S. 347. (Revised December, 1938.)

STATION.

19

REPORT OF TURNING, STARTING AND STOPPING, AND MANOEUVRING TRIALS

(Which must be made in smooth water and little or no tide or wind)

OF

H.M.S. Triumph

Five copies of this form are to be made. One copy is to be inserted in the Navigational Data Book, one copy in the Captain's Ship's Book (Folio 5) and three copies forwarded to the Admiralty for the Director of Navigation, Director of Naval Construction, and Office Ship's Book.

One Diagram of each trial drawn to scale, showing each observed position of the Ship, is to be attached to this report.

Instructions for carrying out Turning and Starting and Stopping Trials.

1. A spar buoy weighted at the lower end sufficiently to keep it upright, and immersed to approximately the draught of the ship, with a staff above water, should be dropped in not less than 20 fathoms. A boat with a mast up should be stationed as close as possible to the buoy without touching it. Two officers and one recorder should be in the boat and provided with two sextants, a hack watch, a stop watch and a notebook.

2. The ship should be steered to pass about one half of the expected diameter of the turning circle from the boat. The rudder should be put over so that the ship turns in a circle round the boat as centre. At zero time, which is one minute before putting the rudder over, observations are to commence as described below.

3. A flag on the mast nearest the compass should be hoisted close up about half a minute before zero time and dipped at zero time. The flag should be re-hoisted immediately after dipping and dipped again when the rudder is put over and subsequently for every 15° alteration of ship's head up to 60° and then every 30°. The syren nearest the boat should be sounded each time the flag is dipped.

4. The following observations should be taken each time the flag is dipped:

ON BOARD THE SHIP

- (i) Time by stop watch.
- (ii) Direction of ship's head.
- (iii) Bearing of the boat's mast.
- (iv) Range of the boat's mast (if small navigational Rangefinder is available).

IN THE BOAT

- (i) Time by stop watch.
- (ii) Altitude of the masthead by sextant.

NOTES.—(a) Both on board the ship and in the boat the G.M.T. of zero time and of the second observation should be recorded.

(b) Stop watches should be started at zero time.

(c) On account of the heel of the ship whilst turning the altitude of the masthead should be taken to some fixed point on the ship's structure and not to the waterline.

5. In Starting and Stopping Trials the flag should be dipped, the syren blown and the observation taken at zero time (which is one minute before the telegraphs are altered) and at each subsequent minute.

6. From the data obtained as above the track of the ship can be plotted and the information required by this form obtained.

7. For some trials it may be better to turn with the boat outside the turning circle to avoid the chance of fouling it.

Name of the Officer who made the calculations

Signed

EXHIBIT 18

Commanding Officer.

M.F. S. 347.

(W. 2294/D76) 4/41 Gp 748/4

(W. 42/D63) 9/41 Gp 748/4

18

DECLASSIFIED

TURNING, STARTING & STOPPING, AND MANŒUVRING POWERS OF H.M.S. TRIUMPH.

N.B. The Speeds and Rudder Angles are to be strictly adhered to.

[illegible]	630
[illegible]	80
[illegible]	Two Outward
[illegible]	25
[illegible]	254
[illegible]	11 6
[illegible]	22°
[illegible]	100
[illegible]	64
[illegible]	Four

	Section I	Section II	Section III	Section IV	Section V	Section VI
[illegible]	1st June	8th June 48	18 August	23rd August	23rd August	19th August
[illegible]	23' 4"	22' 10"	23' 5"	23' 1"	23' 1"	23' 2"
[illegible]	23' 9"	23' 6"	23' 11"	23' 4"	23' 4"	23' 8"
[illegible]	Clean	Clean	Average	Average	Average	Average
[illegible]	12 May 48	12 May 48	12 May 48	12 May 48	12 May 48	12 May 48
[illegible]	Four	Four	Four	Four	Four	Four

DECLASSIFIED

SUMMARY OF TRIALS.

Turning Trials Nos. 1 to 14. Starting and Stopping Trials Nos. 15 to 20. Manœuvring Trials Nos. 21 and 22.

	13	14	15	16	17	18	19	20	21	22
[illegible]	Economical speed	Economical speed	Half speed	Slow speed	Stop	Slow speed	Half speed	Half speed	High speed	High speed
[illegible]	Economical speed	Economical speed	Slow speed	Stop	Half speed	Half speed astern	Half speed astern	Full speed astern	High speed	High speed
[illegible]	Economical speed	Economical speed	Slow speed	Stop	Half speed	Half speed astern	Half speed astern	Full speed astern	High speed	High speed
[illegible]	S.	P.	Steady course	Steady course	Steady course	Amidships	Amidships	Amidships	[illegible] S.	[illegible] P.

