

C.A.F.O 1112

Camouflage of Sea-going Ships—Policy—Reports

(T.S.D.365/42.—11.6.1942)

I. POLICY

Camouflage of sea-going ships may be designed for two purposes:--

- (a) Concealment: i.e. reduction of the range at which a ship may be sighted.
- (b) Temporary confusion of a ship's apparent inclination and identity

2. The present policy is to design camouflage for concealment. Confusion is taken as a secondary object, since it is considered more valuable to hide a ship than to delay recognition of her course and identity.

3. Patterned camouflage is generally recommended, because, for reasons given below in Part II, paragraphs 6 and 13, both concealment and confusion can be achieved by its use.

II. PRINCIPLES

4. In the last war it came to be accepted that painted camouflage could not conceal ships though it might have other merits. The grounds for this conclusion were inadequate and concealment of ships by camouflage has been investigated anew during the present war.

The conclusions which have been drawn are stated below. They are based on surface and aerial observations of camouflaged ships at sea and are theoretically confirmed by scientific investigation.

5. Painted camouflage can give ships at sea effective and valuable concealment at long range or in a subdued light.

6. Its ability to do so depends primarily on the *tone* of the paint used – that is, on its degree of lightness or darkness – *colour being only of secondary importance*.

This applies to an all-over coat of paint of a single tone and also to patterned camouflage when the range of observation is such that the elements of the pattern cannot be distinguished separately.

7. If the tone of a ship matches the tone of her background, she will be concealed.

The tones of the sea and the sky which form the background of a ship at sea vary as the light changes. The apparent tone of a ship's paint does not always vary in the same way. Therefore, camouflage can only be designed to give concealment in one type of lighting condition. It will be liable to fail in conditions for which it is not designed and may then make a ship more conspicuous.

8. For example, white paint will conceal a ship in overcast weather or on a dark night if she is seen from such a height that her background is the sky or the distant sea, but will often make her conspicuous in sunlight; paint of a dark tone may conceal a ship in sunlight but will make her conspicuous in overcast weather or on a dark night when seen against the sky or distant sea.

9. A tone intermediate between light and dark may give concealment in direct moonlight; it will seldom show up as strongly as do light or dark tones in conditions which are adverse to them and is therefore useful as a compromise measure where weather and operational conditions are variable, or unknown.

10. Therefore, the lighting conditions which are expected to prevail where ships are in contact with the enemy must determine the choice of camouflage. In some cases these conditions can be foretold, either from the operation for which the ships are intended, or from the fact that weather conditions are predictable according to season in the area where the ships will operate.

The type of attack or defence expected from the enemy may also influence the choice.

In general, the following will have to be considered:--

- (a) Expected weather and light when in contact with the enemy.
- (b) Which is the more important – the advantage of concealment in lighting conditions favourable to the camouflage, or the disadvantage of showing up in unfavourable conditions.

11. In general, but not invariably, camouflage which conceals from an observer in a ship conceals also from an aircraft observing at normal reconnaissance angles.

12. In wartime, ships are seldom able to change their camouflage to suit a change of operation or area. This fact may in many cases preclude the use of any but a compromise scheme (see 9 above).

13. In patterned camouflage, where the scale of the pattern and the range of observation are such that the pattern merges into its average tone, the value of the pattern is exactly equal to that of an all-over coat of paint of the same tone. When the range is reduced at the different tones in the pattern are distinct, pattern can confuse estimation of inclination and identity.

Where the elements of the pattern are so large that they do not merge into an average tone at extreme sighting range, the precise value of the pattern for concealment is not yet known and is under investigation.

III. TYPES OF DESIGNS

14. The following classification of designs is based upon the average tone assumed by a design when viewed at the range at which pattern becomes no longer distinguishable.

CLASS	EXAMPLE OR DESCRIPTION
(a) LIGHT TONE	Western Approaches type designs, <i>vide</i> C.A.F.O. 679/42.
(b) LIGHT MEDIUM TONE	Light Admiralty type designs, <i>vide</i> C.A.F.O. 679/42.
(c) DARK MEDIUM TONE	General tone is equivalent to Mountbatten pink or colour M.S.3. (C.A.F.O. 679/42 does not show these designs)
(d) DARK TONE	Dark Admiralty type designs, <i>vide</i> C.A.F.O. 679/42

See also Part V below.

