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CONTENTS

TO BE DESTROYED WHEN SUFFICIENTLY PROMULGATED - CERTIFICATE OF DESTRUCTION BEING FORWARDED TO A.S.E.

EDITORIAL

It is believed that sea-going officers feel an understandable reluctance in sending in reports telling of their experiences with, and expressing their opinions of, the radio equipment with which they are provided. It may seem to them that such reports just disappear, are ignored, or are even regarded as a nuisance by the recipients. At any rate it may seem that, as they appear to have no discernable effect upon the future course of events, the labour put into the writing of them is so much wasted effort.

To those who feel in this way it may be said at once that they are very wrong - all reports which reach A.S.E. are circulated to the responsible application and scientific staffs. Experiences are assessed and, if practicable, improving action is taken; recommendations are studied and, if universally applicable, are adopted.

It is the non-adoption of recommendations which is probably the chief cause of the noticeable reticence on the part of potential "reporters". To those on the spot an idea may appear advantageous, logical, even brilliant. Frequently in such cases A.S.E. agrees, but when the idea is weighed against A.S.E's development programme, other improvements - in terms of man-hours and materials - and other projects delayed, it may not be advantageous to exploit it. The point is, however, that the recommendation is weighed and even if not exploited, it leaves its mark on the trend of future equipment policy. This aspect alone makes the suggestion worth while.

A noteable example of reports which have had a useful effect upon decisions concerning new applications, is the recent series from H.M.S. VICTORIOUS, extracts from which, have appeared in the Bulletin from time to time.

Apropos " on the spot bright ideas" it is safe to say that no wartime sea-going "users" have shown more initiative nor produced more orginal ideas having operational significance than those staffs which are responsible for "radio" equipment.

We feel that such initiative has in the past too often lacked recognition and this we regret, since the importance of local initiative cannot be over-emphasised. Thus every care will be taken in future to see that particularly meritorious achievements in the realms of initiative and inventiveness will be brought to Admiralty notice. Needless to say these remarks should not be taken as intimation that A.S.E. can give its blessing to every "bright" idea which comes along nor that it should encourage continual modifications to the design or function of proved standard apparatus. Nevertheless it is A.S.E's aim that justice shall be done, and that progress shall be maintained.

RADAR LONG COURSE EXAMS

Time marches on, and the passage of time means inevitable change. We took our Radar Course at a time when instructors were at a premium and the curriculum included an appreciable amount of "private study". We feel that other "old timers" will be interested in comparing the modern course with the course of their day. Accordingly we append extracts from a modern examination paper which has been supplied by the staff of C.R.T.

"At present there are four main exams in the long radar course, which occur at the end of the various sections of the course. These sections are:-

1. Basic Radar.
2. Warning Sets.
3. Gunnery Sets.
4. Operational.

(There are other sections of the course, which are not considered here). Radar officers (and others), who have been far away from the world of exams for some time, may be amused to test their knowledge on the following extracts from exams set in the last few months. No prizes are offered for correct solutions!

BASIC RADAR.

1. Write notes on the following:

(a) Standing Waves.
(b) "Y-match" to dipole.
(c) Miller effect.
(d) Grounded-grid triode.
(e) Receiver paralysis.

2. What are the factors governing the pulse length of a radar transmission?

Various pulses are used in radar, but they are all interrelated. Illustrate this statement by means of a "family tree" of pulses, and indicate the origin of each type of pulse.

3. "The study of waveguides and transmission lines involves the same principles". Discuss this statement critically.

4. Radar receivers are designed to have:-

(a) Good signal/noise ratio.
(b) Wide bandwidth.
(c) Video amplifier with a response curve. flat from 50 c/s to 2 Mc/s.

Why are these requirements necessary, and how are they satisfied?

5. (1) How is the Miller Effect utilised as a means of producing a Time Base?

(2) Explain carefully the reason for the high degree of linearity in the Miller Time Base.

(3) Discuss, from the practical aspect, the different methods of triggering such a circuit.

GUNNERY SETS.

1. Tabulate the advantages and disadvantages of beam-switching applied to Type 282/3/4/5.

Describe the Line Unit, Adjustable, and show how beam switching is effected.

On what does the angle of switch depend?

2. Explain how the combination of a potentiometer and goniometer can produce an accurate electronic cursor, suitable for use in gunnery ranging panels. Briefly compare the arrangements used in Panels L.17 and L.24.