Notes. (a) Trials 21 and 22 are only to be carried out by Capital Ships, Aircraft Carriers and Cruisers.
(b) For Starting and Stopping Trials (Nos. 15 to 20) only those boilers which would normally be connected when cruising with the fleet at 12 knots are to be used.
(c) At least one section should be completed in a day. If possible, all six sections should be undertaken with the ship under similar conditions of trim, in similar weather. The ship should be steady and have her speed due to revolution before commencing each turn. The engines should be maintained at the proper revolutions, as shown by the telegraph throughout the trial.
(d) Trials 11 to 14 are to be carried out using the tactical rudder employed in the Fleet in which ships are serving.
(e) [illegible] 13 and 14 [illegible] economical speed of [illegible]

TURNING TRIALS.

1. Detailed instructions for calculating the data to insert in lines 4 to 12 of each trial will be found in the Admiralty Navigation Manual and Remarks on Handling Ships (O.U. 5274).
2. Ships other than Capital Ships, Aircraft Carriers and Cruisers need not complete lines 4, 5, 6, 7, 9, 10, 11, 12 of each trial.
3. The Distance to New Course and the Time Correction for Distance to New Course are to be left blank for turns of over 120°.

(Courses in Degrees. Times in minutes and seconds. Distances in yards. Speed in knots.)

Trial No. 1. Speed 12 *Knots. Rudder 35° S.

	15	30	45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	00-44	01-10	01-34	01-57	02-44	03-42	04-[illegible]	05-50	06-40	07-30	08-29	09-27	10-24	[illegible]
2. Transfer (b), (c)	15	58	113	220	448	700	900	1000	972	958	586	320	100	-30
3. Advance (d)	246	461	590	684	780	750	618	386	160	-68	-204	-160	2	230
4. Length of Arc	305	485	626	776	1030	1288	1546	1810	2045	2320	2616	2900	3176	3446
5. Mean speed	12·4	12·3	11·9	11·8	11·52	10·44	10·12	9·82	9·44	9·51	9·3	9·23	9·15	9·12
6. Speed at end of each 30°		12·3		11·9	11·32	10·82	10·13	9·78	9·56	9·37	9·27	9·21	9·18	9·12
7. %age of original speed at end of each 30°		98%		94%	90%	84%	81%	79%	75%	73%	73%	71%	70%	70%
8. Distance to New Course	248	362	468	558	780	1160	—	—	—	—	—	—	—	—
9. Time Correction	00-30	00-53	01-13	01-30	02-04	02-18	—	—	—	—	—	—	—	—
10. Intermediate Course	002½	07	11	18	30	43	55½	69	81	94½	109	116	040	[illegible]
11. Intermediate Distance	297	468	600	720	900	1052	1095	1010	940	845	622	[illegible]	118	255
12. Time Correction	00-43	01-10	01-39	02-09	03-06	0420	05-23	06-28	07-27	08-29	09-[illegible]	[illegible]	11-24	12-22

Initial Speed during 1st minute (before rudder is put over) [illegible] knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard [illegible] Port [illegible]
Time taken to put rudder over 14 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) [illegible] Direction Force
State of Sea 2-1 (Douglas Scale.)

Trial No. 2. Speed 12 *Knots. Rudder 35° P.

	15	30	45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	00-45	01-11	01-55	01-58	02-55	03-53	04-57	05-57	06-57	07-58	09-00	10-04	11-06	12-07
2. Transfer (b), (c)	24	45	110	266	566	842	1040	1196	1165	982	720	315	122	18
3. Advance (d)	300	415	592	695	812	770	572	250	-10	-252	-316	-342	-164	134
4. Length of Arc	305	445	636	786	1111	1403	1752	2083	2354	2663	2945	3327	3643	3983
5. Mean speed	12·6	12·4	12·1	11·8	11·42	10·8	10·55	10·51	10·22	10·0	9·81	9·83	9·85	9·67
6. Speed at end of each 30°		13·46		12·58	11·50	10·48	10·65	10·38	10·26	10·01	9·91	9·83	9·85	9·87
7. %age of original speed at end of each 30°		[illegible]		95%	91%	86%	84%	84%	81%	79%	78%	78%	78%	78%
8. Distance to New Course	219	622	427	544	915	[illegible]	—	—	—	—	—	—	—	—
9. Time Correction	00-29	00-40	01-01	01-35	02-08	02-11	—	—	—	—	—	—	—	—
10. Intermediate Course	4½	11	16	21	35	41½	[illegible]	78	91	105	117½	[illegible]	145	[illegible]
11. Intermediate Distance	300	484	615	750	980	1140	1225	1225	1165	1010	820	[illegible]	205	[illegible]
12. Time Correction	00-45	01-08	01-41	02-21	0352	04-38	05-49	06-49	07-52	08-56	09-59	11-05	12-07	13-0[illegible]

Initial Speed during 1st minute (before rudder is put over) 12·5 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard 96 Port [illegible]
Time taken to put rudder over 13 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) [illegible] Direction Force 1
State of Sea 2-1 (Douglas Scale.)

