ZIG-ZAG DIAGRAMS

FOR SINGLE SHIPS AND CONVOYS

1940

CERTIFICATE OF AMENDMENTS AND CORRECTIONS

Correction No	Authority	Initials	Rank	Date of Insertion
1	SE 42/43	R.C.	O/codet	29/3/44
2	SC54/44	R.C.	O/codet	29/3/44

TABULAR ANALYSIS OF ZIG-ZAG DIAGRAMS

AREA FOR WHICH INTENDED	DIAGRAMS FOR USE BY SHIPS			DIAGRAMS FOR USE BY CONVOYS	
	For general use	For use by ships up to 16 knots	For use by fast ships (16 knots and over)	For general use	For use by fast convoys (12 knots and over)
Open waters where submarines have not previously been operating, but where they may appear	1, 8	2	9, 37		
General use in submarine areas	3, 4, 5,* 6, 20, 21, 23, 24, 29, 34, 35	25, 26	22, 27,† 28, 41, 42	10,†† 11, 12, 14, 15,†† 16, 17, 18, 21, 38, 39	19, 27, 40
Specially dangerous waters	7, 30, 32, 36	31, 33, 43		30	

* Suitable for use in specially dangerous waters by ships of 8 knots and under.

† Suitable for use by ships of 12 knots and over.

†† Never to be used by single ships.

Page (i). *Insert* note as follows :—

Note.—THE MORE COMPLEX THE ZIG-ZAG, THE GREATER THE PROTECTION. Several of the more complicated schemes contained in B.R. 248 should be used, and they should be varied from day to day in order to prevent an enemy becoming familiar with them. It is most undesirable that the same zig-zag should always be adopted as a matter of course.
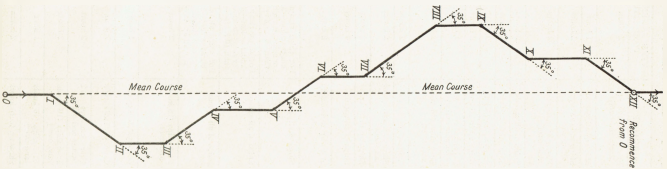
SUMMARY OF ZIG-ZAG DIAGRAMS

ZIG-ZAG No.	AREA FOR WHICH INTENDED	SUITABLE FOR	TIME TAKEN TO COMPLETE	REMARKS
1	Open waters where submarines have not previously been operating, but where they may appear	Ships of all speeds	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	
2	Open waters where submarines have not previously been operating, but where they may appear	Ships up to 16 knots	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	
3	General use in submarine areas	Ships of all speeds	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	Always to port of the Mean Course. The reverse is No. 34
4	General use in submarine areas	Ships of all speeds	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	Always to starboard of the Mean Course. The reverse is No. 33
5	General use in submarine areas	Ships of all speeds	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	Also for use in specially dangerous waters by ships of 8 knots and under
6	General use in submarine areas	Ships of all speeds	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	
7	Specially dangerous waters	Ships of all speeds	For ships steaming 10 knots or less—2 hours For ships steaming more than 10 knots—1 hour	Always to port of the Mean Course. The reverse is No. 36
8	Open waters where submarines have not previously been operating, but where they may appear	Ships of all speeds	2 hours	
9	Open waters where submarines have not previously been operating, but where they may appear	Fast ships (16 knots and over)	2 hours	Always to starboard of the Mean Course. The reverse is No. 37
10	General use in submarine areas	Convoys of all speeds	1 hour	Never to be used by single ships. Should only be used by convoys in low visibility or when the state of the sea makes large alterations of course dangerous or undesirable
11	General use in submarine areas	Convoys of all speeds	2 hours	
12	General use in submarine areas	Convoys of all speeds	1 hour	Always to starboard of the Mean Course. The reverse is No. 38
14	General use in submarine areas	Convoys of all speeds	2 hours	
15	General use in submarine areas	Convoys of all speeds	1 hour	Never to be used by single ships. Should only be used by convoys in low visibility or when the state of the sea makes large alterations of course dangerous or undesirable
16	General use in submarine areas	Convoys of all speeds	2 hours	
17	General use in submarine areas	Convoys of all speeds	1 hour	Always to starboard of the Mean Course. The reverse is No. 39
18	General use in submarine areas	Convoys of all speeds	2 hours	

Summary of zig-zag diagrams (continued)

ZIG-ZAG No.	AREA FOR WHICH INTENDED	SUITABLE FOR	TIME TAKEN TO COMPLETE	REMARKS
19	General use in submarine areas	Fast convoys (16 knots and over)	1 hour	Always to starboard of the Mean Course. The reverse is No. 40
20	General use in submarine areas	Ships of all speeds	2 hours	
21	General use in submarine areas	Ships and convoys of all speeds	2 hours	
22	General use in submarine areas	Fast ships (16 knots and over)	2 hours	Always to starboard of the Mean Course. The reverse is No. 41
23	General use in submarine areas	Ships of all speeds	2 hours	
24	General use in submarine areas	Ships of all speeds	2 hours	
25	General use in submarine areas	Ships up to 16 knots	2 hours	
26	General use in submarine areas	Ships up to 16 knots	2 hours	
27	General use in submarine areas	Ships and convoys of 12 knots and over	1 hour	
28	General use in submarine areas	Fast ships (16 knots and over)	1 hour	Always to starboard of the Mean Course. The reverse is No. 42
29	General use in submarine areas	Ships of all speeds	2 hours	
30	Specially dangerous waters	Ships and convoys of all speeds	2 hours	
31	Specially dangerous waters	Ships up to 16 knots	2 hours	
32	Specially dangerous waters	Ships of all speeds	4 hours	A modified form of zig-zag No. 28
33	Specially dangerous waters	Ships up to 16 knots	2 hours	Always to starboard of the Mean Course. The reverse is No. 43
34	General use in submarine areas	Ships of all speeds	For ships steaming 10 knots or less— ½ hour. For ships steaming more than 10 knots— ¼ hour	Always to starboard of the Mean Course. The reverse is No. 3
35	General use in submarine areas	Ships of all speeds	For ships steaming 10 knots or less— ½ hour. For ships steaming over than 10 knots— ¼ hour	Always to port of the Mean Course. The reverse is No. 4
36	Specially dangerous waters	Ships of all speeds	For ships steaming 10 knots or less— ½ hour. For ships steaming more than 10 knots— ¼ hour	Always to starboard of the Mean Course. The reverse is No. 7
37	Open waters where submarines have not previously been operating, but where they may appear	Fast ships (16 knots and over)	2 hours	Always to port of the Mean Course. The reverse is No. 9
38	General use in submarine areas	Convoys of all speeds	1 hour	Always to port of the Mean Course. The reverse is No. 14
39	General use in submarine areas	Ships of all speeds	1 hour	Always to port of the Mean Course. The reverse is No. 17
40	General use in submarine areas	Fast convoys (16 knots and over)	2 hours	Always to port of the Mean Course. The reverse is No. 19
41	General use in submarine areas	Fast ships (16 knots and over)	2 hours	Always to port of the Mean Course. The reverse is No. 22
42	General use in submarine areas	Fast ships (16 knots and over)	1 hour	Always to port of the Mean Course. The reverse is No. 28
43	Specially dangerous waters	Ships up to 16 knots	2 hours	Always to port of the Mean Course. The reverse is No. 33

O

Mean Course

Mean Course

Recommence
from O

ZIG-ZAG

For use in open waters where submarines have not previously been operating, but where they may appear.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 90% of distance run

Position	Ships steaming 10 knots or less		Ships steaming more than 10 knots		Amount to alter course	Amount ship's head is off the Mean Course
	Time		Time			
	Hr.	Min.	Hr.	Min.		
0	0	00	0	00	~	0°
I	0	07½	0	03¾	35° to Starboard	35° to Starboard
II	0	22½	0	11¼	35° to Port	0°
III	0	30	0	15	35° to Port	35° to Port
IV	0	40	0	20	35° to Starboard	0°
V	0	50	0	25	35° to Port	35° to Port
VI	1	00	0	30	35° to Starboard	0°
VII	1	07½	0	33¾	35° to Port	35° to Port
VIII	1	22½	0	41¼	35° to Starboard	0°
IX	1	30	0	45	35° to Port	35° to Starboard
X	1	40	0	50	35° to Port	0°
XI	1	50	0	55	35° to Starboard	35° to Starboard
XII	2	00	1	00	35° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)						Distance made good each hour along the Mean Course (in miles)
	0 to I and VI to VII	I to II and VII to VIII	II to III and VIII to IX	III to IV and IX to X	IV to V and X to XI	V to VI and XI to XII	
6	0·75	1·5	0·75	1·0	1·0	1·0	5·4
7	0·87	1·75	0·87	1·17	1·17	1·17	6·3
8	1·0	2·0	1·0	1·33	1·33	1·33	7·2
9	1·12	2·25	1·12	1·5	1·5	1·5	8·1
10	1·25	2·5	1·25	1·67	1·67	1·67	9·0
11	0·69	1·37	0·69	0·92	0·92	0·92	9·9
12	0·75	1·5	0·75	1·0	1·0	1·0	10·8
13	0·81	1·63	0·81	1·08	1·08	1·08	11·7
14	0·87	1·75	0·87	1·17	1·17	1·17	12·6
15	0·94	1·87	0·94	1·25	1·25	1·25	13·5
16	1·0	2·0	1·0	1·33	1·33	1·33	14·4
17	1·06	2·12	1·06	1·42	1·42	1·42	15·3

For use in open waters where submarines have not previously been operating, but where they may appear.

SUITABLE FOR SHIPS OF SPEEDS UP TO 16 KNOTS

The diagram takes FOUR hours to complete for ships steaming at 10 knots or less, and TWO hours to complete for ships steaming at more than 10 knots.