3. You join a ship having Type 285 P4 and Type 284 P4 in the same office. The performance of Type 284 is disappointing as the maximum range is less than Type 285 on the same target. Monitoring pulses at the Type 284 transmitter appear to be correct. What tests would you apply to trace the cause of the trouble?

4. (a) Explain the function and use of the L/F and R/F Phase Controls in G.41.

(b) Give a circuit diagram of a typical picture amplifier, which might be used in the ranging panels of Type 282/3/4/5. Include a gain control. (An exact circuit diagram from one particular panel is not called for).

(c) Tabulate the main advantages and disadvantages of spark modulation as used in Type 274 over thyratron modulation as used in say, Type 276.

HISTORICAL NOTE

The following interesting historical note has been received from Commander Delafield (Radar Liaison Officer, H.M.S. Excellent). He says:-

"You are on historic ground:-

'At "Tythe Hill", on the further side of Haslemere, the
'Quennels made gunns and shott for the supply of His
'Majesty's stores during the Civil War (of Cromwell's Day).

See p.171 of "Rural Life in Hampshire" by W.W. Capes- Macmillan 1901. The passage occurs in a section dealing with Sussex and Hampshire Ironworks.

The iron industry was strong locally. Look at your place names.

"Shottermill"
"Hammer"

Waggoners Wells is also a Hammer pond".

(Editor's Note:- We feel constrained to point out that His Majesty Lost that war, but then of course, he was unable to enlist the aid of A.S.E.).

RADIO IN NEW GUINEA

The following notes on tropical conditions in the New Guinea area and ways of preventing deterioration of Radio equipment have been received from the Australian Government.

CLIMATE.

"The climatic conditions to be encountered in the New Guinea area are characterised by moderate to hot temperatures, high humidity, daily condensation and heavy rainfall.

The average relative humidity (in %) at various times of the day at Milne Bay are:-

	0300	0600	0800	1200	1500	1800	2100
April	94	96	88	85	81	84	94
May	85	96	89	86	83	87	93

The annual average rainfall in the same area is 120 inches and it rains on 250 out of the 365 days.

DETERIORATION OF RADIO EQUIPMENT.

The four main causes of deterioration are:-

(a) Direct rainfall. (b) Humidity.
(c) Mould growth. (d) Corrosion.

The deterioration is manifested in these ways:-

(a) Absorption of moisture in the body of the insulation causing insulation, leakage, warping or deterioration of the insulating material or change in the electrical constants of circuits using the insulation as a dielectric.
(b) Absorption of moisture on the surface of the insulator, causing surface leakage.
(c) Condensation of water on the surface of the insulation.
(d) Penetration of moisture through crevices or pinholes in the insulation.
(e) Mould growth.
(f) Corrosion of metal parts.

Surface condensation varies greatly. For instance it will not occur on clean paraffin wax even in a highly saturated atmosphere, whereas ebonite in sunlight may form a film of moisture even if relative humidity is 80% or lower.

Any type of mould growth acts as an agent for the condensation of further moisture. Moulds grow on all types of cellulose fibres, waxes, oils and plastics.

PREVENTION OF DETERIORATION.

(a) Improved packing.
(b) Better storage.
(c) Drier operating conditions.
(d) Adequate "tropic-proofing".
(e) Choice of most suitable insulating materials.
(f) Moisture proofing of individual components.
(g) Prevention of corrosion on metal parts.

(a) Deterioration due to bad packing.

(i) The use of cases that will not stand rough handling.
(ii) Absence of and damage to waterproof lining for cases.
(iii) Use of cushioning material which is not sufficiently dry and which is often in direct contact with components.
(iv) Lack of rust preventative coatings on metal parts.

(b) Better Storage - Requirements Ashore.

(i) Sound top cover.
(ii) Good ventilation.
(iii) Efficient drainage.
(iv) High dunnage.

Requirements ashore or at sea:-

(i) Spare parts in hermetically sealed containers.
(ii) Installation of heater cupboards.
(iii) Use of de-hydrating agents (silica-gel).

(c) Drier operating conditions.

(i) By raising the temperature of the equipment.
  (a) With heater units or lamps.
  (b) Running valve filaments with H.T. off.
(ii) Air conditioning the cabin.
(iii) Sealing units with desiccators enclosed.
(iv) Regular maintenance in cleaning and drying insulation."