Trial No. 3. Speed 12 *Knots. Rudder 25° S.

	15	30	45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	00-49	01-13	01-40	02-02	03-05	04-05	05-06	06-06	07-06	08-08	09-09	10-10	11-11	12-11
2. Transfer (b), (c)	18	57	145	327	536	852	1122	1220	1150	962	700	545	120	20
3. Advance (d)	310	478	620	722	840	785	570	275	-22	-256	-355	-225	-132	165
4. Length of Arc	310	480	640	792	1100	1433	1773	2098	2408	2715	2998	3310	3660	3910
5. Mean speed	11·4	11·8	11·6	11·2	10·7	10·5	10·3	10·2	10·2	10·0	9·8	9·5	9·7	9·7
6. Speed at end of each 30°		11·5		11·1	10·8	10·5	10·3	10·2	10·1	10·0	9·7	9·7	9·6	9·6
7. %age of original speed at end of each 30°		96%		93%	90%	88%	85%	85%	84%	83%	81%	81%	80%	80%
8. Distance to New Course	260	398	480	575	855	1270	—	—	—	—	—	—	—	—
9. Time Correction	00-42	01-00	01-16	01-36	02-05	02-00	—	—	—	—	—	—	—	—
10. Intermediate Course	02	07	13	19	32	47½	63	77	91	105	117	124½	138	07
11. Intermediate Distance	810	480	640	765	990	1175	1260	1250	1155	945	785	515	180	170
12. Time Correction	00-50	01-16	01-46	02-20	03-25	04-28	05-32	06-33	07-35	08-38	09-44	10-45	11-47	12-47

Initial Speed during 1st minute (before rudder is put over) 12 knots.
Initial revolution of engine during 1st minute (before rudder is put over) Starboard 98 Port 98
Time taken to put rudder over 10 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) G.175 Direction Force 2-3
State of Sea 1-2 (Douglas Scale.)

Notes.—* Insert speed.

(a) From the time of ordering the rudder to be put over.
(b) The transfer for any number of degrees is the distance the ship is transferred to the right or left whilst turning that number of degrees measured at right angles to the original course.
(c) The Tactical Diameter is the transfer for the first 180°.
(d) The advance for any number of degrees is the distance the ship is advanced from the position when putting the rudder over in the direction of the original course whilst turning that number of degrees.

Trial No. 4. Speed 12 *Knots. Rudder 25 P.

	15		45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	00-47	01-13	01-40	02-06	03-01	04-04	05-05	[illegible]	07-12	[illegible]	[illegible]	[illegible]	11-52	12-35
2. Transfer (b), (c)	15	68	148	262	520	486	1102	1274	1220	[illegible]	690	[illegible]	52	50
3. Advance (d)	317	500	642	766	844	858	636	[illegible]	[illegible]	[illegible]	[illegible]	-325	76	232
4. Length of Arc	329	508	678	848	1210	1565	1795	[illegible]	2570	[illegible]	[illegible]	[illegible]	[illegible]	4370
5. Mean speed	12.4	12.3	12.0	12.0	11.9	11.5	11.2	11.4	10.8	[illegible]	10.4	10.4	10.4	10.4
6. Speed at end of each 30°		12.1		12.1	11.8	11.5	11.1	10.9	10.7	[illegible]	10.4	10.4	10.4	10.4
7. %age of original speed at end of each 30°		99%		97%	95%	92%	90%	88%	86%	[illegible]	75%	74%	74%	74%
8. Distance to New Course	322	410	512	625	845	1310	—	—	—					
9. Time Correction	00-45	01-01	01-18	01-30	01-46	01-40	—	—	—			—		—
10. Intermediate Course	01	06½	12	18	32	47	61	76	89	105	119½	135	149	140
11. Intermediate Distance	325	504	660	800	1055	1235	1517	1527	1218	[illegible]	[illegible]	[illegible]	100	250
12. Time Correction	00-48	01-16	01-47	02-13	03-11	04-18	05-20	06-35	07-39	08-40	[illegible]	[illegible]	12-04	15-01

Initial Speed during 1st minute (before rudder is put over) 12.5 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard [illegible] Port [illegible]
Time taken to put rudder over 4 secs.
Angle of rudder recorded at rudder head
True wind (relative to initial course) from [illegible] Direction. Force 1
State of Sea 2 (Douglas Scale.)

