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OPINIONS OF SHIPBOARD OBSERVERS

Lt. Comdr. Williams, RN: --

The different camouflage schemes were observed to have the following characteristics:

Admiralty: (no. It was impossible to compare the port and starboard sides of the ships)
Very conspicuous down (moon in bright (moonlight
but gave excellent concealment at dawn and dusk. No help in confusing target angle or type. (sun (sunshine

USN Measure 12 & 22:

Excellent concealment down light in bright direct light, but useless in dim diffused light of dawn and dusk. No help in confusing target angle or type.

USN 32/3D and 33/3D:

Less conspicuous than Admiralty type in direct light and than Measure 12 in twilight. Gave excellent confusion of type and target angle.

No scheme possessed any advantages over the others, in concealment or confusion, in the bright diffused light of A.M., October 3. There were no means of judging this efficiency of range confusion. These observations, within their narrow limits, confirm theoretical predictions and agree with previous experience. They have no other value and should not be taken as a conclusive test of the comparable value of the different camouflage schemes, whether for confusion or concealment, in other conditions of light-strength, light-type, light-direction, height of eye or atmosphere.

Lt. J. A. Richards, RN: --

Observations by day and at night give first place to B ship especially in regard to Reduction of visibility and Range deception.

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Dusk and dawn observations reverse the rating, and A ship whose white mast especially made a definite point of aim throughout the Day exercises --scored on Reduction of Visibility and Range deception. At these periods the white mast could not be seen, while both B and C's masts were visible.

Observation of Target Angle. Estimation generally more difficult with C ship (either side) first, and A or B ship in second place, depending on the period of day or night suitable to their camouflage. The ship showing best target - well defined shape for obtaining Target Angle, Range and Type was: By day - A, At dawn & dusk - B.

It was not possible to determine which side of either of the three ships gave the best results. This could be determined from an analysis of all observers' estimates and errors.

Camouflage should depend on a ship's job.

Lt. T. Oates, RNVR: --

Observations during trial indicate that the Admiralty patterns provide relatively good concealment at dawn and dusk and in overcast conditions, but are conspicuous down sun on a clear day. This is in accordance with expectations. Consider that great care must be taken not to draw too general conclusions from the results of a trial of such short duration and in a single area. Really conclusive comparative data can only be obtained by observing the ships operating together over a long period.

Dr. Warner, BuShips: --

It is impossible to rate these three vessels together as their camouflage was designed to perform different functions.

C(355) was the only one which had much type or target angle deception at any time.

B(353) was the only one which had much range deception.

Rated strictly on the basis as visibility, the Admiralty design made the poorest showing in sunshine, and the best in gray weather on October 3.

The deception design was generally more conspicuous in low sunshine down sun but the measure 22 was usually the most conspicuous in gray weather. The measure 12 side of B was generally better in both sun and overcast.

Lt. Comdr. Evans, USNR.

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-The trials were conducted under the most auspicious weather conditions which afforded a large variety of atmospheric effects so that the subject vessels under observation were observed under a large range of conditions of light and atmosphere.

Each of the six patterns involved in the experiment, possessed particular merit, under a particular condition. The light patterns, particularly the Admiralty, were most effective at dawn, dusk, at night, and under haze conditions. These, however, were most conspicuous under full light, especially with the sun near the horizon. On the other hand, the darker schemes, Measures 22 and 22 $\frac{1}{2}$, afforded considerable protection when seen under full light and against dark background. The dazzle pattern could hardly be evaluated in comparative study with the low visibility schemes, but it was noted that the dazzle patterns proved very effective at considerable ranges where there was an opportunity for elements in the pattern to dissolve. The dazzle pattern also naturally possessed qualities of disruption which were lacking in the low visibility schemes.