Distance made good = 90% of distance run

Positions and Times for alterations of course					
Position	Ships steaming 10 knots or less Time Hr. Min.		Ships steaming more than 10 knots Time Hr. Min.		Amount to alter course	Amount ship's head is off the Mean Course
0	0	00	0	00	~	0°
I	0	15	0	07½	35° to Starboard	35° to Starboard
II	0	35	0	17½	35° to Port	0°
III	0	50	0	25	35° to Starboard	35° to Starboard
IV	1	00	0	30	35° to Port	0°
V	1	15	0	37½	35° to Port	35° to Port
VI	1	35	0	47½	35° to Starboard	0°
VII	1	50	0	55	35° to Port	35° to Port
VIII	2	00	1	00	35° to Starboard	0°
IX	2	15	1	07½	35° to Port	35° to Port
X	2	35	1	17½	35° to Starboard	0°
XI	2	50	1	25	35° to Port	35° to Port
XII	3	00	1	30	35° to Starboard	0°
XIII	3	15	1	37½	35° to Starboard	35° to Starboard
XIV	3	35	1	47½	35° to Port	0°
XV	3	50	1	55	35° to Starboard	35° to Starboard
XVI	4	00	2	00	35° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the MeanCourse (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	1·5	2·0	1·5	1·0	1·5	2·0	1·5	1·0	5·4
7	1·75	2·33	1·75	1·17	1·75	2·33	1·75	1·17	6·3
8	2·0	2·67	2·0	1·33	2·0	2·67	2·0	1·33	7·2
9	2·25	3·0	2·25	1·5	2·25	3·0	2·25	1·5	8·1
10	2·5	3·33	2·5	1·67	2·5	3·33	2·5	1·67	9·0
11	1·38	1·83	1·38	0·92	1·38	1·83	1·38	0·92	9·9
12	1·5	2·0	1·5	1·0	1·5	2·0	1·5	1·0	10·8
13	1·62	2·17	1·62	1·08	1·62	2·17	1·62	1·08	11·7
14	1·75	2·33	1·75	1·17	1·75	2·33	1·75	1·17	12·6
15	1·87	2·5	1·87	1·25	1·87	2·5	1·87	1·25	13·5
16	2·0	2·67	2·0	1·33	2·0	2·67	2·0	1·33	14·4

No. 3

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 85% of distance run

(**Note**:—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 34.*)

Positions and Times for alterations of course						Amount to alter course	Amount ship's head is off the Mean Course
Position	Ships steaming 10 knots or less		Ships steaming more than 10 knots				
	Time		Time				
	Hr.	Min.	Hr.	Min.			
0	0	00	0	00		—	0°
I	0	13½	0	06¾	20° to Port	20° to Port
II	0	30	0	15	40° to Port	60° to Port
III	0	43½	0	21¾	40° to Starboard	20° to Port
IV	1	00	0	30	20° to Starboard	0°
V	1	13½	0	36¾	20° to Starboard	20° to Starboard
VI	1	30	0	45	40° to Starboard	60° to Starboard
VII	1	43½	0	51¾	40° to Port	20° to Starboard
VIII	2	00	1	00	20° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)				Distance made good each hour along the Mean Course (in miles)
	0 to I and IV to V	I to II and V to VI	II to III and VI to VII	III to IV and VII to VIII	
6	1·35	1·65	1·35	1·65	5·1
7	1·57	1·93	1·57	1·93	5·95
8	1·8	2·2	1·8	2·2	6·8
9	2·02	2·48	2·02	2·48	7·65
10	2·25	2·75	2·25	2·75	8·5
11	1·24	1·51	1·24	1·51	9·35
12	1·35	1·65	1·35	1·65	10·2
13	1·46	1·79	1·46	1·79	11·05
14	1·57	1·93	1·57	1·93	11·9
15	1·69	2·06	1·69	2·06	12·75
16	1·8	2·2	1·8	2·2	13·6
17	1·91	2·34	1·91	2·34	14·45

No. 4

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 82% of distance run

(Note:—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 35.)*

Positions and Times for alterations of course						
Position	Ships steaming 10 knots or less		Ships steaming more than 10 knots		Amount to alter course	Amount ship's head is off the Mean Course
	Time		Time			
	Hr.	Min.	Hr.	Min.		
0	0	00	0	00	$\sim$	0°
I	0	13½	0	06¾	30° to Starboard	30° to Starboard
II	0	30	0	15	30° to Starboard	60° to Starboard
III	0	43½	0	21¾	30° to Port	30° to Starboard
IV	1	00	0	30	30° to Port	0°
V	1	13½	0	36¾	30° to Port	30° to Port
VI	1	30	0	45	30° to Port	60° to Port
VII	1	43½	0	51¾	30° to Starboard	30° to Port
VIII	2	00	1	00	30° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)				Distance made good each hour along the Mean Course (in miles)
	0 to I and IV to V	I to II and V to VI	II to III and VI to VII	III to IV and VII to VIII	
6	1·33	1·67	1·33	1·67	4·92
7	1·56	1·94	1·56	1·94	5·74
8	1·78	2·22	1·78	2·22	6·56
9	2·0	2·5	2·0	2·5	7·38
10	2·22	2·78	2·22	2·78	8·2
11	1·22	1·53	1·22	1·53	9·02
12	1·33	1·67	1·33	1·67	9·84
13	1·44	1·81	1·44	1·81	10·66
14	1·56	1·94	1·56	1·94	11·48
15	1·67	2·08	1·67	2·08	12·3
16	1·78	2·22	1·78	2·22	13·12
17	1·89	2·36	1·89	2·36	13·94

No. 5

For general use in submarine areas. (Also for use in specially dangerous waters by ships of 8 knots and under.)

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 86% of distance run

Positions and Times for alterations of course					
Position	Ships steaming 10 knots or less		Ships steaming more than 10 knots		Amount to alter course
	Time		Time		
	Hr.	Min.	Hr.	Min.	
0	0	00	0	00	~
I	0	00	0	02½	60° to Starboard
II	0	15	0	07½	40° to Starboard
III	0	30	0	15	50° to Port
IV	0	35	0	17½	30° to Starboard
V	0	45	0	22½	30° to Port
VI	1	00	0	30	30° to Starboard
VII	1	05	0	32½	60° to Port
VIII	1	15	0	37½	40° to Starboard
IX	1	30	0	45	50° to Starboard
X	1	35	0	47½	30° to Port
XI	1	45	0	52½	30° to Starboard
XII	2	00	1	00	~

	Amount ship's head is off the Mean Course
	0°
	60° to Starboard
	20° to Starboard
	30° to Port
	0°
	30° to Port
	0°
	60° to Port
	20° to Port
	30° to Starboard
	0°
	30° to Starboard
	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)						Distance made good each leg along the Mean Course (in miles)
	0 to I and VI to VII	I to II and VII to VIII	II to III and VIII to IX	III to IV and IX to X.	IV to V and X to XI	V to VI and XI to XII	
6	0·5	1·0	1·5	0·5	1·0	1·5	5·16
7	0·58	1·17	1·75	0·58	1·17	1·75	6·02
8	0·67	1·33	2·0	0·67	1·33	2·0	6·88
9	0·75	1·5	2·25	0·75	1·5	2·25	7·74
10	0·83	1·67	2·5	0·83	1·67	2·5	8·6
11	0·46	0·92	1·37	0·46	0·92	1·37	9·46
12	0·5	1·0	1·5	0·5	1·0	1·5	10·32
13	0·54	1·08	1·63	0·54	1·08	1·63	11·18
14	0·58	1·17	1·75	0·58	1·17	1·75	12·04
15	0·62	1·25	1·88	0·62	1·25	1·88	12·9
16	0·67	1·33	2·0	0·67	1·33	2·0	13·76
17	0·71	1·42	2·12	0·71	1·42	2·12	14·62

No. 6

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 86% of distance run

	Ships steaming 10 knots or less		Ships steaming more than 10 knots		Amount to alter course		Amount ship's head is off the Mean Course
Position	Time		Time				
	Hr.	Min.	Hr.	Min.			
0	0	00	0	00	~		0°
I	0	05	0	02½	20° to Starboard		20° to Starboard
II	0	14	0	07	30° to Starboard		50° to Starboard
III	0	26	0	13	60° to Port		10° to Port
IV	0	41	0	20½	40° to Starboard		30° to Starboard
V	0	50	0	25	70° to Port		40° to Port
VI	1	00	0	30	40° to Starboard		0°
VII	1	05	0	32½	20° to Port		20° to Port
VIII	1	14	0	37	30° to Port		50° to Port
IX	1	26	0	43	60° to Starboard		10° to Starboard
X	1	41	0	50½	40° to Port		30° to Port
XI	1	50	0	55	70° to Starboard		40° to Starboard
XII	2	00	1	00	40° to Port		0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)						Distance made good each hour along the Mean Course (in miles)
	0 to I and VI to VII	I to II and VII to VIII	II to III and VIII to IX	III to IV and IX to X	IV to V and X to XI	V to VI and XI to XII	
6	0·5	0·9	1·2	1·5	0·9	1·0	5·16
7	0·58	1·05	1·4	1·75	1·05	1·17	6·02
8	0·67	1·2	1·6	2·0	1·2	1·33	6·88
9	0·75	1·35	1·8	2·25	1·35	1·5	7·74
10	0·83	1·5	2·0	2·5	1·5	1·67	8·6
11	0·46	0·82	1·1	1·38	0·82	0·92	9·46
12	0·5	0·9	1·2	1·5	0·9	1·0	10·32
13	0·54	0·97	1·3	1·62	0·97	1·08	11·18
14	0·58	1·05	1·4	1·75	1·05	1·17	12·04
15	0·62	1·13	1·5	1·87	1·13	1·25	12·9
16	0·67	1·2	1·6	2·0	1·2	1·33	13·76
17	0·71	1·28	1·7	2·12	1·28	1·42	14·62

No. 7

For use in specially dangerous waters.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 70% of distance run

(**Note:**—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag is to Starboard of the Mean Course is No. 36.*)

Positions and Times for alterations of course					Amount to alter course	Amount ship's head is off the Mean Course
Position	Ships steaming 10 knots or less		Ships steaming more than 10 knots			
	Time		Time			
	Hr.	Min.	Hr.	Min.		
0	0	00	0	00	~	0°
I	0	13½	0	06¾	40° to Port	40° to Port
II	0	30	0	15	40° to Port	80° to Port
III	0	43½	0	21¾	40° to Starboard	40° to Port
IV	1	0	0	30	40° to Starboard	0°
V	1	13½	0	36¾	40° to Starboard	40° to Starboard
VI	1	30	0	45	40° to Starboard	80° to Starboard
VII	1	43½	0	51½	40° to Port	40° to Starboard
VIII	2	00	1	00	40° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)				Distance made good each hour along the Mean Course (in miles)
	0 to I and IV to V	I to II and V to VI	II to III and VI to VII	III to IV and VII to VIII	
6	1·33	1·67	1·33	1·67	4·2
7	1·56	1·94	1·56	1·94	4·9
8	1·78	2·22	1·78	2·22	5·6
9	2·0	2·5	2·0	2·5	6·3
10	2·22	2·78	2·22	2·78	7·0
11	1·22	1·53	1·22	1·53	7·7
12	1·33	1·67	1·33	1·67	8·4
13	1·44	1·81	1·44	1·81	9·1
14	1·56	1·94	1·56	1·94	9·8
15	1·67	2·08	1·67	2·08	10·5
16	1·78	2·22	1·78	2·22	11·2
17	1·89	2·36	1·89	2·36	11·9

For use in open waters where submarines have not previously been operating, but where they may appear.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = **93%** of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 04	25° to Starboard	25° to Starboard
II	0 12	50° to Port	25° to Port
III	0 20	25° to Starboard	0°
IV	0 24	25° to Port	25° to Port
V	0 32	50° to Starboard	25° to Starboard
VI	0 40	25° to Port	0°
VII	0 44	25° to Starboard	25° to Starboard
VIII	0 52	50° to Port	25° to Port
IX	1 00	25° to Starboard	0°
X	1 04	25° to Port	25° to Port
XI	1 12	50° to Starboard	25° to Starboard
XII	1 20	25° to Port	0°
XIII	1 24	25° to Starboard	25° to Starboard
XIV	1 32	50° to Port	25° to Port
XV	1 40	25° to Starboard	0°
XVI	1 44	25° to Port	25° to Port
XVII	1 52	50° to Starboard	25° to Starboard
XVIII	2 00	25° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and IX to X	I to II and X to XI	II to III and XI to XII	III to IV and XII to XIII	IV to V and XIII to XIV	V to VI and XIV to XV	VI to VII and XV to XVI	VII to VIII and XVI to XVII	VIII to IX and XVII to XVIII	
6	0·4	0·8	0·8	0·4	0·8	0·8	0·4	0·8	0·8	5·58
7	0·46	0·94	0·94	0·46	0·94	0·94	0·46	0·94	0·94	6·51
8	0·53	1·07	1·07	0·53	1·07	1·07	0·53	1·07	1·07	7·44
9	0·6	1·2	1·2	0·6	1·2	1·2	0·6	1·2	1·2	8·37
10	0·67	1·33	1·33	0·67	1·33	1·33	0·67	1·33	1·33	9·3
11	0·73	1·47	1·47	0·73	1·47	1·47	0·73	1·47	1·47	10·23
12	0·8	1·6	1·6	0·8	1·6	1·6	0·8	1·6	1·6	11·16
13	0·87	1·73	1·73	0·87	1·73	1·73	0·87	1·73	1·73	12·09
14	0·93	1·87	1·87	0·93	1·87	1·87	0·93	1·87	1·87	13·02
15	1·0	2·0	2·0	1·0	2·0	2·0	1·0	2·0	2·0	13·95
16	1·07	2·13	2·13	1·07	2·13	2·13	1·07	2·13	2·13	14·88
17	1·13	2·27	2·27	1·13	2·27	2·27	1·13	2·27	2·27	15·81

For use in open waters where submarines have not previously been operating, but where they may appear.

