philosophy of how the command should operate the ship has taken a radical change with the continuous use of direct bridge control of main engine and steering. The Director of Naval Equipment was a pioneer of this concept and sponsored various additions to *Exmouth's* bridge for a seated OOW. Already fitted were the main-engine throttle lever and auto-pilot electric steering and with the addition of a nine-inch radar PPI, portable chart-table and by resiting the overhead pelorus 18 inches, the OOW is approaching a control system similar to an aircraft.

Some MEOs might be reticent to allow a seaman officer to handle his machinery; he need have no fears, however, for this is one of the great advantages of gas turbine propulsion: programmed control is fool-proof. Why waste time on

*See Note at the end of the previous article.

passing orders through the coxswain when remote control can achieve rapid results without ill effects. Other advantages not originally foreseen are:

(*a*) Higher day speeds can be achieved in rough weather as the OOW can drive the ship between waves.

(*b*) A higher standard of station keeping is possible with complete ease under adverse weather conditions for replenishment at sea.

(*c*) A further saving in seaman and engine-room manpower, namely: quartermaster, telegraphsman, and throttle watchkeeper.

Main Gearing and SSS Clutches

When the locking sleeve of the Olympus SSS clutch seized due to fretting at the input-end collar after approximately 4000 hours service, the ship continued to operate with no limitations for five months with a solid primary transmission; clutches are now being modified with an extra oil-way to prevent a recurrence. Both Proteus were used with no ill effects to the Olympus gas generator turning under windage generated by the power turbine.

There still remains a weakness in the gearing primary input line necessitating renewal of numbers 1, 2 and 3 bearing shells after about 1250 hours. A study by ship's staff using an IRD analyser showed varying magnitudes of vibration depending on whether the Olympus SSS clutch was in a good or bad position. This is immediately apparent by looking at the bearing pressure-gauge panel, the needles of which are steady or vibrate depending on the position selected.

Magnitudes of vibration at full power (5660 r.p.m.) vary about the limit of 0·26 in./sec RMS value. In July 1971 at the instigation of the MOD, Y-ARD investigated this problem using extra transducers mounted on the primary bearings.

The ship is currently being fitted with the depot spare clutch which had been modified to restrict the movement of the locking sleeve so that the lock did not engage. The provision for 'locking in' has now been re-instated and the clutch will operate in service as a lockable model. In an attempt to improve possible out-of-balance vibration effects, the clutch has been stripped and reassembled by the manufacturer after using a new production operation of grinding the clutch teeth to the simulated torque condition.

Torque Tube

The problem of high oil temperatures of 300°F inside the torque tube has been solved by modifying the ventilation trunking to cool the outside surface. Maximum torque-tube oil temperatures can now be held at 210°F. Unfortunately the space between No. 1 bearing and the input flange is insufficient to fit an oil thrower ring, which technically would be a better solution to the problem. Various oil baffles and drainage sumps have failed to provide an alternative solution.

CPP System

This system has been very reliable. During the 1972 DED, the commercial CP propeller blades were fitted and set up to give zero thrust at:

0° blade angle at the propeller hub,

0° at the oil distribution box,

Zero power pitch control lever setting,

thus making the setting up of the control system both simple and logical; this had not been the case previously.

The flexible H.P. oil pipes continue to fail regularly at the flange radii because their restraints are insufficient to prevent excessive expansions when subjected to shock loads. Their replacement in the confined space makes it a tiresome task; in one case obstructing pipes have to be removed before the work can be done.