Trial No. 5. Speed 12 *Knots. Rudder 15 S.

	15		45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	01-02	01-34	02-04	02-38	03-43	04-54	06-07	07-18	08-24	09-31	10-42	11-53	13-01	14-18
2. Transfer (b), (c)	22	73	167	308	656	1045	1372	1518	1468	1212	886	495	145	52
3. Advance (d)	410	610	783	918	1064	989	756	372		-262	-452	-390	-172	186
4. Length of Arc	438	220	210	205	385	405	405	420	340	350	350	345	345	405
5. Mean speed	12.5	12.4	12.4	12.0	11.6	11.3	11.5	10.9	10.9	10.7	10.6	10.5	10.5	10.4
6. Speed at end of each 30°		12.3		10.9	10.6	10.2	9.8	10.5	10.2	10.2	9.5	9.9	10.2	9.7
7. %age of original speed at end of each 30°		98%		86%	85%	81%	78%	83%	81%	81%	76%	74%	81%	77%
8. Distance to New Course	361	474	611	740	1056	1592	—	—	—	—	—	—	—	—
9. Time Correction	00-54	01-12	01-28	01-44	02-1[illegible]	02-05	—	—	—	—	—	—	—	—
10. Intermediate Course	2½	7	12½	18½	32	47	61½	77	90	105	117	125½	130½	14
11. Intermediate Distance	407	618	800	970	1245	1440	1575	1555	1460	1260	985	640	255	200
12. Time Correction	01-02	01-34	02-04	02-38	03-47	05-05	06-18	07-34	08-40	09-51	11-04	12-15	13-23	14-42

Initial Speed during 1st minute (before rudder is put over) 12.5 knots.
Initial revolution of engine during 1st minute (before rudder is put over) Starboard 98 Port 98
Time taken to put rudder over 8 secs.
Angle of rudder recorded at rudder head 15°
True wind (relative to initial course) from [illegible] Direction. Force 2-3
State of Sea 3 (Douglas Scale.)

Trial No. 6. Speed 12 *Knots. Rudder 15 P.

	15		45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	01-00	01-35	[illegible]	02-45	03-51	05-05	06-18	[illegible]	08-43	09-56	[illegible]	[illegible]	13-40	[illegible]
2. Transfer (b), (c)	40	120	228	540	750	[illegible]	1248	[illegible]	[illegible]	[illegible]	[illegible]	501	174	55
3. Advance (d)	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	423	[illegible]	[illegible]	244
4. Length of Arc	415	[illegible]	[illegible]	[illegible]	269	[illegible]	400	409	390	412	412	412	448	401
5. Mean speed	12.2	[illegible]	[illegible]	[illegible]	11.4	11.0	10.8	10.6	10.4	[illegible]	10.3	10.5	10.3	10.2
6. Speed at end of each 30°		[illegible]		[illegible]	9.6	7.8	9.8	9.8	9.9	10.0	[illegible]	[illegible]	10.0	[illegible]
7. %age of original speed at end of each 30°		[illegible]		85%	75%	69%	77%	77%	77%	79%	80%	77%	79%	78%
8. Distance to New Course	260	422	608	746	1074	1650	—	—						
9. Time Correction	[illegible]	[illegible]	01-14	01-36	02-06	02-24	—	—	—	—	—			
10. Intermediate Course	[illegible]	[illegible]	15	22	34	47	60½	75	88½	102½	115	[illegible]	103½	10½
11. Intermediate Distance	[illegible]	[illegible]	[illegible]	1040	1310	1478	1547	1612	1532	1315	1000	619	115	[illegible]
12. Time Correction	[illegible]	01-35	02-01	02-45	04-00	05-36	06-54	08-03	09-08	10-22	11-34	12-45	14-06	[illegible]

Initial Speed during 1st minute (before putting rudder over) 12 knots.
Initial revolution of engine during 1st minute (before rudder is put over) Starboard [illegible] Port 92
Time taken to put rudder over secs.
Angle of rudder recorded at rudder head [illegible]
True wind (relative to initial course) [illegible] Direction. Force [illegible]
State of Sea [illegible] (Douglas Scale.)