SUITABLE FOR FAST SHIPS (16 KNOTS AND OVER)

The diagram takes TWO hours to complete.

Distance made good = 90% of distance run

{**Note:**—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 37.*}

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 06	10° to Starboard	10° to Starboard
II	0 15	10° to Starboard	20° to Starboard
III	0 21	10° to Starboard	30° to Starboard
IV	0 30	10° to Starboard	40° to Starboard
V	0 36	10° to Port	30° to Starboard
VI	0 45	10° to Port	20° to Starboard
VII	0 51	10° to Port	10° to Starboard
VIII	1 00	10° to Port	0°
IX	1 06	10° to Port	10° to Port
X	1 15	10° to Port	20° to Port
XI	1 21	10° to Port	30° to Port
XII	1 30	10° to Port	40° to Port
XIII	1 36	10° to Starboard	30° to Port
XIV	1 45	10° to Starboard	20° to Port
XV	1 51	10° to Starboard	10° to Port
XVI	2 00	~	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	14·4
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	15·3
18	1·8	2·7	1·8	2·7	1·8	2·7	1·8	2·7	16·2
19	1·9	2·85	1·9	2·85	1·9	2·85	1·9	2·85	17·1
20	2·0	3·0	2·0	3·0	2·0	3·0	2·0	3·0	18·0
21	2·1	3·15	2·1	3·15	2·1	3·15	2·1	3·15	18·9
22	2·2	3·3	2·2	3·3	2·2	3·3	2·2	3·3	19·8
23	2·3	3·45	2·3	3·45	2·3	3·45	2·3	3·45	20·7
24	2·4	3·6	2·4	3·6	2·4	3·6	2·4	3·6	21·6
25	2·5	3·75	2·5	3·75	2·5	3·75	2·5	3·75	22·5
26	2·6	3·9	2·6	3·9	2·6	3·9	2·6	3·9	23·4
27	2·7	4·05	2·7	4·05	2·7	4·05	2·7	4·05	24·3

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 96% of distance run

(Note:—*This diagram should never be used by single ships. It should only be used by convoys in low visibility or when the state of the sea makes large alterations of course dangerous or undesirable.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00		0°
I	0 06	22½° to Starboard	22½° to Starboard
II	0 15	22½° to Port	0°
III	0 21	22½° to Port	22½° to Starboard
IV	0 30	22½° to Starboard	0°
V	0 36	22½° to Port	22½° to Port
VI	0 45	22½° to Starboard	0°
VII	0 51	22½° to Starboard	22½° to Starboard
VIII	1 00	22½° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	VII to VIII	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	5·76
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	6·72
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	7·68
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	8·64
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	9·60
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	10·56
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	11·52
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	12·48
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	13·44
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	14·40
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	15·36
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	16·32

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 95% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time			
	Hr.	Min.		
0	0	00	~	0°
I	0	10	30° to Port	30° to Port
II	0	20	20° to Starboard	10° to Port
III	0	30	20° to Starboard	10° to Starboard
IV	0	40	30° to Port	20° to Port
V	0	45	45° to Starboard	25° to Starboard
VI	1	00	25° to Port	0°
VII	1	10	30° to Starboard	30° to Starboard
VIII	1	20	20° to Port	10° to Port
IX	1	30	20° to Port	10° to Port
X	1	40	30° to Starboard	10° to Port
XI	1	45	45° to Port	25° to Port
XII	2	00	25° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)						Distance made good each hour along the Mean Course (in miles)
	0 to I and VI to VII	I to II and VII to VIII	II to IV and VIII to IX	III to IV and IX to X	IV to V and X to XI	V to VI and XI to XII	
6	1·0	1·0	1·0	1·0	0·5	1·5	5·70
7	1·17	1·17	1·17	1·17	0·58	1·75	6·65
8	1·33	1·33	1·33	1·33	0·67	2·0	7·60
9	1·5	1·5	1·5	1·5	0·75	2·25	8·55
10	1·67	1·67	1·67	1·67	0·83	2·5	9·50
11	1·83	1·83	1·83	1·83	0·92	2·75	10·45
12	2·0	2·0	2·0	2·0	1·0	3·0	11·40
13	2·17	2·17	2·17	2·17	1·08	3·25	12·35
14	2·33	2·33	2·33	2·33	1·17	3·5	13·30
15	2·5	2·5	2·5	2·5	1·25	3·75	14·25
16	2·67	2·67	2·67	2·67	1·33	4·0	15·20
17	2·83	2·83	2·83	2·83	1·42	4·25	16·15

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 94% of distance run

(**Note**:—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 38.*)

Positions and Time for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	—	0°
I	0 10	10° to Starboard	10° to Starboard
II	0 15	20° to Starboard	30° to Starboard
III	0 25	20° to Port	10° to Starboard
IV	0 35	20° to Port	10° to Port
V	0 45	20° to Port	30° to Port
VI	0 55	20° to Starboard	10° to Port
VII	1 00	10° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	
6	1·0	0·5	1·0	1·0	1·0	1·0	0·5	5·64
7	1·17	0·58	1·17	1·17	1·17	1·17	0·58	6·58
8	1·33	0·67	1·33	1·33	1·33	1·33	0·67	7·52
9	1·5	0·75	1·5	1·5	1·5	1·5	0·75	8·46
10	1·67	0·83	1·67	1·67	1·67	1·67	0·83	9·4
11	1·83	0·92	1·83	1·83	1·83	1·83	0·92	10·34
12	2·0	1·0	2·0	2·0	2·0	2·0	1·0	11·28
13	2·17	1·08	2·17	2·17	2·17	2·17	1·08	12·22
14	2·33	1·17	2·33	2·33	2·33	2·33	1·17	13·16
15	2·5	1·25	2·5	2·5	2·5	2·5	1·25	14·10
16	2·67	1·33	2·67	2·67	2·67	2·67	1·33	15·04
17	2·83	1·42	2·83	2·83	2·83	2·83	1·42	15·98

No. 14

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 92% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 06	34° to Port	34° to Port
II	0 15	11° to Starboard	23° to Port
III	0 21	34° to Starboard	11° to Starboard
IV	0 30	11° to Port	0°
V	0 36	34° to Port	34° to Starboard
VI	0 45	11° to Port	23° to Starboard
VII	0 51	34° to Port	11° to Starboard
VIII	1 00	11° to Starboard	0°
IX	1 06	34° to Starboard	34° to Port
X	1 15	11° to Port	23° to Port
XI	1 21	34° to Starboard	11° to Port
XII	1 30	11° to Starboard	0°
XIII	1 36	34° to Port	34° to Starboard
XIV	1 45	11° to Starboard	23° to Starboard
XV	1 51	34° to Starboard	11° to Starboard
XVI	2 00	11° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	5·52
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	6·44
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	7·36
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	8·28
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	9·20
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	10·12
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	11·04
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	11·96
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	12·88
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	13·80
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	14·72
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	15·64

No. 15

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 91% of distance run

(Note:—This diagram should never be used by single ships. It should only be used by convoys in low visibility or when the state of the sea makes large alterations of course dangerous or undesirable.

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Hr.	Min.		
0	0	00	—	0°
I	0	05	30° to Port	30° to Port
II	0	15	30° to Starboard	0°
III	0	20	30° to Starboard	30° to Starboard
IV	0	30	30° to Port	0°
V	0	35	30° to Starboard	30° to Starboard
VI	0	45	30° to Port	0°
VII	0	50	30° to Port	30° to Port
VIII	1	00	30° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	VII to VIII	
6	0·5	1·0	0·5	1·0	0·5	1·0	0·5	1·0	5·46
7	0·58	1·17	0·58	1·17	0·58	1·17	0·58	1·17	6·37
8	0·67	1·33	0·67	1·33	0·67	1·33	0·67	1·33	7·28
9	0·75	1·5	0·75	1·5	0·75	1·5	0·75	1·5	8·19
10	0·83	1·67	0·83	1·67	0·83	1·67	0·83	1·67	9·10
11	0·92	1·83	0·92	1·83	0·92	1·83	0·92	1·83	10·01
12	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0	10·92
13	1·08	2·17	1·08	2·17	1·08	2·17	1·08	2·17	11·83
14	1·17	2·33	1·17	2·33	1·17	2·33	1·17	2·33	12·74
15	1·25	2·5	1·25	2·5	1·25	2·5	1·25	2·5	13·65
16	1·33	2·67	1·33	2·67	1·33	2·67	1·33	2·67	14·56
17	1·42	2·83	1·42	2·83	1·42	2·83	1·42	2·83	15·47