IV. SELECTION OF DESIGNS

15. The Admiralty policy is to select types of camouflage design in accordance with the following notes. These notes are more comprehensive than those given in C.A.F.O. 679/42, para. 3, and apply to ships of all types, in all waters, whereas C.A.F.O. 679/42 (which had a different special distribution) is concerned only with destroyers and smaller craft operating in home waters and the north Atlantic. Administrative authorities when requesting designs should state which type they require. In the absence of any indication the Admiralty will supply the type which is considered most suitable. In case of doubt Admiralty (D.T.S.D.. Tel. 109) should be consulted.

16. It is recommended that all surface ships with the exception of those described in 18 to 20 below should paint as follows:--

(a) If operating only in an area where overcast weather predominates and where all forms of enemy action are equally to be expected both by day and night.

Paint with LIGHT TONE: this gives concealment—

- (i) on overcast or moonless nights;
- (ii) from aircraft at long range on overcast days;
- (iii) in mist or fog and in twilight.

It also reduces visibility to surface observers on overcast days.

Note.—LIGHT TONE has not hitherto been used on ships larger than destroyers, except for special operations, because their area of operation has not been limited to the conditions described in this paragraph.

LIGHT TONE shows up when observed downlight in direct sunlight or moonlight.

(b) If operating under the same conditions as above but in an area where sunny weather and cloudless nights are expected to dominate.

Paint with DARK TONE:

- (i) This gives concealment on clear sunny days from aircraft at long range.
- (ii) In the same conditions, is less visible to surface observers than a light tone.
- (iii) Conceals from aircraft on moonlight nights (but the wake may show up)
- (iv) Is better than LIGHT TONE from surface observation on clear moonlight nights.
- (v) Does not show up under star-shell, etc. so much as other tones.

DARK TONE shows up on overcast days and dark nights, except when seen against a near sea background.

(c) (i) If liable to operate from time to time both in sunny and in clouded areas;
(ii) If the allocation is not decided by the time a ship has to paint after refit;
(iv) If operating in an area where part of each day is regularly overcast and part clear and sunlit, and where all forms of enemy action are equally to be expected.

Paint with DARK MEDIUM TONE. (The MEDIUM TONES, being a compromise are in general less effective than LIGHT TONE in overcast weather, etc. and than DARK TONE in sunlight. But they are probably the most effective against surface observation by moonlight and never show up so much as LIGHT or DARK TONES in the wrong conditions.)

17. Convoy Escort Vessels and other ships when the form of enemy action can accurately be predicted (i.e. where (a) to (d) below apply).

(a) If a U-boat attack is more probable than any other and air attack is *not* expected.

Paint with LIGHT TONE because this gives concealment on dark nights. It shows up down-

light in clear moonlight, but in any one month the number of moonless hours between sunset and sunrise will exceed the number of hours of moonlight, and these hours of moonlight which occur in overcast weather will favour this form of camouflage. It shows up down-light in clear sunlight, but no ship can be concealed from surface observation then.

Sub-paragraph 17 (a) above applies irrespective of area of operation.

(b) (i) If U-Boat attack is expected with aerial reconnaissance in an area where sunlight is usual and where a LIGHT TONE escort might therefore show up a convoy.

Paint with LIGHT MEDIUM TONE. This shows up less than LIGHT TONE in sunlight and is fairly effective on a dark night when the U-Boat attacks. (Aircraft, however, are likely to spot a convoy no matter how the escorts are painted.)

(ii) If in an area where overcast weather predominates.