Trial No. 7. Speed 18 *Knots. Rudder 25 S.

	15		45	60	90	120	150	180	210	240	270	300	330	360
1. Time of Turning (a)	00-35	01-06	01-21	01-40	02-19	03-02	03-46	04-25	05-07	05-52	06-34	07-20	08-02	08-48
2. Transfer (b), (c)	Nil	54	160	272	551	865	1122	1240	1176	968	675	332	60	-55
3. Advance (d)	405	568	720	922	930	885	690	398	708	-142	-330	-255	-50	270
4. Length of Arc	405	590	770	932	1237	1559	1890	2220	2540	2885	3213	3566	3916	4256
5. Mean speed	18.1	17.7	17.0	16.7	15.8	15.3	16.0	14.9	14.9	14.8	14.6	14.6	14.6	14.6
6. Speed at end of each 30°		17.3		16.2	15.3	14.9	14.8	14.8	14.8	14.9	14.6	14.6	14.6	14.6
7. %age of original speed at end of each 30°		96%		90%	85%	83%	82%	82%	82%	82%	82%	82%	82%	82%
8. Distance to New Course	405	490	562	660	930	1349	—	—	—	—	—	—	—	—
9. Time Correction	00-25	00-53	01-10	01-23	01-47	01-49	—	—	—	—	—	—	—	—
10. Intermediate Course	0	6	12	[illegible]	31	44	58	72	86	101	116	127	135	-11
11. Intermediate Distance	410	580	730	[illegible]	1080	1240	1319	1300	1185	990	755	420	90	210
12. Time Correction	00-35	01-03	01-31	01-53	02-41	03-29	04-16	04-56	05-38	06-24	07-08	07-54	08-32	[illegible]

Initial Speed during 1st minute (before putting rudder over) 18 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard 149 Port 148
Time taken to put rudder over 10 secs.
Angle of rudder recorded at rudder head
True wind (relative to initial course) from R20 Direction. Force [illegible]
State of Sea Calm (Douglas Scale.)

Trial No. 8. Speed 18 *Knots Rudder 25° P.

1. Time of Turning (a)	00-38	00-54	01-18	01-35	02-16	03-02	03-42	04-32	05-16	06-01	06-46	07-30	08-14	08-57
2. Transfer (b), (c)	22	82	192	350	658	980	1250	1378	1298	1086	764	415	140	22
3. Advance (d)	405	665	765	870	970	925	640	555	10	-265	-395	345	-155	200
4. Length of Arc	410	630	825	985	1335	1670	2045	2345	2765	3115	3465	5830	4110	4550
5. Mean speed	18.5	18.1	17.5	19.2	16.6	16.2	15.8	15.5	15.0	14.4	14.8	14.8	14.8	14.8
6. Speed at end of each 30		19.2		17.6	16.8	16.3	15.8	15.6	15.1	14.4	14.8	14.8	14.8	14.8
7. %age of original speed at end of each 30		91%		95%	90%	88%	85%	84%	83%	81%	81%	81%	81%	81%
8. Distance to New Course	342	410	580	685	980	1510	—	—	—	—	—	—	—	—
9. Time Correction	00-37	00-45	00-56	01-06	01-25	01-26	—	—	—	—	—	—	—	—
10. Intermediate Course	3	8	14	21	34	47	61	75	90	104	118	130	137	7
11. Intermediate Distance	400	615	740	920	1175	1355	1440	1415	1300	1110	865	535	210	200
12. Time Correction	00-38	01-01	01-23	01-43	02-30	03-20	04-01	04-57	05-46	06-32	07-18	08-02	08-44	09-29

Initial Speed during 1st minute (before rudder is put over) 18 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard 148, Port 148
Time taken to put rudder over 10 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) G160 Direction Force 2
State of Sea Calm (Douglas Scale.) 1

Trial No. 9. Speed 18 *Knots Rudder 15° S.