A comparison of the subject patterns, one with another, and particularly with the Admiralty scheme (which employed greenish grays), substantiates an opinion long held by the writer that the value of chroma in any camouflage scheme is much over-rated. This is a matter that should be thoroughly investigated. It is well recognized that grays produced solely by black and white can be controlled much better than where pigment is employed and that paints so produced, are far more permanent than those employing colors, especially the blues and greens. Achromatic schemes approximate more properly the physical conditions at sea, where a deficiency of pigment is noted. Any color taken on by the sea or the atmosphere (clouds) is derived from refraction and reflectance of the light source, so that it is logical to assume that this color will also be superimposed upon the vessel. Therefore, if the vessel itself is already colored, the color reflected upon the vessel from the sky or the water is an added color. The use of black and white as components for all camouflage paint would result in a noticeable economy of paint and produce a much more permanent finished job.

The experiment was highly successful, primarily in establishing convictions already held, and as an evidence of the necessity for continuing tests of this nature. It is the opinion of the writer that tests at sea of this nature, under operational conditions, are the only proper means by which studies may be pursued intelligently, by those who are actively engaged in camouflage designs.

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It is felt that nothing particularly new was learned but that the greatest practical value may be attached to the continuance of such field work, and it is recommended that serious consideration be given to the following suggestion. Six or seven vessels, either destroyers or escorts, should be allocated for camouflage study so that suitable designs could be placed upon these vessels operating in a division together. Several camouflage observers should be assigned from time to time to accompany these vessels on their maneuvers for the specific purpose of studying the relative merits of the several designs. It is assumed that this could be accomplished without materially increasing the cost of painting the subject vessels or in any way interfering with their operational work.

It may be observed that camouflage possesses its main protection through elements of uniqueness and surprise, and it is to be deplored when identical patterns are applied to a number of vessels of the same type. This practice is apt to lessen the value of the patterns, to help identify the class of vessel to the enemy, and through frequent observation to lose any merit it might have originally possessed.

In conclusion, it is felt that camouflage designs must be produced with a full knowledge of the operational and tactical conditions peculiar to a special type of vessel within its Force, the hour of the day or night when the subject vessel may be seen by the enemy vessel or joined therewith, and the orientation of the subject vessel as seen by the enemy. All of these considerations must enter into the problem. It is not sufficient to consider merely the atmospheric conditions of the particular area in which the vessel will operate.

Mr. O'Zara , BuShips: --

As might be expected the Admiralty ship DE-354 was best at dawn half light and on overcast days as to low visibility.

It was also a foregone conclusion that the De-355 would give the best course distortion, and the ship with horizontal markings, the DE-353, the best range deception.

By range deception I mean not that the ship looks always further away than its mates. It did at times when the sea was dark. It seemed nearer than the other two when the sea was light in value.

My conclusion is that while it may be impossible to compromise on the same ship between low visibility, course distortion, and type deception, it is possible to make this compromise with a fleet of ships.

So my recommendation is that these types of designs be developed as follows:

- a. Course distortion and nothing else.
- b. Type deception and nothing else.
- c. Low visibility for several times of day or kinds of day.

In planning the paintings of a fleet the operations of A, B, and several C's can be varied to suit the conditions under which the fleet is to be used. Obviously, one kind of ship will be taking more risks at one time, another when circumstances are different.

Lt.(jg) H. B. Buck, USNR: --

The Admiralty ship showed lowest visibility at dawn of 3 October 1944, a very significant fact. B ship was not as effective as C during this time. B ship was, by far, the most effective in range deception, and was superior to A ship as to low visibility except during the observation referred to above.

C ship was excellent in course distortion during fewer intervals than I had anticipated, and the 5-L often appeared to be very bright without indicating any deception in target angle.

The distinction between the two sides of the same vessel seemed to be of minor significance.

I believe the A vessel could be improved by darkening the hull considerably and darkening the mast, slightly.

I believe that on B vessel, Measure 12 is slightly better than Measure 22 and feel that if it could be improved, somehow, to match the low visibility of A vessel at dawn, we would have a perfect vessel. This vessel deceived me very much on two occasions as to course and target angle.