RADIO IN THE TROPICS

The following are extracts from a letter received from The Director of Signal and Communications, Royal Australian Navy.

The establishment of the Naval W/T Station, Madang (VKM) in August, 1944.

"When work commenced, with all hands in, the site was utterly overgrown with Kurnai grass as much as 7 feet tall, hundreds of coconut trees with the leaves shot off by "strafing" from Allied aircraft, literally dozens of unexploded 12 pounder and 2 inch mortar shells lying around all over the place.....no water wells - in fact an unutterable wilderness. However, off we went with the installation of the W/T equipment, hacking and hewing cleared spaces, first for the prefabricated hut as the Transmitting Station, and then for the 60 X 20 foot hut as Central Receiving Station and Code, Cypher Office. Everybody dug out extraordinarily well and within 5 days we had VKM on the air.....

There were never ending hold ups ..... the remote control leads were first "bulldozed" into oblivion and, having been re-run were burned to cinders by the Army who were clearing Kurnai by fire for an A.A. site ..... Then, two 14-foot pythons were killed less than 100 yards from the C.R.S. and the "boongs" (natives) had a tremendous feast".

(From Lieutenant (C) on staff of N.O.I.C. New Guinea).

Conditions at Madang W/T, September, 1944.

"A minor, and in some degree humorous, cause for complaint is the fact that three lowly forms of local fauna have put us off the air a few times. In the middle of transmitting a message (on 10th September), one of the operators found his keying line dead. Hearing a scuffle on the cement floor at his feet, he looked down and found a large-sized crab with the lead-cased cable neatly nipped between his claws. The rats chew through our D.8 telephone cable; and small lizards perch themselves across fixed condensers - They go up, and so do the condensers."

(From Port W/T Officer, Madang).

RADAR FOR COMBINED OPERATIONS

At this stage of the war, when Assault Landings on Enemy Coastlines are taking place at almost monthly intervals, something should be said about the part played by Radar in Combined Operations.

In this peculiar fleet of Landing Craft, several specially developed types of Radar Equipment are used. For those with no experience in Combined Operations Radar, a short description of this equipment might be interesting.

Featuring amongst the more widely used of these sets is Type 970. This equipment is fitted in all L.C.T.(R) and L.C.H. and in many M.L's which in the past have been attached to Combined Operations. It is a W.S. Set which has been developed from Airborne Radio Equipment. It has a 5" local and remote P.P.I. presentation and a $2\frac{1}{2}$" monitor "A" Scan. Ranges are 0 - $3\frac{1}{2}$; 0 - 7; and 0 - 25 miles. Ranging is done directly on the P.P.I. by an adjustable Strobe circle to an accuracy of $\pm$ 50 yards on the $3\frac{1}{2}$ and 7 mile Ranges and $\pm$ 200 yards on the 25 mile Range. Beam width is 8° in azimuth. Bearing Accuracy is $\pm$ 2°.

Typical results against surface Targets for an Aerial Height of 30 ft. (average operational height in Combined Operations) are :-

	Reliable Yds.	Maximum Yds.
Cliffs over 500 ft.	40,000	50,000
Cliffs over 100 ft.	30,000	35,000
Cliffs at 20 ft.	8,000	9,000
Land at 100 ft. slightly sloping	21,000	25,000
Land at 10 ft. slightly sloping	5,000	7,000
Merchant Ship (5,000 tons)	16,000	20,000
Destroyer	14,000	16,000
M.L. or L.C.T.	6,000	7,500
Buoy	2,000	3,000