1. Time of Turning (a)	00-43	01-08	01-31	01-56	02-40	03-27	04-20	05-01	05-54	06-44	07-34	08-25	09-15	10-06
2. Transfer (b), (c)	20	82	200	340	715	1085	1385	1482	1445	1190	815	388	88	-40
3. Advance (d)	435	665	835	985	1085	1030	780	420	45	-280	-405	-350	-90	+320
4. Length of Arc	435	665	875	1085	1415	1865	2255	2650	3010	3420	3830	4270	4610	5120
5. Mean speed	18.1	17.5	17.3	16.9	16.5	16.3	15.8	15.5	15.3	15.3	15.3	15.3	15.3	15.3
6. Speed at end of each 30		17.6		16.9	16.6	16.2	15.8	15.5	15.3	15.3	15.3	15.3	15.3	15.3
7. %age of original speed at end of each 30		98%		94%	92%	89%	87%	86%	85%	85%	85%	85%	85%	85%
8. Distance to New Course	382	520	646	770	1085	1660	—	—	—	—	—	—	—	—
9. Time Correction	00-37	00-57	01-10	01-27	01-44	01-38	—	—	—	—	—	—	—	—
10. Intermediate Course	3	8	14	20	34	47	60	74	88	103	117	132	138	-8
11. Intermediate Distance	435	662	865	1035	1300	1490	1570	1540	1440	1230	910	520	120	330
12. Time Correction	00-43	01-13	01-38	02-07	02-55	03-44	04-42	05-32	06-21	07-11	08-01	08-52	09-42	10-33

Initial Speed during 1st minute (before rudder is put over) 18 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard 148, Port 148
Time taken to put rudder over 7 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) R20 Direction Force 2
State of Sea Calm (Douglas Scale.) 11

Trial No. 10. Speed 18 *Knots. Rudder 15° P

1. Time of Turning (a)	00-40	01-10	01-28	01-53	02-40	03-30	04-21	05-13	06-07	06-58	07-48	08-41	09-31	10-23
2. Transfer (b), (c)	20	90	205	380	780	1190	1540	1620	1540	1310	935	500	145	20
3. Advance (d)	405	655	825	988	1100	1040	662	400	-110	-415	-530	-480	-210	205
4. Length of Arc	405	670	860	1120	1530	1960	2480	2755	3265	3655	4045	4410	4940	5390
5. Mean speed	18.2	17.3	18	17.8	17.3	16.9	16.9	16.5	16	15.7	15.5	15.5	15.5	15.5
6. Speed at end of each 30		17.9		17.7	17.4	17.1	16.7	16.5	16.1	15.7	15.5	15.5	15.5	15.5
7. %age of original speed at end of each 30		99%		98%	97%	95%	93%	92%	89%	87%	86%	86%	86%	86%
8. Distance to New Course	350	500	615	765	1100	1710	—	—	—	—	—	—	—	—
9. Time Correction	00-31	00-59	01-01	01-11	01-31	01-25	—	—	—	—	—	—	—	—
10. Intermediate Course	2	8	14	21	35	49	67	76	44	108	120	133	144	9
11. Intermediate Distance	405	660	850	1060	1340	1610	1670	1660	1540	1370	1080	695	255	215
12. Time Correction	00-40	01-17	01-28	01-55	02-47	03-41	04-32	05-26	06-27	07-20	08-15	09-06	09-56	10-48

Initial Speed during 1st minute (before rudder is put over) 18 knots.
Initial revolution of engine during 1st minute (before rudder is put over) Starboard 148, Port 148
Time taken to put rudder over 7 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) G100 Direction Force 2
State of Sea Calm. (Douglas Scale.) 11

Trial No. 11 Speed 21 *Knots Tactical Rudder 25° S.

1. Time of Turning (a)	00-32	00-50	01-02	01-22	01-58	02-41	03-11	03-47	04-24	05-00	05-37	06-13	06-48	07-24
2. Transfer (b), (c)	15	80	160	286	566	836	1140	1200	1117	1008	700	370	90	10
3. Advance (d)	382	580	580	825	980	480	708	288	105	-152	-288	-232	-36	282
4. Length of Arc	386	538	753	918	1230	1500	1900	2328	2514	2322	3150	3480	3624	4154
5. Mean speed	21	20.6	20	19.8	19.1	19.0	11.8	17.8	17.3	17.2	16.8	16.8	16.8	17.0
6. Speed at end of each 30		20.5		19.5	19.6	18.4	18.4	17.5	17.4	17.1	16.9	16.8	16.9	16.9
7. %age of original speed at end of each 30		98%		96%	96%	88%	88%	83%	83%	82%	81%	80%	81%	81%
8. Distance to New Course	340	438	560	662	970	1450	—	—	—	—	—	—	—	—
9. Time Correction	00-29	00-39	00-42	00-52	01-11	01-21	—	—	—	—	—	—	—	—
10. Intermediate Course	2	8	13	19	30	41	58	76½	85	99	111	121	112	3
11. Intermediate Distance	380	582	740	872	1148	12-70	1340	1230	1170	1020	150	440	100	285
12. Time Correction	00-32	00-53	01-08	01-32	01-56	02-[illegible]	03-37	04-14	04-55	05-34	06-12	06-47	07-24	07-59

Initial Speed during 1st minute (before putting rudder over) 21 knots
Initial revolution of engine during 1st minute (before rudder is put over) Starboard 172, Port 172
Time taken to put rudder over secs.
Angle of rudder recorded at rudder head 25°
True wind (relative to initial course) Direction [illegible] Force 1
State of Sea Calm (Douglas Scale.)