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 91% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr.	Min.		
0	0	00	~	0°
I	0	06	15° to Starboard	15° to Starboard
II	0	15	30° to Starboard	45° to Starboard
III	0	24	25° to Port	20° to Starboard
IV	0	30	25° to Port	5° to Port
V	0	39	35° to Port	40° to Port
VI	0	45	30° to Starboard	10° to Port
VII	0	51	25° to Port	35° to Port
VIII	1	00	35° to Starboard	0°
IX	1	06	15° to Starboard	15° to Starboard
X	1	15	30° to Starboard	45° to Starboard
XI	1	24	25° to Port	20° to Starboard
XII	1	30	25° to Port	5° to Starboard
XIII	1	39	35° to Port	40° to Starboard
XIV	1	45	30° to Port	10° to Starboard
XV	1	51	25° to Starboard	35° to Starboard
XVI	2	00	35° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·6	0·9	0·9	0·6	0·9	0·6	0·6	0·9	5·46
7	0·7	1·05	1·05	0·7	1·05	0·7	0·7	1·05	6·37
8	0·8	1·2	1·2	0·8	1·2	0·8	0·8	1·2	7·28
9	0·9	1·35	1·35	0·9	1·35	0·9	0·9	1·35	8·19
10	1·0	1·5	1·5	1·0	1·5	1·0	1·0	1·5	9·10
11	1·1	1·65	1·65	1·1	1·65	1·1	1·1	1·65	10·01
12	1·2	1·8	1·8	1·2	1·8	1·2	1·2	1·8	10·92
13	1·3	1·95	1·95	1·3	1·95	1·3	1·3	1·95	11·83
14	1·4	2·1	2·1	1·4	2·1	1·4	1·4	2·1	12·74
15	1·5	2·25	2·25	1·5	2·25	1·5	1·5	2·25	13·65
16	1·6	2·4	2·4	1·6	2·4	1·6	1·6	2·4	14·56
17	1·7	2·55	2·55	1·7	2·55	1·7	1·7	2·55	15·47

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 90% of distance run

(Note:—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 39.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 06	20° to Starboard	20° to Starboard
II	0 15	20° to Starboard	40° to Starboard
III	0 21	20° to Port	20° to Starboard
IV	0 30	20° to Port	0°
V	0 30	20° to Port	20° to Port
VI	0 45	20° to Port	40° to Port
VII	0 51	20° to Starboard	20° to Port
VIII	1 00	20° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	VII to VIII	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	5·4
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	6·3
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	7·2
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	8·1
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	9·0
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	9·9
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	10·8
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	11·7
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	12·6
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	13·5
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	14·4
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	15·3

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes TWO *hours to complete.*

Distance made good = 86·5% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time			
	Hr.	Min.	~	
0	0	00		0°
I	0	10	20° to Starboard	20° to Starboard
II	0	20	20° to Starboard	40° to Starboard
III	0	30	30° to Port	10° to Starboard
IV	0	35	15° to Port	5° to Port
V	0	45	30° to Port	35° to Port
VI	0	55	20° to Port	55° to Port
VII	1	00	55° to Starboard	0°
VIII	1	10	20° to Port	20° to Port
IX	1	20	20° to Port	40° to Port
X	1	30	30° to Starboard	10° to Port
XI	1	35	15° to Starboard	5° to Starboard
XII	1	45	30° to Starboard	35° to Starboard
XIII	1	55	20° to Starboard	55° to Starboard
XIV	2	00	55° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XIV puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VII to VIII	I to II and VIII to IX	II to III and IX to X	III to IV and X to XI	IV to V and XI to XII	V to VI and XII to XIII	VI to VII and XIII to XIV	
6	1·0	1·0	1·0	0·5	1·0	1·0	0·5	5·19
7	1·17	1·17	1·17	0·58	1·17	1·17	0·58	6·06
8	1·33	1·33	1·33	0·67	1·33	1·33	0·67	6·92
9	1·5	1·5	1·5	0·75	1·5	1·5	0·75	7·78
10	1·67	1·67	1·67	0·83	1·67	1·67	0·83	8·65
11	1·83	1·83	1·83	0·92	1·83	1·83	0·92	9·51
12	2·0	2·0	2·0	1·0	2·0	2·0	1·0	10·38
13	2·17	2·17	2·17	1·08	2·17	2·17	1·08	11·24
14	2·33	2·33	2·33	1·17	2·33	2·33	1·17	12·11
15	2·5	2·5	2·5	1·25	2·5	2·5	1·25	12·97
16	2·67	2·67	2·67	1·33	2·67	2·67	1·33	13·84
17	2·83	2·83	2·83	1·42	2·83	2·83	1·42	14·71

For general use in submarine areas.

SUITABLE FOR FAST CONVOYS (12 KNOTS AND OVER)

The diagram takes TWO hours to complete.

Distance made good = 92% of distance run

(**Note:**—*This zig-zag is always to Starboard of the Mean Course, The corresponding zig-zag to Port of the Mean Course is No. 40.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 0	20° to Starboard*	20° to Starboard
I	0 10	20° to Starboard	40° to Starboard
II	0 15	40° to Port	0°
III	0 25	20° to Starboard	20° to Starboard
IV	0 35	20° to Starboard	40° to Starboard
V	0 40	40° to Port	0°
VI	0 50	20° to Starboard	20° to Starboard
VII	1 00	40° to Port	20° to Port
VIII	1 10	20° to Port	40° to Port
IX	1 15	40° to Starboard	0°
X	1 25	20° to Port	20° to Port
XI	1 35	20° to Port	40° to Port
XII	1 40	40° to Starboard	0°
XIII	1 50	20° to Port	20° to Port
XIV	2 00	40° to Starboard	20° to Starboard

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XIV puts the ship on the first leg of the zig-zag from position 0.

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* This alteration is carried out **on first commencing** the zig-zag only, as the ship will have been on the mean course immediately prior to the alteration. When **repeating** the zig-zag (from position XIV) an alteration of 40° is required to put the ship on the first leg of the zig-zag, as the ship will **not** have been on the mean course immediately prior to the alteration.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VII to VIII	I to II and VIII to IX	II to III and IX to X	III to IV and X to XI	IV to V and XI to XII	V to VI and XII to XIII	VI to VII and XIII to XIV	
12	2·0	1·0	2·0	2·0	1·0	2·0	2·0	1·04
13	2·17	1·08	2·17	2·17	1·08	2·17	2·17	11·96
14	2·33	1·17	2·33	2·33	1·17	2·33	2·33	12·88
15	2·5	1·25	2·5	2·5	1·25	2·5	2·5	13·80
16	2·67	1·33	2·67	2·67	1·33	2·67	2·67	14·72
17	2·83	1·42	2·83	2·83	1·42	2·83	2·83	15·64
18	3·0	1·5	3·0	3·0	1·5	3·0	3·0	16·56
19	3·17	1·58	3·17	3·17	1·58	3·17	3·17	17·48
20	3·33	1·67	3·33	3·33	1·67	3·33	3·33	18·40
21	3·5	1·75	3·5	3·5	1·75	3·5	3·5	19·32
22	3·67	1·83	3·67	3·67	1·83	3·67	3·67	20·24
23	3·83	1·92	3·83	3·83	1·92	3·83	3·83	21·16

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 88% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr.	Min.		
0	0	00	~	0°
I	0	04	35° to Starboard	35° to Starboard
II	0	12	70° to Port	35° to Port
III	0	20	35° to Starboard	0°
IV	0	24	35° to Port	35° to Port
V	0	32	70° to Starboard	35° to Starboard
VI	0	40	35° to Port	0°
VII	0	44	35° to Starboard	35° to Starboard
VIII	0	52	70° to Port	35° to Port
IX	1	00	35° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position IX puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)									Distance made good along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	VII to VIII	VIII to IX	
6	0·4	0·8	0·8	0·4	0·8	0·8	0·4	0·8	0·8	5·16
7	0·46	0·94	0·94	0·46	0·94	0·94	0·46	0·94	0·94	6·02
8	0·53	1·07	1·07	0·53	1·07	1·07	0·53	1·07	1·07	6·88
9	0·6	1·2	1·2	0·6	1·2	1·2	0·6	1·2	1·2	7·74
10	0·67	1·33	1·33	0·67	1·33	1·33	0·67	1·33	1·33	8·60
11	0·73	1·47	1·47	0·73	1·47	1·47	0·73	1·47	1·47	9·46
12	0·8	1·6	1·6	0·8	1·6	1·6	0·8	1·6	1·6	10·32
13	0·87	1·73	1·73	0·87	1·73	1·73	0·87	1·73	1·73	11·18
14	0·93	1·87	1·87	0·93	1·87	1·87	0·93	1·87	1·87	12·04
15	1·0	2·0	2·0	1·0	2·0	2·0	1·0	2·0	2·0	12·90
16	1·07	2·13	2·13	1·07	2·13	2·13	1·07	2·13	2·13	13·76
17	1·13	2·27	2·27	1·13	2·27	2·27	1·13	2·27	2·27	14·62

For general use in submarine areas.

SUITABLE FOR SHIPS AND CONVOYS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 86% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr.	Time Min.		
0	0	00	25° to Starboard	25° to Starboard
I	0	06	25° to Starboard	50° to Starboard
II	0	15	25° to Port	25° to Starboard
III	0	21	25° to Port	0°
IV	0	30	25° to Port	25° to Port
V	0	36	25° to Port	50° to Port
VI	0	45	25° to Starboard	25° to Port
VII	0	51	25° to Starboard	0°
VIII	1	00	25° to Port	25° to Port
IX	1	06	25° to Port	50° to Port
X	1	15	25° to Starboard	25° to Port
XI	1	21	25° to Starboard	0°
XII	1	30	25° to Starboard	25° to Starboard
XIII	1	36	25° to Starboard	50° to Starboard
XIV	1	45	25° to Port	25° to Starboard
XV	1	51	25° to Port	0°
XVI	2	00	25° to Starboard	25° to Starboard

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to X	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	5·16
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	6·02
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	6·88
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	7·74
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	8·60
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	9·46
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	10·32
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	11·18
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	12·04
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	12·90
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	13·76
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	14·62

No. 22

For general use in submarine areas.

SUITABLE FOR FAST SHIPS (16 KNOTS AND OVER)

The diagram takes TWO hours to complete.

Distance made good = 86% of distance run

(Note:—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 41.*)

Positions and Times for alteration of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Hr.	Min.		
0	0	00	—	0°
I	0	04¼	10° to Starboard	10° to Starboard
II	0	12	10° to Starboard	20° to Starboard
III	0	16¾	10° to Starboard	30° to Starboard
IV	0	24	10° to Starboard	40° to Starboard
V	0	28¾	10° to Starboard	50° to Starboard
VI	0	36	10° to Port	40° to Starboard
VII	0	40¾	10° to Port	30° to Starboard
VIII	0	48	10° to Port	20° to Starboard
IX	0	52¾	10° to Port	10° to Starboard
X	1	00	10° to Port	0°
XI	1	04¾	10° to Port	10° to Port
XII	1	12	10° to Port	20° to Port
XIII	1	16¾	10° to Port	30° to Port
XIV	1	24	10° to Port	40° to Port
XV	1	28¾	10° to Port	50° to Port
XVI	1	36	10° to Starboard	40° to Port
XVII	1	40¾	10° to Starboard	30° to Port
XVIII	1	48	10° to Starboard	20° to Port
XIX	1	52¾	10° to Starboard	10° to Port
XX	2	00	10° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XX puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)										Distance made good each hour along the Mean Course (in miles)
	0 to I and X to XI	I to II and XI to XII	II to III and XII to XIII	III to IV and XIII to XIV	IV to V and XIV to XV	V to VI and XV to XVI	VI to VII and XVI to XVII	VII to VIII and XVII to XVIII	VIII to IX and XVIII to XIX	IX to X and XIX to XX	
16	1·24	1·96	1·24	1·96	1·24	1·96	1·24	1·96	1·24	1·96	13·76
17	1·32	2·08	1·32	2·08	1·32	2·08	1·32	2·08	1·32	2·08	14·62
18	1·40	2·20	1·40	2·20	1·40	2·20	1·40	2·20	1·40	2·20	15·48
19	1·48	2·32	1·48	2·32	1·48	2·32	1·48	2·32	1·48	2·32	16·34
20	1·56	2·44	1·56	2·44	1·56	2·44	1·56	2·44	1·56	2·44	17·20
21	1·63	2·57	1·63	2·57	1·63	2·57	1·63	2·57	1·63	2·57	18·06
22	1·71	2·69	1·71	2·69	1·71	2·69	1·71	2·69	1·71	2·69	18·92
23	1·79	2·81	1·79	2·81	1·79	2·81	1·79	2·81	1·79	2·81	19·78
24	1·87	2·93	1·87	2·93	1·87	2·93	1·87	2·93	1·87	2·93	20·64
25	1·95	3·05	1·95	3·05	1·95	3·05	1·95	3·05	1·95	3·05	21·50
26	2·02	3·18	2·02	3·18	2·02	3·18	2·02	3·18	2·02	3·18	22·36
27	2·10	3·30	2·10	3·30	2·10	3·30	2·10	3·30	2·10	3·30	23·22