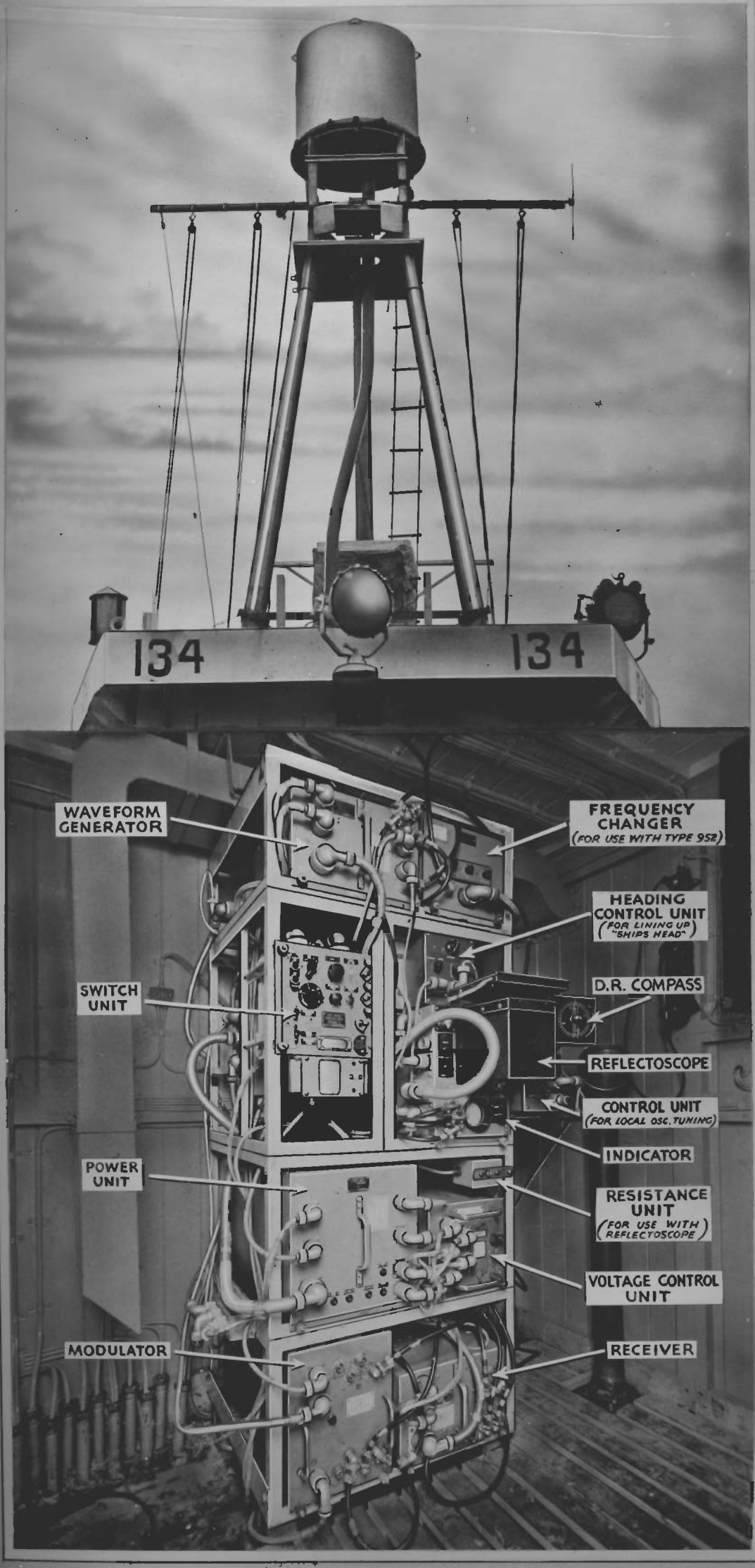
Minimum range is 250 yards. The aerial is rotated continuously at 60 r.p.m. Peak Transmitter Power is 50 kW., with a pulse length of 1 microsecond.

All the main units of this set are modified Air Ministry Units, fitted in a standard Admiralty Pattern Frame. An Admiralty Pattern Scanner with common aerial working for transmission and reception has been produced, and this is mounted in a Perspex Dome, usually on a lattice or tripod mast.

Power Supply Outfit DUR produces power at 80 volts 2000 cycles and 24 volts D.C. to run the set.

When fitted in L.C.T.(R), Type 970 is used for ranging on enemy coastlines to control Rocket Bombardment. Results have been very satisfactory and accurate.

When fitted in M.L's attached to Assault Forces, Type 970 is used on passage as a Navigational Aid and W.S. set. During Assault, one M.L. is attached to each Flotilla of L.C.T. carrying S.P. Artillery. Radar Ranges and Fixing assist the S.P. Artillery in shore bombardment during the approach and prior to disembarkation. These M.L's will ultimately be superseded by L.C.H's fitted with Type 970.