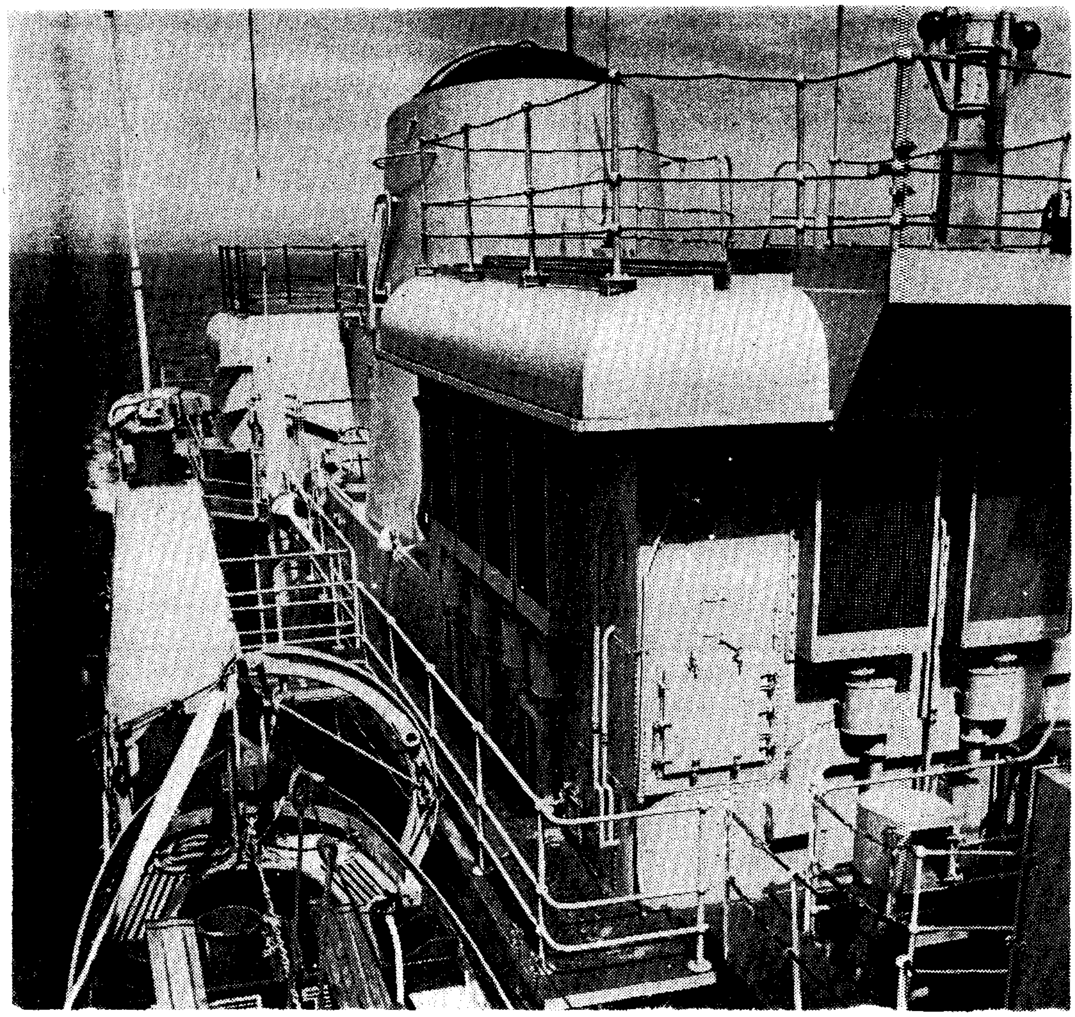

FIG. 2—OLYMPUS AND CENTRAX INTAKES AFTER FITTING WITH PEERLESS MK 1 SPRAY ELIMINATORS

Intakes

The fitting recently of the Mark 1 Peerless spray eliminators was the fourth attempt to solve the problem of salt spray entering the Olympus gas generator. It is most pleasing to report that, besides its neater appearance, it has been the most significant breakthrough achieved to date. The separation when subjected to direct attack with a firemain hose is 99 per cent effective; this was further proved when *Exmouth* ran for nine days in a November North Atlantic Opeval under continuous gale force conditions without loss of power and without compressor cleaning.

The original monel wire knitmesh filters have now been replaced by polypropylene filters; at the moment there is no intention to fit a Mark 2 Peerless in series, the present ultimate in gas generator protection. There is a penalty in that the original full power intake depression has increased from 5·5 to 10·0 inches watergauge at full power.

Generators

The Centrax 500 kVA gas turbo alternator has continued to give trouble, particularly with the governing arrangements, and has been changed twice; a job not to be tackled lightly, requiring the upper deck to be cut while the ship is supported in dry dock for a month. Siting of the HSDE electronic control system in an area of high ambient temperature has been contributory to failures. Although nothing to do with the COGOG propulsion, this has given the ship a poor name for availability.

Fortunately the Diesel generators have been nearly 100 per cent reliable after the cooling water problems were solved by resiting the header tanks behind the funnel. In fact, the Staff have been unruffled by a total electrical failure in a Force 9 gale; the remote starting of the Diesels from the MCR in 45 seconds has restored power to the steering gear before the ship has been noticeably off course. Propulsion and propulsion control is independent of power supplies.

Gas Turbine Exhaust Lagging

In the 1971 refit, the dockyard made an excellent lagging job of the Proteus exhaust bellows lagging pads. It was therefore a little disconcerting when increasing to full power for the first time to see flames dancing on the pad pieces as if they had been saturated with methylated spirits. The explanation was that the asbestos has been replaced by fibreglass cloth, the resin in which material ignites at about 500°C. The ship is now evaluating some pad pieces supplied by Gloster Saro Limited made from Kerlane, a ceramic fibre of French manufacture suitable for temperatures up to 1260°C. As it is six times as costly, underblanket pad pieces only were fitted.

Gervase Flowmeter

A digital readout head has been recently sited on the Olympus section of the MCR console. It is a very sensitive instrument instantaneously recording fuel flow rate in gallons per hour and showing any hunts and variations in power setting and, by interpretation, giving a direct reading of s.h.p. Its accuracy is now within half a per cent when above 50 per cent power. It is significant to say that as a MEO of a gas turbine ship I would feel lost without it.

Data Recording

This is covered by a separate article by *Exmouth's* AMEO published in this issue of the *Journal*. When in bridge control, there is no means of recording engine movements in the traditional 'Record of Working of Main Engines'. However, data recording provides a taped record of the bridge power pitch control lever air signals and with other engine and CP propeller parameters, there is a complete record. In addition, there is a paper trace of the steered course and rudder movements which, with data recording, provides a complete 'black box' narrative if required.

Personnel

The enthusiasm and pride in the 'Oly' and COGOG propulsion shown by all engine-room ratings promises well for the future. Visitors have noted the knowledge and interest displayed by the ship's staff. Four Fleet Board charge certificate successes last year—two with 'VGs'—out of five MEA(P)s/mechanicians in the complement indicates the quality of the ratings.

I do feel that the non-GEC POMEMs need some record of achievement; they exercise full control of the plant while the MEA(P)s/mechanicians do shift engineer. Page 4 of the history sheet of one particularly competent POMEM has been anotated 'Exmouth G/T Unit Ticket'; it is felt that there is a need to award some official recognition to these ratings in place of a boiler-room certificate.

Conclusion

Exmouth will continue to serve a useful purpose for some years in pathfinding the new era of marinized aero gas turbine propulsion. The Type 14 frigate remains a comparatively cheap ship to run and, with her steam-driven sister ships, provides the operators with a direct comparison. The Squadron Marine Engineer Officer endorses the statement that Exmouth is more reliable and gives less heart-ache than the traditional steam versions of the Class.