AIR CONDITIONING IN H.M. SHIPS.

As a result of numerous requests from ships for air conditioning of living spaces to alleviate the conditions brought about by the necessity for keeping doors, hatches and ventilation in a high state of readiness, a full investigation has been made.

The following assumptions (based on as much evidence as was available) were made:—

Average outside (shade) conditions at sea	88° F.D.B. 80° F.W.B.
Internal conditions required for reasonable comfort	85° F.D.B. 71° F.W.B. (corresponding to an Effective Temperature of 78° F.).
Minimum fresh air requirement ..	10 cu. ft. per minute per man.
Average temperature of spaces adjoining air conditioned compartments	15° F. above atmospheric dry bulb.

Solar radiation on exposed surfaces equivalent to a rise of 30° F. above atmospheric (shade) temperature.

Lagging of internal surfaces could only be supplied to a very limited extent in existing ships since the amount of top weight which can be accepted is limited.

Applying the above assumptions to a mess space with 50 occupants the heat load involved might be expected to be of the following order:—

(1) Personnel load (sensible and latent heat)	23,000	B.T.U's per hour.
(2) Fresh air load (reducing 10 cu. ft./minute/man from 88° F.D.B. 80° F.W.B. to 85° F.D.B. 71° F.W.B.	19,500	,,
(3) Transmission through boundaries ..	40,000	,,
(4) Solar radiation	10,500	,,
(5) Fans, lighting, etc.	5,000	,,
Total	98,000	B.T.U's per hour.

This total may be somewhat reduced if we assume that for 1 and 2 above, only two-thirds of the personnel are likely to be in the space at any one time. The new total load would then be 84,000 B.T.U's per hour.

Space Requirements:—Using the figure of 84,000 B.T.U's per hour for a mess space of 50 occupants the approximate electrical load necessary to drive the cooling machinery would be 6½ Kilowatts, the additional weight of cooling machinery, air coolers, trunks, etc., would be about 1¼ tons, and cooling water for the machine would be required at a rate of about 5 tons per hour. In addition about 100 cubic feet of space would be required in or near the space to be cooled to accommodate the necessary machinery.

For existing ships the above considerations make the general application of air conditioning of living spaces impossible except possibly at a major refit.

It is sometimes stated that even if it is not possible to fit full air conditioning to spaces a smaller amount would go a long way towards improving conditions. The internal sources of heat given above must, however, be neutralised before

any improvement can be achieved and unless a cooling capacity amounting to about two-thirds of that proposed for full conditioning is available, there will be a build up of heat giving rise to temperature above that of the outside air. It can be seen, therefore, that full use of the ventilation arrangements fitted will give more benefit than an under-sized cooling plant.

Portable Units:—As an immediate remedy for existing ships it has been decided to supply a number of portable air conditioning plants with separate evaporator air cooler and fan for fitting to certain compartments vital to the action organisation of the ship where shut down conditions are likely to affect the efficiency of the personnel. These compartments include action information centre, fighter direction rooms, damage control headquarters, secondary D.C.H.Q. transmitting stations, wireless and radar offices low down in the ship, H.A.C.P's, telephone exchanges, primary steering position, and switchboard room. Sick bays are also to be air conditioned where reasonable conditions of habitability are not otherwise practicable.

In new construction, consideration is being given to the provision of large centralised cooling plants of either the compressor or steam jet type for cooling all the above compartments and the worst placed living spaces.