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 85% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 06	22½° to Starboard	22½° to Starboard
II	0 15	22½° to Starboard	45° to Starboard
III	0 21	45° to Port	0°
IV	0 30	22½° to Port	22½° to Port
V	0 36	33° to Port	55½° to Port
VI	0 45	22½° to Starboard	33° to Port
VII	0 51	70° to Starboard	37° to Starboard
VIII	1 00	37° to Port	0°
IX	1 06	22½° to Port	22½° to Port
X	1 15	22½° to Port	45° to Port
XI	1 21	45° to Starboard	0°
XII	1 30	22½° to Starboard	22½° to Starboard
XIII	1 36	33° to Starboard	55½° to Starboard
XIV	1 45	22½° to Port	33° to Starboard
XV	1 51	70° to Port	37° to Port
XVI	2 00	37° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	5·10
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	5·95
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	6·80
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	7·65
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	8·50
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	9·35
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	10·20
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	11·05
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	11·90
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	12·75
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	13·60
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	14·45

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO *hours to complete.*

Distance made good = 85% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 04	34° to Port	34° to Port
II	0 10	11° to Starboard	23° to Port
III	0 14	34° to Starboard	11° to Starboard
IV	0 20	11° to Starboard	22° to Starboard
V	0 24	34° to Starboard	56° to Starboard
VI	0 30	11° to Port	45° to Starboard
VII	0 34	34° to Port	11° to Starboard
VIII	0 40	11° to Port	0°
IX	0 44	34° to Port	34° to Port
X	0 50	11° to Starboard	45° to Port
XI	0 54	34° to Starboard	11° to Port
XII	1 00	11° to Starboard	0°
XIII	1 04	34° to Starboard	34° to Starboard
XIV	1 10	11° to Port	23° to Starboard
XV	1 14	34° to Port	11° to Port
XVI	1 20	11° to Port	22° to Port
XVII	1 24	34° to Port	56° to Port
XVIII	1 30	11° to Starboard	45° to Port
XIX	1 34	34° to Starboard	11° to Port
XX	1 40	11° to Starboard	0°
XXI	1 44	34° to Starboard	34° to Starboard
XXII	1 50	11° to Port	45° to Starboard
XXIII	1 54	34° to Port	11° to Starboard
XXIV	2 00	11° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XXIV puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)											Distance made good each hour along the Mean Course (in miles)
	0 to I and XII to XIII	I to II and XIII to XIV	II to III and XIV to XV	III to IV and XV to XVI	IV to V and XVI to XVII	V to VI and XVII to XVIII	VI to VII and XVIII to XIX	VII to VIII and XIX to XX	VIII to IX and XX to XXI	IX to X and XXI to XXII	X to XI and XXII to XXIII	XI to XII and XXIII to XXIV	
6	0·4	0·6	0·4	0·6	0·4	0·6	0·4	0·6	0·4	0·6	0·4	0·6	5·10
7	0·46	0·7	0·46	0·7	0·46	0·7	0·46	0·7	0·46	0·7	0·46	0·7	5·95
8	0·53	0·8	0·53	0·8	0·53	0·8	0·53	0·8	0·53	0·8	0·53	0·8	6·80
9	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	7·65
10	0·67	1·0	0·67	1·0	0·67	1·0	0·67	1·0	0·67	1·0	0·67	1·0	8·50
11	0·73	1·1	0·73	1·1	0·73	1·1	0·73	1·1	0·73	1·1	0·73	1·1	9·35
12	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	10·20
13	0·87	1·3	0·87	1·3	0·87	1·3	0·87	1·3	0·87	1·3	0·87	1·3	11·05
14	0·93	1·4	0·93	1·4	0·93	1·4	0·93	1·4	0·93	1·4	0·93	1·4	11·90
15	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	12·75
16	1·07	1·6	1·07	1·6	1·07	1·6	1·07	1·6	1·07	1·6	1·07	1·6	13·60
17	1·13	1·7	1·13	1·7	1·13	1·7	1·13	1·7	1·13	1·7	1·13	1·7	14·45

For general use in submarine areas.

SUITABLE FOR SHIPS OF SPEEDS UP TO 16 KNOTS

The diagram takes TWO hours to complete.

Distance made good = 85% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 06	50° to Starboard	50° to Starboard
II	0 14	30° to Port	20° to Starboard
III	0 17	50° to Port	30° to Port
IV	0 29	60° to Starboard	30° to Starboard
V	0 36	50° to Port	20° to Port
VI	0 50	30° to Port	50° to Port
VII	1 00	50° to Starboard	0°
VIII	1 06	50° to Starboard	50° to Starboard
IX	1 14	30° to Port	20° to Starboard
X	1 17	50° to Starboard	30° to Starboard
XI	1 29	60° to Starboard	30° to Port
XII	1 36	50° to Starboard	20° to Starboard
XIII	1 50	30° to Starboard	50° to Starboard
XIV	2 00	50° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XIV puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VII to VIII	I to II and VIII to IX	II to III and IX to X	III to IV and X to XI	IV to V and XI to XII	V to VI and XII to XIII	VI to VII and XIII to XIV	
6	0·6	0·8	0·3	1·2	0·7	1·4	1·0	5·10
7	0·7	0·93	0·35	1·4	0·82	1·63	1·16	5·95
8	0·8	1·07	0·40	1·6	0·93	1·87	1·33	6·80
9	0·9	1·20	0·45	1·8	1·05	2·10	1·50	7·65
10	1·0	1·33	0·50	2·0	1·17	2·33	1·67	8·50
11	1·1	1·47	0·55	2·2	1·28	2·57	1·83	9·35
12	1·2	1·60	0·60	2·4	1·40	2·80	2·0	10·20
13	1·3	1·73	0·65	2·6	1·52	3·03	2·17	11·05
14	1·4	1·87	0·70	2·8	1·63	3·27	2·33	11·90
15	1·5	2·0	0·75	3·0	1·75	3·50	2·50	12·75
16	1·6	2·13	0·80	3·2	1·87	3·73	2·67	13·60

For general use in submarine areas.

SUITABLE FOR SHIPS OF SPEEDS UP TO 16 KNOTS

The diagram takes TWO hours to complete.

Distance made good = 85% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	40° to Port	40° to Port
I	0 10	40° to Starboard	0°
II	0 20	40° to Starboard	40° to Starboard
III	0 30	40° to Port	0°
IV	0 35	40° to Starboard	40° to Starboard
V	0 45	80° to Port	40° to Port
VI	0 55	40° to Starboard	0°
VII	1 00	40° to Starboard	40° to Starboard
VIII	1 10	40° to Port	0°
IX	1 30	40° to Port	40° to Port
X	1 30	40° to Starboard	0°
XI	1 35	40° to Port	40° to Port
XII	1 45	80° to Starboard	40° to Starboard
XIII	1 55	40° to Port	0°
XIV	2 00	40° to Port	40° to Port

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XIV puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VII to VIII	I to II and VIII to IX	II to III and IX to X	III to IV and X to XI	IV to V and XI to XII	V to VI and XII to XIII	VI to VII and XIII to XIV	
6	1·0	1·0	1·0	0·5	1·0	1·0	0·5	5·10
7	1·17	1·17	1·17	0·58	1·17	1·17	0·58	5·95
8	1·33	1·33	1·33	0·67	1·33	1·33	0·67	6·80
9	1·5	1·5	1·5	0·75	1·5	1·5	0·75	7·65
10	1·67	1·67	1·67	0·83	1·67	1·67	0·83	8·50
11	1·83	1·83	1·83	0·92	1·83	1·83	0·92	9·35
12	2·0	2·0	2·0	1·0	2·0	2·0	1·0	10·20
13	2·17	2·17	2·17	1·08	2·17	2·17	1·08	11·05
14	2·33	2·33	2·33	1·17	2·33	2·33	1·17	11·90
15	2·5	2·5	2·5	1·25	2·5	2·5	1·25	12·75
16	2·67	2·67	2·67	1·33	2·67	2·67	1·33	13·60

For general use in submarine areas.

SUITABLE FOR SHIPS AND CONVOYS OF 12 KNOTS AND OVER

The diagram takes ONE hour to complete.

Distance made good = 84% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time			
	Hr.	Min.		
0	0	00	~	0°
I	0	05	40° to Port	40° to Port
II	0	15	40° to Starboard	0°
III	0	20	40° to Starboard	40° to Starboard
IV	0	30	40° to Port	0°
V	0	35	40° to Starboard	40° to Starboard
VI	0	45	40° to Port	0°
VII	0	50	40° to Port	40° to Port
VIII	1	00	40° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	VII to VIII	
12	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0	10·08
13	1·08	2·17	1·08	2·17	1·08	2·17	1·08	2·17	10·92
14	1·17	2·33	1·17	2·33	1·17	2·33	1·17	2·33	11·76
15	1·25	2·5	1·25	2·5	1·25	2·5	1·25	2·5	12·60
16	1·33	2·67	1·33	2·67	1·33	2·67	1·33	2·67	13·44
17	1·42	2·83	1·42	2·83	1·42	2·83	1·42	2·83	14·28
18	1·5	3·0	1·5	3·0	1·5	3·0	1·5	3·0	15·12
19	1·58	3·17	1·58	3·17	1·58	3·17	1·58	3·17	15·96
20	1·67	3·33	1·67	3·33	1·67	3·33	1·67	3·33	16·80
21	1·75	3·5	1·75	3·5	1·75	3·5	1·75	3·5	17·64
22	1·83	3·67	1·83	3·67	1·83	3·67	1·83	3·67	18·48
23	1·92	3·83	1·92	3·83	1·92	3·83	1·92	3·83	19·32

For general use in submarine areas.

SUITABLE FOR FAST SHIPS (16 KNOTS AND OVER)

The diagram takes ONE hour to complete.