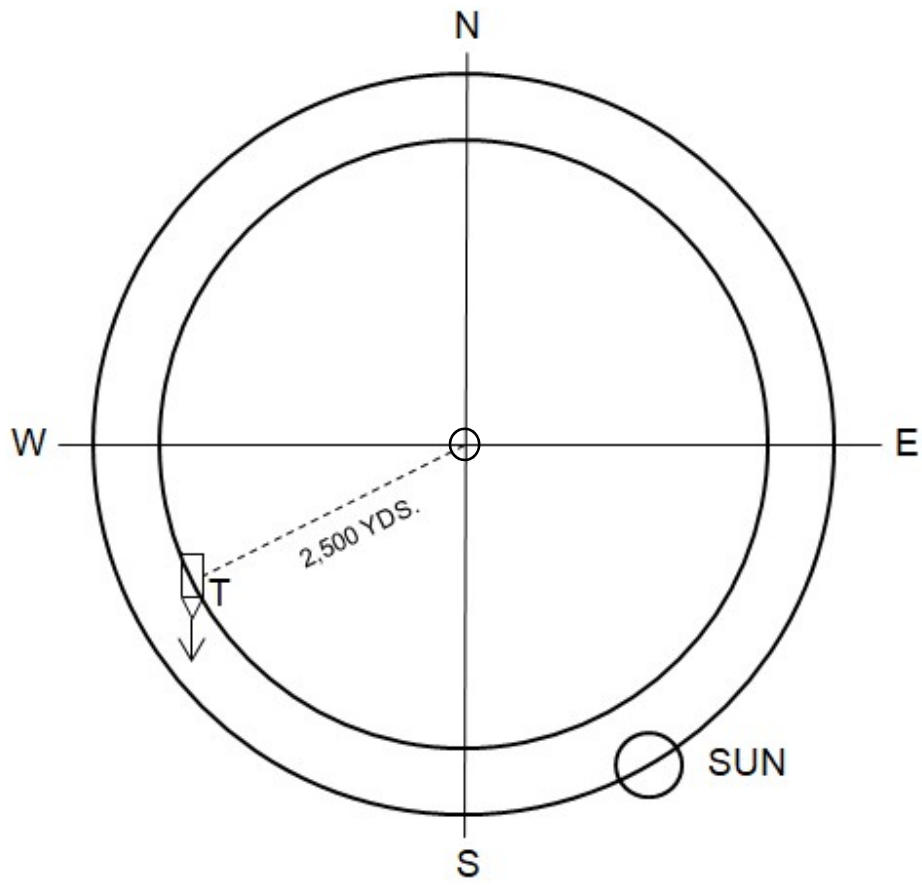
Paint with LIGHT TONE. Which conceals against aerial observation in overcast weather.

(c) If E-Boat attacks and night air attacks are equally probable (e.g. in the North Sea) or if E-Boat attack alone is probable.

Paint with LIGHT MEDIUM TONE. This gives concealment in moonlight unless the atmosphere is very clear, and yet is fairly effective on dark nights.

Sub-paragraph 17 (c) above applies irrespective of area of operation.

C.A.F.O. DIAGRAM 76/42



(d) If air attack by moonlight or in twilight is the most probable form of enemy action and:

(i) if night surface attack may also be expected.

(ii) if no other form of attack is likely either by day or night.

Paint with LIGHT MEDIUM TONE: any darker tone may show up from the surface even in moonlight

Paint with DARK MEDIUM TONE: this probably gives the best concealment against aircraft at night.

Sub-paragraphs 17 (d) (i) and (ii) above apply irrespective of area of operation.

18. *Ships which can be specially camouflaged to suit a particular operation.*

(a) Paint in accordance with the above remarks on concealment by tone, taking into account the circumstances in which concealment will be most needed. For example, it may be possible to predict from the plan of the operation the weather, time of day, presence or absence of moon and form of enemy action expected.

(b) If concealment is required when seen against the land the general tone of the camouflage should match the tone of the land background.

19. *Armed Merchant Cruisers, Ocean Boarding Vessel and any other ships which might be taken for Merchantmen.* Paint with DARK MEDIUM TONE. The use of a uniform medium grey paint will increase the resemblance to merchant ships and the likelihood of deceiving the enemy. See C.A.F.O. 1124/41.

20. *Ships operating independently by night only, e.g. minelayers, where dark nights are preferred but moonlight cannot be ruled out.* Paint with LIGHT MEDIUM TONE. For reason see sub-paragraph 17 (c) above.

V. EMERGENCY DESIGNS : CAMOUFLAGE WITHOUT PATTERN

21. In the following paragraphs instructions are given for painting a ship with a simple equivalent of each class of design described in Section III above, using only White, Home Fleet Grey and Mediterranean Grey.

These schemes of painting will be of about the same value for concealment as patterned designs, but will produce less confusion. They are intended for use when there is no time to obtain or paint to a patterned camouflage design.

Little experience has been gained with these emergency designs and the equivalent (a) of LIGHT TONE designs should not be applied to ships larger than Destroyers, except for special operations, owing to the increased visibility in sunlight.