I believe that C vessel is properly designed, that the spacing of the areas is correct, and that the values are correct for a disruptive type of camouflage application on DDs, DEs, Corvettes and other vessels of low silhouette. However, I do not consider this the proper approach to vessels with large free board.

I have absolutely no criticism to make of the plan of maneuvers executed on this test run and feel satisfied that all pertinent data had been included.

Lt. (jg) W.H. Brown, USNR

OBSERVATIONS

OVERALL RATING - (Numbers indicate order of preference.)

C A M O U F L A G E F U N C T I O N

		<u>Reduction of Target Angle Visibility</u>	<u>Deception</u>	<u>Type Deception</u>	<u>Range Deception</u>
WEATHER AND LIGHT CONDITIONS		<u>XYZ</u>	<u>XYZ</u>	<u>XYZ</u>	<u>XYZ</u>
A (354)	Admiralty A	311	None	333	332
	Admiralty D	311	None	333	332
B (354)	USN 12	133	None	222	113
	USN 22	133	None	222	113
C (355)	USN 32/3D	222	111	111	331*
	USN 33/3D	222	111	111	223

X-Weather clear; Sea sloppy(dark); Vessels down sun. (Afternoon, 20 Oct.)
 Y-Weather clear; Sea sloppy(dark); Vessels down sun. (Evening, 20 Oct.)
 Z-Weather overcast; Sea calm (light). (Dawn, 3 Oct.)

*The difference in the range deception performance of the two sides of DE 355 is a result of the nature of design 3D (dark at waterline on port and light at waterline on starboard), and is not a result of any difference between measures 32 and 33.

COMMENTS

All tested measures were observed to be effective in one way or another, at one time or another. For vessels of any one type which may be expected to operate together, consideration should be given, first, to the camouflage functions desired for operational reasons, and, second, to the use of as great a variety of designs and tonalities as may be provided in those camouflage measures which perform the desired functions. This will provide the best coverage against changing weather, sea, and light conditions.

It is the opinion of this observer that in the case of Destroyer Escorts, and other vessel types having distinctive broadside silhouettes, the possibilities of course deception are and must be limited to creating uncertainty as to whether a ship is going or coming. The characteristic nature of a DE, (with raked mast, with considerable deck slope from stem to stern, and with superstructure located well forward), permits any observer acquainted with DEs fairly accurately to estimate the angle of deviation from the line of sight. However, it is not always possible to tell immediately which is nearer, the stem or stern.

From previous observations, this officer has noted that Design 3D can create this "coming or going" confusion, especially when the observed vessel makes an angle of less than 45° with the line of sight. However, repeated viewing of Design 3D, or any design, tends to eliminate whatever confusion may exist when the design is seen for the first time.

With respect to pattern design 3D, the maximum value contrasts in measure 32 (black to light gray) and measure 33 (navy blue to pale gray) appeared about equal, one or the other having a slight advantage depending on light, sea, and weather conditions.

If further course-deception tests are held, it is suggested that if possible they be:

- (1) Extended to include vessels of a type more symmetrical fore and aft than DEs (as AKAs, APAs, CLs.)
- (2) Extended to include more than one course deception design.
- (3) Extended so that at certain times during the maneuver the test vessels are steaming sharply away from observer.
- (4) Conducted so that observers cannot watch test vessels during periods while they shift from one heading to the next.

Mr. W.F. Walter, BuShips: --

During countermarch maneuvers afternoon of Oct. 2, the graded systems ship (B & b) was much better according to my observations as far as reduced visibility was concerned - almost in every case. Its range deception, also was by far harder to estimate.

At twilight the British A was quite good -- less visible than our graded system ship which gets my triple A rating for the impossible all-around 24-hour day pattern.