Distance made good = 83% of distance run

(Note:—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 42.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 04	10° to Starboard	10° to Starboard
II	0 10	10° to Starboard	20° to Starboard
III	0 14	10° to Starboard	30° to Starboard
IV	0 20	10° to Starboard	40° to Starboard
V	0 24	10° to Starboard	50° to Starboard
VI	0 30	50° to Port	0°
VII	0 34	10° to Port	10° to Port
VIII	0 40	10° to Port	20° to Port
IX	0 44	10° to Port	30° to Port
X	0 50	10° to Port	40° to Port
XI	0 54	10° to Port	50° to Port
XII	1 00	50° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)						Distance made good each hour along the Mean Course (in miles)
	0 to I and VI to VII	I to II and VII to VIII	II to III and VIII to IX	III to IV and IX to X	IV to V and X to XI	V to VI and XI to XII	
16	1·07	1·6	1·07	1·6	1·07	1·6	13·28
17	1·13	1·7	1·13	1·7	1·13	1·7	14·11
18	1·20	1·8	1·20	1·8	1·20	1·8	14·94
19	1·27	1·9	1·27	1·9	1·27	1·9	15·77
20	1·33	2·0	1·33	2·0	1·33	2·0	16·60
21	1·40	2·1	1·40	2·1	1·40	2·1	17·43
22	1·47	2·2	1·47	2·2	1·47	2·2	18·26
23	1·53	2·3	1·53	2·3	1·53	2·3	19·09
24	1·60	2·4	1·60	2·4	1·60	2·4	19·92
25	1·67	2·5	1·67	2·5	1·67	2·5	20·75
26	1·73	2·6	1·73	2·6	1·73	2·6	21·58
27	1·80	2·7	1·80	2·7	1·80	2·7	22·41

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 83% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	~	0°
I	0 04	30° to Starboard	30° to Starboard
II	0 15	60° to Port	30° to Port
III	0 19	30° to Port	60° to Port
IV	0 30	60° to Starboard	0°
V	0 34	20° to Port	20° to Port
VI	0 45	30° to Port	50° to Port
VII	0 49	80° to Starboard	30° to Starboard
VIII	1 00	30° to Port	0°
IX	1 04	30° to Port	30° to Port
X	1 15	60° to Starboard	30° to Starboard
XI	1 19	30° to Starboard	60° to Starboard
XII	1 30	60° to Port	0°
XIII	1 34	20° to Starboard	20° to Starboard
XIV	1 45	30° to Starboard	50° to Starboard
XV	1 49	80° to Port	30° to Port
XVI	2 00	30° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·4	1·1	0·4	1·1	0·4	1·1	0·4	1·1	4·98
7	0·47	1·28	0·47	1·28	0·47	1·28	0·47	1·28	5·81
8	0·53	1·47	0·53	1·47	0·53	1·47	0·53	1·47	6·64
9	0·6	1·65	0·6	1·65	0·6	1·65	0·6	1·65	7·47
10	0·67	1·83	0·67	1·83	0·67	1·83	0·67	1·83	8·30
11	0·73	2·02	0·73	2·02	0·73	2·02	0·73	2·02	9·13
12	0·8	2·20	0·8	2·20	0·8	2·20	0·8	2·20	9·96
13	0·87	2·38	0·87	2·38	0·87	2·38	0·87	2·38	10·79
14	0·93	2·57	0·93	2·57	0·93	2·57	0·93	2·57	11·62
15	1·0	2·75	1·0	2·75	1·0	2·75	1·0	2·75	12·45
16	1·07	2·93	1·07	2·93	1·07	2·93	1·07	2·93	13·28
17	1·13	3·12	1·13	3·12	1·13	3·12	1·13	3·12	14·11

For use in specially dangerous waters.

SUITABLE FOR SHIPS AND CONVOYS OF ALL SPEEDS

The diagram takes TWO hours to complete.

Distance made good = 82% of distance run

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	—	35° to Starboard
I	0 06	20° to Starboard	55° to Starboard
II	0 15	35° to Port	20° to Starboard
III	0 21	20° to Port	0°
IV	0 30	35° to Port	35° to Port
V	0 36	20° to Port	55° to Port
VI	0 45	35° to Starboard	20° to Port
VII	0 51	20° to Starboard	0°
VIII	1 00	35° to Starboard	35° to Starboard
IX	1 06	20° to Port	55° to Starboard
X	1 15	35° to Starboard	20° to Starboard
XI	1 21	20° to Starboard	0°
XII	1 30	35° to Starboard	35° to Starboard
XIII	1 36	20° to Starboard	55° to Starboard
XIV	1 45	35° to Starboard	20° to Starboard
XV	1 51	20° to Port	0°
XVI	2 00	35° to Starboard	35° to Starboard

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	4·92
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	5·74
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	6·56
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	7·38
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	8·20
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	9·02
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	9·84
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	10·66
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	11·48
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	12·30
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	13·12
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	13·94

For ▦▦▦ in specially dangerous waters.

SUITABLE FOR SHIPS OF SPEEDS UP TO 16 KNOTS

The diagram takes TWO hours to complete.

Distance made good = 79% of distance run

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is of the Mean Course
Position	Time Hr.	Time Min.		
0	0	00	~	0°
I	0	04½	35° to Starboard	15° to Starboard
II	0	15	50° to Port	15° to Port
III	0	19½	35° to Starboard	20° to Starboard
IV	0	30	50° to Port	30° to Port
V	0	34½	35° to Port	65° to Port
VI	0	45	50° to Starboard	15° to Port
VII	0	49½	35° to Port	50° to Port
VIII	1	00	50° to Starboard	0°
IX	1	04½	35° to Port	35° to Port
X	1	15	50° to Starboard	15° to Starboard
XI	1	19½	35° to Port	20° to Port
XII	1	30	50° to Starboard	30° to Starboard
XIII	1	34½	35° to Starboard	65° to Starboard
XIV	1	45	50° to Port	15° to Starboard
XV	1	49½	35° to Starboard	50° to Starboard
XVI	2	00	50° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·45	1·05	0·45	1·05	0·45	1·05	0·45	1·05	4·74
7	0·52	1·23	0·52	1·23	0·52	1·23	0·52	1·23	5·53
8	0·60	1·40	0·60	1·40	0·60	1·40	0·60	1·40	6·32
9	0·67	1·58	0·67	1·58	0·67	1·58	0·67	1·58	7·11
10	0·75	1·75	0·75	1·75	0·75	1·75	0·75	1·75	7·90
11	0·82	1·93	0·82	1·93	0·82	1·93	0·82	1·93	8·69
12	0·90	2·10	0·90	2·10	0·90	2·10	0·90	2·10	9·48
13	0·97	2·28	0·97	2·28	0·97	2·28	0·97	2·28	10·27
14	1·05	2·45	1·05	2·45	1·05	2·45	1·05	2·45	11·06
15	1·12	2·63	1·12	2·63	1·12	2·63	1·12	2·63	11·85
16	1·20	2·80	1·20	2·80	1·20	2·80	1·20	2·80	12·64

For ▓▓▓ in specially dangerous waters.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes FOUR hours to complete.

Distance made good = 79% of distance run

(Note:—*This zig-zag is no more than a modified form of zig-zag No. 26. The course made good is changed hourly and varied about the Mean Course so as to maintain a mean line of advance along the Mean Course. This is clearly shown in the diagram.*)

Positions and Times for alterations of course		Amount to alter course	Amount that the course made good for the hour is off the Mean Course	Amount ship's head is off the course made good for the hour	Amount ship's head is off the Mean Course
Position	Time Hr. Min.				
0	0 00	70° to Port		40° to Port	70° to Port
I	0 10	40° to Starboard		0°	30° to Port
II	0 20	40° to Starboard	For first hour 30° to Port	40° to Starboard	10° to Starboard
III	0 30	40° to Starboard		0°	30° to Port
IV	0 35	40° to Starboard		40° to Starboard	10° to Starboard
V	0 45	80° to Port		40° to Port	70° to Port
VI	0 55	40° to Starboard		0°	30° to Port
VII	1 00	40° to Starboard		40° to Port	40° to Port
VIII	1 10	40° to Port		0°	0°
IX	1 20	40° to Port	For second hour 0°	40° to Starboard	40° to Starboard
X	1 30	40° to Starboard		0°	0°
XI	1 35	40° to Starboard		40° to Starboard	40° to Starboard
XII	1 45	80° to Starboard		40° to Port	40° to Port
XIII	1 55	40° to Port		0°	0°
XIV	2 00	70° to Port		40° to Starboard	70° to Starboard
XV	2 10	40° to Port		0°	30° to Starboard
XVI	2 20	40° to Port	For third hour 30° to Starboard	40° to Port	10° to Port
XVII	2 30	40° to Starboard		0°	30° to Starboard
XVIII	2 35	40° to Starboard		40° to Port	10° to Port
XIX	2 45	80° to Port		40° to Starboard	70° to Starboard
XX	2 55	40° to Port		0°	30° to Starboard
XXI	3 00	70° to Port		40° to Port	40° to Port
XXII	3 10	40° to Starboard		0°	0°
XXIII	3 20	40° to Starboard	For fourth hour 0°	40° to Starboard	40° to Starboard
XXIV	3 30	40° to Starboard		0°	0°
XXV	3 35	40° to Starboard		40° to Starboard	40° to Starboard
XXVI	3 45	80° to Port		40° to Port	40° to Port
XXVII	3 55	40° to Starboard		0°	0°
XXVIII	4 00	70° to Port	As for first hour	40° to Port	70° to Port

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XXVIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good along the course EACH HOUR	Distance made good along the course IN FOUR HOURS
	0 to I / VII to VIII / XIV to XV / XXI to XXII	I to II / VIII to IX / XV to XVI / XXII to XXIII	II to III / IX to X / XVI to XVII / XXIII to XXIV	III to IV / X to XI / XVII to XVIII / XXIV to XXV	IV to V / XI to XII / XVIII to XIX / XXV to XXVI	V to VI / XII to XIII / XIX to XX / XXVI to XXVII	VI to VII / XIII to XIV / XX to XXI / XXVII to XXVIII		
6	1·0	1·0	1·0	0·5	1·0	1·0	0·5	5·10	18·96
7	1·17	1·17	1·17	0·58	1·17	1·17	0·58	5·55	22·12
8	1·33	1·33	1·33	0·67	1·33	1·33	0·67	6·80	25·28
9	1·5	1·5	1·5	0·75	1·5	1·5	0·75	7·25	28·44
10	1·67	1·67	1·67	0·83	1·67	1·67	0·83	8·50	31·60
11	1·83	1·83	1·83	0·92	1·83	1·83	0·92	9·35	34·76
12	2·0	2·0	2·0	1·0	2·0	2·0	1·0	10·50	37·92
13	2·17	2·17	2·17	1·08	2·17	2·17	1·08	11·05	41·08
14	2·33	2·33	2·33	1·17	2·33	2·33	1·17	11·90	44·24
15	2·5	2·5	2·5	1·25	2·5	2·5	1·25	12·75	47·40
16	2·67	2·67	2·67	1·33	2·67	2·67	1·33	13·60	50·56
17	2·83	2·83	2·83	1·41	2·83	2·83	1·42	14·45	53·72

For use in specially dangerous waters.