134
134
WAVEFORM GENERATOR
FREQUENCY CHANGER (FOR USE WITH TYPE 952)
HEADING CONTROL UNIT (FOR LINING UP "SHIPS HEAD")
SWITCH UNIT
D.R. COMPASS
REFLECTOSCOPE
CONTROL UNIT (FOR LOCAL OSC. TUNING)
INDICATOR
POWER UNIT
RESISTANCE UNIT (FOR USE WITH REFLECTOSCOPE)
VOLTAGE CONTROL UNIT
MODULATOR
RECEIVER

A system of Predictions has been developed for use with Type 970. These predictions are in the form of Transparencies, and, when fitted in a Reflectoscope attachment to the P.P.I., produce on the C.R.T. an image of the particular piece of coastline for which the prediction has been made. This image shows echoes which may be expected to appear on the P.P.I. and also intended tracks. By comparison of this predicted P.P.I. picture with the actual Radar picture on the P.P.I. the Radar operator is given great help in recognising his P.P.I. picture. By observation of the position of the P.P.I. control spot relative to intended track marked on the prediction an instant estimate of crafts position is possible. In addition an accurate fix may be obtained by ranging on suitable points shown on the prediction and corresponding points marked on the chart. By this system the craft may be brought into the desired position quite blind with an accuracy of about 100 to 200 yards. This system is of great assistance in L.C.T.(R), where the prediction can be prepared for the actual position at which Rockets are to be released. Without the aid of such a prediction the Radar operator might experience considerable difficulty in interpreting his picture, particularly if the coastline were low, gently sloping, and featureless.

Production of Modified Air Ministry Units by which Type 970 is to be retrospectively modified to Type 971, has recently commenced. Modification involves replacement of the present Transmitter-Receiver, Receiver and Scanner, together with the introduction of further minor pieces of equipment.

When so modified, Type 971 functions on a higher frequency. Although Range of the equipment is not greatly improved, the modification gives all the advantages of higher frequency working. Chief among these are improved presentation and a reduction of beam-width from 8° to $2\frac{1}{2}$°. The presentation of coastlines is greatly improved by the reduction of Beam-width. Minimum Range has once again been reduced. An echo which was previously lost in the Groundwave at 200 yards can now be followed until it has closed to 100 yards. This latter is a definite advantage when navigating in company with many flotillas of small craft, or in confined waters.

It would not be much use bombarding and otherwise "softening up" the Assault beach, if the L.C.A's, L.C.T's, etc. carrying assault troops were unable to identify this beach and put their troops ashore in the right place. Many precautions are taken to ensure that such a situation does not occur, and Radar features largely among them.

All White Ensign L.S.I. and certain Red Ensign L.S.I. - the troopships which take the assault troops to the Lowering Point off-shore - are Radar fitted. Usual installation is Type 271P or 271Q, Type 291 and Outfit QH. Unless Radar Silence is enforced on passage, full use is made of the sets for station keeping, air and surface warning. QH a very useful Navigational Aid in waters around the United Kingdom, is used in conjunction with Radar and all other types of navigation, to bring the L.S.I. to the predetermined lowering position for L.C.A. From here the L.C.A. make their own way to the correct section of the beach. This is never an easy task for a small, heavily laden flat-bottomed craft. The distance may be anything up to 10 miles, and, with mines and underwater obstructions, wind and tide, it may be very difficult to identify the low featureless coast-line - particularly if it is partly obscured by smoke or early morning mists. Here, then, is a job for the L.C.N., a very small craft fitted with all possible Navigational Aids which directs the Assault Craft in to the beaches. L.C.N's are fitted with QH, Echo Sounders, etc. and are now being fitted with U.S. Radar Type SO13.

S013 is an equipment designed for fitting in small ships. The transmitter is situated at the base of a collapsible tripod mast. Power at 115 volts 400 cycles is obtained from a 24 - 30 volt D.C. Motor Alternator, and resolved into a 50 kW. (peak power) 1 micro-second pulse at a recurrence frequency of 400 c.p.s. P.P.I. presentation is used. Bearing accuracy is $\pm 3^{\circ}$. Range scales used are 0 - 4, 0 - 20, 0 - 80 miles. Range accuracy is $\pm$ 200 yards.

Typical performances for an aerial height of 15 ft. are :-

Cliffs 400 ft. to 500 ft.	20 - 30 miles.
Cliffs 100 ft.	12 - 15 miles.
Cliffs 20 ft.	6 - 7 miles.
Land, slightly sloping, 100 ft.	10 miles.
Land, slightly sloping, 10 ft.	4,500 yards.
Merchant ship 5,000 tons.	15,000 yards.
Destroyer.	10,000 yards.
L.C.T. or M.L.	4,500 yards.
Buoy.	2,000 yards.