* Knots

Alteration of Course	15°	30	45°	60°	[illegible]	120°	150°	180°	210°	240°	270°	300°	330°	360°
Trial No. 12. Speed [illegible] *Knots														
Tactical Rudder [illegible] °P.														
1. Time of Turning (a)	00-32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	04-5[illegible]	05-4[illegible]	[illegible]	[illegible]	[illegible]
2. Transfer (b), (c)	16	30	[illegible]	[illegible]	[illegible]	448	[illegible]	[illegible]	[illegible]	1100	[illegible]	[illegible]	[illegible]	[illegible]
3. Advance (d)	386	[illegible]	[illegible]	[illegible]	[illegible]	955	[illegible]	[illegible]	[illegible]	-280	[illegible]	-546	[illegible]	[illegible]
4. Length of Arc	340	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5118	[illegible]	[illegible]	[illegible]	[illegible]
5. Mean speed	21.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.9	17.7	[illegible]	[illegible]	[illegible]
6. Speed at end of each 30°		[illegible]		[illegible]	[illegible]	19.4	[illegible]	[illegible]	[illegible]	18.9	17.7	[illegible]	[illegible]	[illegible]
7. %age of original speed at end of each 30°		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	87%	87%	[illegible]	[illegible]	[illegible]
8. Distance to New Course	320	[illegible]	545	673	[illegible]	[illegible]	—	—	—	—	—	—	—	—
9. Time Correction	00-27	[illegible]	[illegible]	[illegible]	01-15	[illegible]	—	—	—	—	—	—	—	—
10. Intermediate Course	3	[illegible]	10	21	33	[illegible]	[illegible]	[illegible]	[illegible]	104	119	121	126	[illegible]
11. Intermediate Distance	390	[illegible]	[illegible]	320	1170	1545	[illegible]	[illegible]	[illegible]	1130	810	520	114	[illegible]
12. Time Correction	00-32	[illegible]	[illegible]	01-27	02-07	[illegible]-52	[illegible]	[illegible]	[illegible]1-45	06-22	05-57	[illegible]	[illegible]	[illegible]
Trial No. 13. Speed 21 *Knots														
Tactical Rudder 15 °S.														
1. Time of Turning (a)	00-42	01-02	01-25	01-44	02-23	03-04	03-43	04-21	05-02	05-48	06-27	07-08	07-49	08-30
2. Transfer (b), (c)	30	115	222	370	720	1040	1444	1540	1480	1828	860	460	150	20
3. Advance (d)	492	724	905	1030	1160	1160	916	475	80	-205	-360	-306	-50	320
4. Length of Arc	[illegible]	740	950	1145	1515	1843	[illegible]	2727	3232	[illegible]	4012	4417	4822	5222
5. Mean speed	21.0	20.5	19.8	19.4	19.0	18.9	18.4	18.4	18.1	18.0	17.8	17.4	17.4	17.2
6. Speed at end of each 30°		20.6		19.7	19.2	18.9	18.0	18.4	18.3	18.0	17.9	17.6	17.4	17.3
7. %age of original speed at end of each 30°		97%		94%	92%	92%	89%	88%	88%	86%	86%	84%	84%	83%
8. Distance to New Course	565	525	[illegible]	716	1160	1710	—	—	—	—	—	—	—	—
9. Time Correction	00-32	00-55	00-58	01-09	01-22	01-24	—	—	—	—	—	—	—	—
10. Intermediate Course	6½	9	14	20	32	42	59	73	87	100	113	125	107	3
11. Intermediate Distance	490	725	920	1090	1360	1540	1675	1620	1480	1248	940	558	160	320
12. Time Correction	00-46	01-12	01-35	01-44	02-40	03-25	04-07	04-50	05-33	06-13	06-53	07-32	08-19	09-00
Trial No. 14. Speed 21 *Knots														
Tactical Rudder 15 °P.														
1. Time of Turning (a)	00-37	01-00	01-21	01-43	02-26	03-11	03-54	04-39	05-23	06-07	06-51	07-34	08-20	09-04
2. Transfer (b), (c)	20	80	225	395	750	1195	1530	1740	1700	1390	930	490	124	-40
3. Advance (d)	440	675	862	1000	1130	1062	825	375	50	-445	-544	-515	-230	204
4. Length of Arc	440	690	930	1150	1545	1995	2406	2895	3215	3806	4286	4736	5198	5658
5. Mean speed	20.9	20.5	20.4	20.0	19.2	18.8	18.6	18.5	18.0	18.1	18.5	18.5	18.5	18.5
6. Speed at end of each 30°		20.6		20.3	19.6	18.9	18.6	18.3	18.3	18.3	18.3	18.5	18.5	18.5
7. %age of original speed at end of each 30°		98%		98%	95%	92%	89%	87%	87%	87%	87%	88%	88%	88%
8. Distance to New Course	360	530	640	778	1130	1755	—	—	—	—	—	—	—	—
9. Time Correction	00-35	00-20	00-59	00-59	01-39	01-09	—	—	—	—	—	—	—	—
10. Intermediate Course	2½	7	14	22	34	49	62	78	88	107½	122	136	151	350
11. Intermediate Distance	435	690	890	1020	1355	1610	1740	1784	1705	1450	1098	705	260	205
12. Time Correction	00-42	01-04	01-26	01-49	02-41	03-29	04-14	05-00	05-48	06-39	07-12	07-57	08-40	09-25