SUITABLE FOR SHIPS OF SPEEDS UP TO 16 KNOTS

The diagram takes TWO hours to complete.

Distance made good = 69% of distance run

(**Note**:—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 43.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time		
	Hr.	Min.		
0	0	00	—	0°
I	0	03	50° to Starboard	50° to Starboard
II	0	15	90° to Port	40° to Port
III	0	21	60° to Starboard	20° to Starboard
IV	0	30	20° to Port	0°
V	0	33	60° to Starboard	60° to Starboard
VI	0	45	40° to Port	20° to Starboard
VII	0	51	50° to Starboard	70° to Starboard
VIII	1	00	70° to Port	0°
IX	1	03	50° to Port	50° to Port
X	1	15	90° to Starboard	40° to Port
XI	1	21	60° to Port	20° to Port
XII	1	30	20° to Starboard	0°
XIII	1	33	60° to Port	60° to Port
XIV	1	45	40° to Starboard	20° to Port
XV	1	51	50° to Port	70° to Port
XVI	2	00	70° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·3	1·2	0·6	0·9	0·3	1·2	0·6	0·9	4·14
7	0·35	1·4	0·7	1·05	0·35	1·4	0·7	1·05	4·83
8	0·4	1·6	0·8	1·2	0·4	1·6	0·8	1·2	5·52
9	0·45	1·8	0·9	1·35	0·45	1·8	0·9	1·35	6·21
10	0·5	2·0	1·0	1·5	0·5	2·0	1·0	1·5	6·90
11	0·55	2·2	1·1	1·65	0·55	2·2	1·1	1·65	7·59
12	0·6	2·4	1·2	1·8	0·6	2·4	1·2	1·8	8·28
13	0·65	2·6	1·3	1·95	0·65	2·6	1·3	1·95	8·97
14	0·7	2·8	1·4	2·1	0·7	2·8	1·4	2·1	9·66
15	0·75	3·0	1·5	2·25	0·75	3·0	1·5	2·25	10·35
16	0·8	3·2	1·6	2·4	0·8	3·2	1·6	2·4	11·04

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 85% of distance run

(Note:—This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 3.)

Positions and Times for alterations of course				
Position	Ships steaming 10 knots or less	Ships steaming more than 10 knots	Amount to alter course	Amount ship's head is off the Mean Course
	Time Hr. Min.	Time Hr. Min.		
0	0 00	0 00	~	0°
I	0 00	0 06¼	20° to Starboard	20° to Starboard
II	0 30	0 15	40° to Starboard	60° to Starboard
III	0 43¾	0 21¼	40° to Port	20° to Starboard
IV	1 00	0 30	20° to Port	0°
V	1 13¾	0 36¼	20° to Port	20° to Port
VI	1 30	0 45	40° to Port	60° to Port
VII	1 43¾	0 51¼	40° to Starboard	20° to Port
VIII	2 00	1 00	20° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)				Distance made good each hour along the Mean Course (in miles)
	0 to I and IV to V	I to II and V to VI	II to III and VI to VII	III to IV and VII to VIII	
6	1·35	1·65	1·35	1·65	5·1
7	1·57	1·93	1·57	1·93	5·95
8	1·8	2·2	1·8	2·2	6·8
9	2·02	2·48	2·02	2·48	7·65
10	2·25	2·75	2·25	2·75	8·5
11	1·24	1·51	1·24	1·51	9·35
12	1·35	1·65	1·35	1·65	10·2
13	1·46	1·79	1·46	1·79	11·5
14	1·57	1·93	1·57	1·93	11·9
15	1·69	2·06	1·69	2·06	12·75
16	1·8	2·2	1·8	2·2	13·6
17	1·91	2·34	1·91	2·34	14·45

For general use in submarine areas.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less, and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 82% of distance run

(**Note:**—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 4.*)

Position	Ships steaming 10 knots or less		Ships steaming more than 10 knots		Amount to alter course	Amount ship's head is off the Mean Course
	Time		Time			
	Hr.	Min.	Hr.	Min.		
0	0	00	0	00	~	0°
I	0	13½	0	06⅔	30° to Port	30° to Port
II	0	30	0	15	30° to Port	60° to Port
III	0	43½	0	21⅔	30° to Starboard	30° to Port
IV	1	00	0	30	30° to Starboard	0°
V	1	13½	0	36⅔	30° to Starboard	30° to Starboard
VI	1	30	0	45	30° to Starboard	60° to Starboard
VII	1	43½	0	51⅔	30° to Starboard	30° to Starboard
VIII	2	00	1	00	30° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)				Distance made good each hour along the Mean Course (in miles)
	0 to I and IV to V	I to II and V to VI	II to III and VI to VII	III to IV and VII to VIII	
6	1·33	1·67	1·33	1·67	4·92
7	1·56	1·94	1·56	1·94	5·74
8	1·78	2·22	1·78	2·22	6·56
9	2·0	2·5	2·0	2·5	7·38
10	2·22	2·78	2·22	2·78	8·2
11	1·22	1·53	1·22	1·53	9·02
12	1·33	1·67	1·33	1·67	9·84
13	1·44	1·81	1·44	1·81	10·66
14	1·56	1·94	1·56	1·94	11·48
15	1·67	2·08	1·67	2·08	12·3
16	1·78	2·22	1·78	2·22	13·12
17	1·89	2·36	1·89	2·36	13·94

For use in specially dangerous waters.

SUITABLE FOR SHIPS OF ALL SPEEDS

The diagram takes TWO hours to complete for ships steaming at 10 knots or less and ONE hour to complete for ships steaming at more than 10 knots.

Distance made good = 70% of distance run

(**Note:**—*This zig-zag is always to Starboard of the Mean Course. The corresponding zig-zag to Port of the Mean Course is No. 7.*)

Positions and Times for alterations of course					
	Ships steaming 10 knots or less		Ships steaming more than 10 knots		
Position	Time		Time		Amount to alter course	Amount ship's head is off the Mean Course
	Hr.	Min.	Hr.	Min.		
0	0	00	0	00	~	0°
I	0	13½	0	6⅔	40° to Starboard	40° to Starboard
II	0	30	0	15	40° to Starboard	80° to Starboard
III	0	43½	0	21⅔	40° to Port	40° to Starboard
IV	1	00	0	30	40° to Port	0°
V	1	13½	0	36⅔	40° to Port	40° to Port
VI	1	30	0	45	40° to Port	80° to Port
VII	1	43½	0	51⅔	40° to Starboard	40° to Port
VIII	2	00	1	00	40° to Starboard	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)				Distance made good each hour along the Mean Course (in miles)
	0 to I and IV to V	I to II and V to VI	II to III and VI to VII	III to IV and VII to VIII	
6	1·33	1·67	1·33	1·67	4·2
7	1·56	1·94	1·56	1·94	4·9
8	1·78	2·22	1·78	2·22	5·6
9	2·0	2·5	2·0	2·5	6·3
10	2·22	2·78	2·22	2·78	7·0
11	1·22	1·53	1·22	1·53	7·7
12	1·33	1·67	1·33	1·67	8·4
13	1·44	1·81	1·44	1·81	9·1
14	1·56	1·94	1·56	1·94	9·8
15	1·67	2·08	1·67	2·08	10·5
16	1·78	2·22	1·78	2·22	11·2
17	1·89	2·36	1·89	2·36	11·9

For use in open waters where submarines have not previously been operating, but where they may appear.

SUITABLE FOR FAST SHIPS (16 KNOTS AND OVER)

The diagram takes TWO hours to complete.

Distance made good = 90% of distance run

(Note:—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 9.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	—	0°
I	0 06	10° to Port	10° to Port
II	0 15	20° to Port	20° to Port
III	0 21	10° to Port	30° to Port
IV	0 30	10° to Port	40° to Port
V	0 36	10° to Starboard	30° to Port
VI	0 45	10° to Starboard	20° to Port
VII	0 51	10° to Starboard	10° to Port
VIII	1 00	10° to Starboard	0°
IX	1 06	10° to Starboard	10° to Starboard
X	1 15	10° to Starboard	20° to Starboard
XI	1 21	10° to Starboard	30° to Starboard
XII	1 30	10° to Starboard	40° to Starboard
XIII	1 36	10° to Port	30° to Starboard
XIV	1 45	10° to Port	20° to Starboard
XV	1 51	10° to Port	10° to Starboard
XVI	2 00	10° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	14·4
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	15·3
18	1·8	2·7	1·8	2·7	1·8	2·7	1·8	2·7	16·2
19	1·9	2·85	1·9	2·85	1·9	2·85	1·9	2·85	17·1
20	2·0	3·0	2·0	3·0	2·0	3·0	2·0	3·0	18·0
21	2·1	3·15	2·1	3·15	2·1	3·15	2·1	3·15	18·9
22	2·2	3·3	2·2	3·3	2·2	3·3	2·2	3·3	19·8
23	2·3	3·45	2·3	3·45	2·3	3·45	2·3	3·45	20·7
24	2·4	3·6	2·4	3·6	2·4	3·6	2·4	3·6	21·6
25	2·5	3·75	2·5	3·75	2·5	3·75	2·5	3·75	22·5
26	2·6	3·9	2·6	3·9	2·6	3·9	2·6	3·9	23·4
27	2·7	4·05	2·7	4·05	2·7	4·05	2·7	4·05	24·3

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 94% of distance run

(**Note:**—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 12.*)

Positions and Times for alterations of course		Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr. Min.		
0	0 00	—	0°
I	0 10	10° to Port	10° to Port
II	0 15	20° to Port	30° to Port
III	0 28	20° to Starboard	10° to Port
IV	0 35	20° to Starboard	10° to Starboard
V	0 45	20° to Starboard	30° to Starboard
VI	0 55	20° to Port	10° to Starboard
VII	1 00	10° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	
6	1·0	0·5	1·0	1·0	1·0	1·0	0·5	5·64
7	1·17	0·58	1·17	1·17	1·17	1·17	0·58	6·58
8	1·33	0·67	1·33	1·33	1·33	1·33	0·67	7·52
9	1·5	0·75	1·5	1·5	1·5	1·5	0·75	8·46
10	1·67	0·83	1·67	1·67	1·67	1·67	0·83	9·4
11	1·83	0·92	1·83	1·83	1·83	1·83	0·92	10·34
12	2·0	1·0	2·0	2·0	2·0	2·0	1·0	11·28
13	2·17	1·08	2·17	2·17	2·17	2·17	1·08	12·22
14	2·33	1·17	2·33	2·33	2·33	2·33	1·17	13·16
15	2·5	1·25	2·5	2·5	2·5	2·5	1·25	14·10
16	2·67	1·33	2·67	2·67	2·67	2·67	1·33	15·04
17	2·83	1·42	2·83	2·83	2·83	2·83	1·42	15·98

For general use in submarine areas.

SUITABLE FOR CONVOYS OF ALL SPEEDS

The diagram takes ONE hour to complete.

Distance made good = 90% of distance run

(**Note:**—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No.* 17.)