This large fleet of Landing Ships and Craft is directed from the Force Headquarters Ship (L.S.H.) Each Force is sub-divided into two or more Assault Groups, each with its Assault Group Headquarters ship.

The Force Headquarters ship is usually a converted merchant ship, fitted with Operation Room and Filter Room. Radar fitted is Type 273 or 277 and Type 291. From this ship the movements of the entire Naval Assault Force are controlled, after sailing, by the Force Naval Staff. R.A.F. Staff aboard the L.S.H. control the Radar Plot and Filter Room. Army staff also use the L.S.H. to control movements ashore until a bridgehead is established.

Assault Group Headquarters Ships are also usually converted Merchant Ships, or in some cases, Frigates. Radar fitted is Type 271 and 291. One Assault Group Headquarters Ship in each Force serves as stand-by Headquarters Ship.

Two types of Beacon have been produced for Combined Operations use.

Type 255 is a self-mooring Marker Buoy which can be launched where convenient in water of up to 100 fathoms. When so launched, the buoy is automatically moored, the mast is erected, and the equipment is switched on. Type 255 responds to signals on the Type 291 band of frequencies at ranges up to 10 miles, transmitting a coded signal which is superimposed on the Radar signal.

Type 952, which has recently replaced Type 951 is a portable marker beacon, built for either Mains or Battery operation. It radiates a coded signal, which appears directly on the P.P.I. This beacon is used in Combined Operations chiefly in conjunction with Types 970, 971 and S013, but can be used with all other equipments on the same frequency.

"MAKE FAST"

The sky was clear, the sun was bright,
The harbour lay - a pretty sight -
Embraced by cliffs of white and green
And on its bosom could be seen
A ship both large and stately.

Aboard the ship, upon the deck,
There climbed a man whose trunk and neck
Were topped by brain beyond all ken
Which brain bid tongue say there and then:
"They ain't been up top lately!"

(The man of brain - whose name was Bold -
Wore on his sleeve a band of gold
Of shape and line undulatory;
And (not to be deprecatory)
A further band of green.)

"Come forth my merry lads with hook
And wing upon your arms, and look!
Up at the truck, out at the yard
There's gear of ours; needs cleaning hard;
Now! who is stout of spleen?"

"I, Sir will go! and take my tools,"
Spake R. M. Blinks, "these other fools
Can do the daily testing stuff,
Whilst I, aloft, will clean that guff
And bask me in the sunshine.

"Well said! my man," cried Sub-Loot Bold,
"A volunteer, or so we're told,
Is worth ten Pressed men, and I say
You're worth your solder any day:
You'll be a P.O. sometime!"

"Oh, thank you, Sir," our friend Blinks cried,
"I'll fix that gear, until the pride
Of all the fleet our ship is!" Thus
With gesture brave and no more fuss
He started to ascend.

"One hand for ship and one for me."
Shellbacks of old, salts of the sea
Have passed their wisdom down the times
But Blinks ignored their crafty rhymes
And new ideas did lend.

He carried pliers in his pockets,
A file, a hammer and spare sockets;
Bits of solder, ends of wire,
And on he climbed, high and yet higher
A black dot 'gainst the sky.

With gusto set about his job
Far above the madding mob;
Sniffed the keen air, felt the sun
And thought "This really is good fun;
If only I could fly!"

Upon the quarterdeck below
Three rings were pacing to and fro:
Three rings upon each sleeve, you mind
Their wearer was, of men, the kind
Whose word is held not lightly.

"He's not a bad chap, so they say;
But still, I'd rather be away
Up here, safe from that steely eye.
And now, I think I'll move and try
To clean that dipole brightly.

But as he bent his nether limb
The tools they fell from out of him!
With awful stare, he saw them go
Farther and farther down below,
A-whistling as they went.

The poor Commander never knew
What cometh for him out the blue.
A hammer, pliers, in succession
Sought to give him slight concussion
And quick his body bent.

In Zoos, strong cages hold the lions
On ships they call it "clapt in irons;"
And R. M. Blinks gazed sadly out
From iron bars, and felt a doubt
About his quick promotion.

He saw "crossed-hooks" as in a dream
And thought P.O.? I'd say I've been!
One lesson I have learned too late
And to you all I'll intimate:
WHENEVER WORKING UP THE MAST
MAKE SURE YOUR TOOLS ARE ALL MADE FAST!"

Roberts.