(a) *Equivalent of LIGHT TONE Designs.* All weather work should be painted pure white except for a band right round the ship, extending from the water-line half-way up to the forecastle deck or half-way up to the upper deck in ships without a forecastle deck. This band should be Light Grey Admiralty Pattern 507C and should cover the boot topping (*vide* C.A.F.O. 2515/41).

(b) *Equivalent of LIGHT MEDIUM TONE Designs.* – All weather work should be painted Light Grey Admiralty Pattern 507C except for a band right round the ship, extending from the water-line half-way up to the forecastle deck or half-way up to the upper deck in ships without a forecastle deck. This band should be painted with a mixture of equal parts Light

- Grey Admiralty Pattern 507C and Dark Grey Admiralty Pattern 507A, and should cover the boot topping (*vide* C.A.F.O. 2515/41).
- (c) *Equivalent of DARK MEDIUM TONE Designs.* – All weather work should be painted with a mixture of equal parts Light Grey Admiralty Pattern 507C and Dark Grey Admiralty Pattern 507A.
 - (d) *Equivalent of DARK TONE Designs.* – All upper works should be painted with a mixture of equal parts Light Grey Admiralty Pattern 507C and Dark Grey Admiralty Pattern 507A. The hull should be painted all Dark Grey Admiralty Pattern 507A.
 - (e) In all Schemes of Painting the undersides of platforms and horizontal projections, blast shields, etc. should be painted White. All parts of a ship which are permanently in shade or shadow should also be painted White.

VI. DECISIONS TO CAMOUFLAGE SHIPS

22. The decision whether or not ships *in service* should be camouflaged rests with administrative authorities subject to the approval of Commanders-in-Chief.

23. The decision whether ships building, converting or refitting at home should be camouflaged will be made by the Admiralty. The Admiralty's decision will be guided by recommendations from the administrative authorities, who should inform the Admiralty of their views from time to time.

24. Unless instructions are specifically given to the contrary, ships building, converting or refitting are only to be painted to camouflage designs *provided that completion is not thereby delayed.*

VII. REPORTS WHEN SHIPS HAVE BEEN CAMOUFLAGED

25. In view of the proviso stated in paragraph 24 above, where a ship has been painted to a camouflage design, her Commanding Officer is to notify the fact to the Secretary of the Admiralty (for D.T.S.D.). If the design has not been supplied by the Admiralty and is not one of those promulgated in C.A.F.O. 679/42 a sketch of the design and a shade card of each colour used is to be enclosed with the notification.

VIII. REPORTS ON OBSERVATIONS OF CAMOUFLAGED SHIPS

26. Reports on observations of camouflaged ships are required both from the air and from the surface. As knowledge of the exact conditions of light and background is essential in assessing the reports, reports should be made in the following form:--

Form of Reports on Camouflage Ships

- A. Name or description of target ship.
- B. Approximate position.
- C. Time and date of observation.
- D. Weather:--
 - (i) Proportion of cloud.
 - (ii) Whether sun or moon was unobscured, partially obscured or obscured by cloud, fog or haze.
 - (iii) Approximate angle of elevation of sun or moon, if any.
- E. Height from which target ship was observed.
- F. Whether observed against sky, sea or land background, stating tone and colour of background and state of sea.

- G. Approximate compass bearings of target ship and sun or moon from observer, range of observation and course of target ship, shown diagrammatically of C.A.F.O. diagram 76/42

Note – On C.A.F.O. diagram 76/42 the bearing of the sub, or moon, if any is to be shown on the outer circle and the bearing of the target ship, pointing on her approximate course, on the inner circle. As an example, the diagram is shown filled in for the following conditions:--

Bearing of the Sun - 150°

Bearing of Target (T) - 250°

Course of Target – 180°

Distance from Observer (O) to Target (T) – 2,500 yards.

- H. Effect on camouflage. Compare visibility of target ship with any other ship in the vicinity seen in a similar light, stating how the comparison ship is painted. If no ship is available for comparison the fact should be stated, but remarks under this head will still be of value.
- I. If camouflage renders inclination or identity difficult to judge, this should be stated
- J. General remarks and suggestions

IX. REPORTS FROM FOREIGN STATIONS

27. Reports are required on experience to date together with type of camouflage recommended, particularly from foreign stations, on receipt of this Order and again as further experience is obtained. Administrative Authorities are to inform the Admiralty in accordance with paragraph 23.

(C.A.F.O.s 1124/41, 2515/41 and 679/42.)
(C.A.F.O. 1983/41 is cancelled.)