The afternoon zig zag maneuvers Oct. 2 didn't prove too much for me as the ships were too far away most of the time and the leg numbers on the fan tail (my observation station) confused.

On morning Oct. 3 (overcast) starboard side of 3D had extremely good course distortion.

Sheffield Kagy, SP(X)2/C, BuShips: --

The tests to me show that all around observations for this trip put Measures 12 and 22 in the lead. The Admiralty A and D camouflage a close tie. Design 3D, Measures 32 and 33 excellent under some conditions, however, since the tests were obviously for low visibility, pattern camouflage was at a disadvantage. Since Pattern camouflage is primarily for course and type deception, it was amazing how well the 3D design stood up.

DE-354 The Admiralty on the run out yesterday and during the first test run was at all times identified and revealed by its white foremast. During the late afternoon ship B stood up better, but just at dusk and shortly after ship A became extremely good. In our tests we were restricted to only a few weather conditions in only one area. I feel the British gray green for this area would be improved by more of a blue green retaining about the same value. The masts, of course, (for this area) would be greatly improved by using a light or haze gray value.

DE-353 Measures 12, 22. These measures appeared to be alike at a distance. During the afternoon they appeared to be better than the other two ships. The colors under most conditions were better than A. I would like to see a little irregular design used with the Measure 12 colors. It would give it more course distortion and still have good low visibility and range deception.

DE-355 Design 3D, Measures 32, 33. This ship's design worked very well up to about 10,000 yds. She had some low visibility and good type deception. I am more than convinced of the value of pattern camouflage. Navy Blue seems dark enough to be quite effective.

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Lt. Comdr. Stinchcomb, USN:--
(Task Group Commander)

Test results valid only for Atlantic in this area. Not for North Atlantic or Pacific. Course deception patterns probably best that can be used. No question of visibility in South Pacific. The Commodore was very much confused in trying to estimate target angles of DE-355.

Thayer System (Measure 16) excellent for Northern waters e.g. near Greenland.

Camouflage should be chameleon-like in painting for a given mission.

Lt. Comdr. Auld, USN:--
(Captain of DE-531)

DE-355(C) only ship having possibility of type deception; might be mistaken for DD. Liked DE-353(B) best - next DE-355(C). DE-354 might be all right for Northern waters.

Lt. Comdr. Ingle, USN:--
(Captain of DE-353)

Seen down moon, DE-354 stood out conspicuously. DE-355 couldn't be seen without binoculars at two mile range.

Lt. Cowden, USN:--
(Communications Officer of DE-354)

DE-355(C) hard to spot. Looked like a cylinder coming through the water. Couldn't get heading within 15°.

DE-353(B) stood out like a sore thumb in overcast light.

Williamson twin would have been better on countermarch.

Lt. H.K. Asplund, USN:--

Aboard
DE-355 O.D. 2000-2400.
Range of DE-354 appeared 300 yds. as against 600 yds. (true) when vessel was astern (bow, dead on). DE-354 at all times appeared smaller than DE-353. DE-531

appeared at all times larger than either the other two; white mast of DE-354 conspicuous during day time but could see mast at 600 yds. at night. The course of the DE-355 (C) was almost always difficult to determine and caused considerable anxiety during the regular position runs on the night of 2 October.

Lt. Ruckmick, USN:-- Aboard DE-531.
(BuAer (P.S.L.))

Each vessel has effective value under certain weather and lighting conditions.

1. "A" (Admiralty) Vessel most effective at dusk and dawn. In daylight conditions, the hull was invisible whereas the mast was visible at extreme ranges.
2. "B" Vessel was a very effective pattern under average conditions of visibility.
3. "C" Vessel, on average ranges (4-6 mi.), had a very deceptive range effect.

Aboard DE-354. Sailor on Mid Watch (0-0400) Lookout with Binoculars.

Moon light - Visibility clear.

At night DE-355 showed up. Could see dark spots with unaided eye. Range 3100 yds.