Trial No. 12:

Initial Speed during 1st minute (before rudder is put over) [illegible] knots.
Initial revolution of engine during 1st minute (before rudder is put over) Starboard [illegible] Port [illegible]
Time taken to put rudder over [illegible] secs.
Angle of rudder recorded at rudder head [illegible] °.
True wind (relative to initial course) Direction [illegible] Force 1
State of Sea [illegible]
(Douglas Scale.)

Trial No. 13:

Initial Speed during 1st minute (before rudder is put over) 21 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard 178 Port 178
Time taken to put rudder over 7 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) Direction [illegible] Force 1
State of Sea Calm.
(Douglas Scale.)

Trial No. 14:

Initial Speed during 1st minute (before rudder is put over) 20.7 knots.
Initial revolutions of engine during 1st minute (before rudder is put over) Starboard 178 Port 178
Time taken to put rudder over 7 secs.
Angle of rudder recorded at rudder head °
True wind (relative to initial course) Direction Ahead Force 1
State of Sea Calm.
(Douglas Scale.)

Notes.—* Insert speed.
(a) From the time of ordering the rudder to be put over.
(b) The transfer for any number of degrees is the distance the ship is transferred to the right or left whilst turning that number of degrees measured at right angles to the original course.
(c) The Tactical Diameter is the transfer for the first 180°.
(d) The advance for any number of degrees is the distance the ship is advanced from the position when putting the rudder over in the direction of the original course whilst turning that number of degrees.

STARTING AND STOPPING TRIALS.

No.																					
15	[illegible]	[illegible]	[illegible]	[illegible]	10·5	11·0	9·6	9·6	9·6	9·1	9·2	7·7	7·6	9·3	5505	10	0			G 40°	
16	[illegible]	[illegible]	[illegible]	[illegible]	7·2	16·5	5·5	4·5	3·6	5·4	5·1	2·7	2·6	2·5	1200	7	0			S15	5 / 30
17	[illegible]	[illegible]	[illegible]	[illegible]	0	0·4	1·2	5·4	11	11	11·4	11·1	12·1	12·1	1750	7	0			R 120° / S 20°	5 / 50
18	[illegible]	[illegible]	[illegible]	[illegible]	7·5	7·5	4·2	0	0	1·1	5·4	3·1	5·4	11	750	4	0	1	Stbd.	G 120° / G 40°	1 / 20
19	[illegible]	[illegible]	[illegible]	[illegible]	12·9	7·1	2·7	3·0	1·2	2·4	4·2	3·1	6·0	6·5		5	20	0	Stbd.	G 120°	1 / 20
20	[illegible]	[illegible]	[illegible]	[illegible]	10·5	10·1	7·7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11·2	1010	4	15	5	Stbd.	G 120°	20

MANŒUVRING TRIALS.

INSTRUCTIONS FOR CARRYING OUT TRIALS (Only to be carried out by Cruisers, Aircraft Carriers and Capital Ships.)

[illegible]

Speed ... 18 ... Slight (S1) ... Wind ... Steering Gear ...

No.											
21	35° S.	[illegible]	[illegible]	[illegible]	[illegible]	41°	14[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Corrected speed by Log		17·6 Knots	17·6 Knots	17·[illegible] Knots						
22	35° P.	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Corrected speed by Log		17·6 Knots	17·3 Knots	17·6 Knots						