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr.	Min.		
0	0	00	—	0°
I	0	06	20° to Port	20° to Port
II	0	15	20° to Port	40° to Port
III	0	21	20° to Starboard	20° to Port
IV	0	30	20° to Starboard	0°
V	0	36	20° to Starboard	20° to Starboard
VI	0	45	20° to Starboard	40° to Starboard
VII	0	51	20° to Port	20° to Starboard
VIII	1	00	20° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position VIII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good each hour along the Mean Course (in miles)
	0 to I	I to II	II to III	III to IV	IV to V	V to VI	VI to VII	VII to VIII	
6	0·6	0·9	0·6	0·9	0·6	0·9	0·6	0·9	5·4
7	0·7	1·05	0·7	1·05	0·7	1·05	0·7	1·05	6·3
8	0·8	1·2	0·8	1·2	0·8	1·2	0·8	1·2	7·2
9	0·9	1·35	0·9	1·35	0·9	1·35	0·9	1·35	8·1
10	1·0	1·5	1·0	1·5	1·0	1·5	1·0	1·5	9·0
11	1·1	1·65	1·1	1·65	1·1	1·65	1·1	1·65	9·9
12	1·2	1·8	1·2	1·8	1·2	1·8	1·2	1·8	10·8
13	1·3	1·95	1·3	1·95	1·3	1·95	1·3	1·95	11·7
14	1·4	2·1	1·4	2·1	1·4	2·1	1·4	2·1	12·6
15	1·5	2·25	1·5	2·25	1·5	2·25	1·5	2·25	13·5
16	1·6	2·4	1·6	2·4	1·6	2·4	1·6	2·4	14·4
17	1·7	2·55	1·7	2·55	1·7	2·55	1·7	2·55	15·3

For general use in submarine areas.

SUITABLE FOR FAST CONVOYS (12 KNOTS AND OVER)

The diagram takes TWO hours to complete.

Distance made good = 92% of distance run

(**Note:**—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 19.*)

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time			
	Hr.	Min.		
0	0	00	20° to Port*	
I	0	10	20° to Port	40° to Port
II	0	15	40° to Starboard	0°
III	0	25	20° to Port	20° to Port
IV	0	35	20° to Port	40° to Port
V	0	40	40° to Starboard	0°
VI	0	50	20° to Port	20° to Port
VII	1	00	40° to Starboard	20° to Starboard
VIII	1	10	20° to Starboard	40° to Starboard
IX	1	15	40° to Port	0°
X	1	25	20° to Starboard	20° to Starboard
XI	1	35	40° to Port	40° to Starboard
XII	1	40	40° to Port	0°
XIII	1	50	20° to Starboard	20° to Starboard
XIV	2	00	20° to Port	20° to Starboard

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XIV puts the ship on the first leg of the zig-zag from position 0.

* This alteration is carried out **on first commencing** the zig-zag only, as the ship will have been on the mean course immediately prior to the alteration. When **repeating** the zig-zag (from position XIV) an alteration of 40° is required to put the ship on the first leg of the zig-zag, as the ship will **not** have been on the mean course immediately prior to the alteration.

Speed of ship (in knots)	Distance run on each leg (in miles)							Distance made good each hour along the Mean Course (in miles)
	0 to I and VII to VIII	I to II and VIII to IX	II to III and IX to X	III to IV and X to XI	IV to V and XI to XII	V to VI and XII to XIII	VI to VII and XII to XIV	
12	2·0	1·0	2·0	2·0	1·0	2·0	2·0	11·04
13	2·17	1·08	2·17	2·17	1·08	2·17	2·17	11·96
14	2·33	1·17	2·33	2·33	1·17	2·33	2·33	12·88
15	2·5	1·25	2·5	2·5	1·25	2·5	2·5	13·80
16	2·67	1·33	2·67	2·67	1·33	2·67	2·67	14·72
17	2·83	1·42	2·83	2·83	1·42	2·83	2·83	15·64
18	3·0	1·5	3·0	3·0	1·5	3·0	3·0	16·56
19	3·17	1·58	3·17	3·17	1·58	3·17	3·17	17·48
20	3·33	1·67	3·33	3·33	1·67	3·33	3·33	18·40
21	3·5	1·75	3·5	3·5	1·75	3·5	3·5	19·32
22	3·67	1·83	3·67	3·67	1·83	3·67	3·67	20·24
23	3·83	1·92	3·83	3·83	1·92	3·83	3·83	21·16

For general use in submarine areas.

SUITABLE FOR FAST SHIPS (16 KNOTS AND OVER)

The diagram takes TWO hours to complete.

Distance made good = 86% of distance run

(Note:—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 22.*)

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time			
	Hr.	Min.		
0	0	00	~	0°
I	0	04¾	10° to Port	10° to Port
II	0	12	10° to Port	20° to Port
III	0	16¾	10° to Port	30° to Port
IV	0	24	10° to Port	40° to Port
V	0	28¾	10° to Port	50° to Port
VI	0	36	10° to Starboard	40° to Port
VII	0	40¾	10° to Starboard	30° to Port
VIII	0	48	10° to Starboard	20° to Port
IX	0	52¾	10° to Starboard	10° to Port
X	1	00	10° to Starboard	0°
XI	1	04¾	10° to Starboard	10° to Starboard
XII	1	12	10° to Starboard	20° to Starboard
XIII	1	16¾	10° to Starboard	30° to Starboard
XIV	1	24	10° to Starboard	40° to Starboard
XV	1	28¾	10° to Starboard	50° to Starboard
XVI	1	36	10° to Port	40° to Starboard
XVII	1	40¾	10° to Port	30° to Starboard
XVIII	1	48	10° to Port	20° to Starboard
XIX	1	52¾	10° to Port	10° to Starboard
XX	2	00	10° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XX puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)										Distance made good each hour along the Mean Course (in miles)
	0 to I and X to XI	I to II and XI to XII	II to III and XII to XIII	III to IV and XIII to XIV	IV to V and XIV to XV	V to VI and XV to XVI	VI to VII and XVI to XVII	VII to VIII and XVII to XVIII	VIII to IX and XVIII to XIX	IX to X and XIX to XX	
16	1·24	1·96	1·24	1·96	1·24	1·96	1·24	1·96	1·24	1·96	13·76
17	1·32	2·08	1·32	2·08	1·32	2·08	1·32	2·08	1·32	2·08	14·62
18	1·40	2·20	1·40	2·20	1·40	2·20	1·40	2·20	1·40	2·20	15·48
19	1·48	2·32	1·48	2·32	1·48	2·32	1·48	2·32	1·48	2·32	16·34
20	1·56	2·44	1·56	2·44	1·56	2·44	1·56	2·44	1·56	2·44	17·20
21	1·63	2·57	1·63	2·57	1·63	2·57	1·63	2·57	1·63	2·57	18·06
22	1·71	2·69	1·71	2·69	1·71	2·69	1·71	2·69	1·71	2·69	18·92
23	1·79	2·81	1·79	2·81	1·79	2·81	1·79	2·81	1·79	2·81	19·78
24	1·87	2·93	1·87	2·93	1·87	2·93	1·87	2·93	1·87	2·93	20·64
25	1·95	3·05	1·95	3·05	1·95	3·05	1·95	3·05	1·95	3·05	21·50
26	2·02	3·18	2·02	3·18	2·02	3·18	2·02	3·18	2·02	3·18	22·36
27	2·10	3·30	2·10	3·30	2·10	3·30	2·10	3·30	2·10	3·30	23·22

For general use in submarine areas.

SUITABLE FOR FAST SHIPS (16 KNOTS AND OVER.)

The diagram takes ONE hour to complete.

Distance made good — 83% of distance run

(**Note**:—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 28.*)

Positions and Times for alterations of Course			Amount to alter course	Amount ship's head is off the Mean Course
Position	Time Hr.	Min.		
0	0	00	—	0°
I	0	04	10° to Port	10° to Port
II	0	10	10° to Port	20° to Port
III	0	14	10° to Port	30° to Port
IV	0	20	10° to Port	40° to Port
V	0	24	10° to Port	50° to Port
VI	0	30	50° to Starboard	0°
VII	0	34	10° to Starboard	10° to Starboard
VIII	0	40	10° to Starboard	20° to Starboard
IX	0	44	10° to Starboard	30° to Starboard
X	0	50	10° to Starboard	40° to Starboard
XI	0	54	10° to Starboard	50° to Starboard
XII	1	00	50° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XII puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)						Distance made good each hour along the Mean Course (in miles)
	0 to I and VI to VII	I to II and VII to VIII	II to III and VIII to IX	III to IV and IX to X	IV to V and X to XI	V to VI and XI to XII	
16	1·07	1·6	1·07	1·6	1·07	1·6	13·28
17	1·13	1·7	1·13	1·7	1·13	1·7	14·11
18	1·20	1·8	1·20	1·8	1·20	1·8	14·94
19	1·27	1·9	1·27	1·9	1·27	1·9	15·77
20	1·33	2·0	1·33	2·0	1·33	2·0	16·60
21	1·40	2·1	1·40	2·1	1·40	2·1	17·43
22	1·47	2·2	1·47	2·2	1·47	2·2	18·26
23	1·53	2·3	1·53	2·3	1·53	2·3	19·09
24	1·60	2·4	1·60	2·4	1·60	2·4	19·92
25	1·67	2·5	1·67	2·5	1·67	2·5	20·75
26	1·73	2·6	1·73	2·6	1·73	2·6	21·58
27	1·80	2·7	1·80	2·7	1·80	2·7	22·41

For use in specially dangerous waters.

SUITABLE FOR SHIPS OF SPEEDS UP TO 16 KNOTS

The diagram takes TWO hours to complete.

Distance made good = 69% of distance run

(Note:—*This zig-zag is always to Port of the Mean Course. The corresponding zig-zag to Starboard of the Mean Course is No. 33.*)

Positions and Times for alterations of course			Amount to alter course	Amount ship's head is off the Mean Course
Positions	Time Hr.	Time Min.		
0	0	00	~	0°
I	0	03	50° to Port	50° to Port
II	0	15	90° to Starboard	40° to Starboard
III	0	21	60° to Port	20° to Port
IV	0	30	20° to Starboard	0°
V	0	33	60° to Port	60° to Port
VI	0	45	40° to Starboard	20° to Port
VII	0	51	50° to Port	70° to Port
VIII	1	00	70° to Starboard	0°
IX	1	03	50° to Starboard	50° to Starboard
X	1	15	90° to Port	40° to Port
XI	1	21	60° to Starboard	20° to Starboard
XII	1	30	20° to Port	0°
XIII	1	33	60° to Starboard	60° to Starboard
XIV	1	45	40° to Port	20° to Starboard
XV	1	51	50° to Starboard	70° to Starboard
XVI	2	00	70° to Port	0°

Repeat the zig-zag, recommencing from position 0. The alteration of course at position XVI puts the ship on the first leg of the zig-zag from position 0.

Speed of ship (in knots)	Distance run on each leg (in miles)								Distance made good along the each hour Mean Course (in miles)
	0 to I and VIII to IX	I to II and IX to X	II to III and X to XI	III to IV and XI to XII	IV to V and XII to XIII	V to VI and XIII to XIV	VI to VII and XIV to XV	VII to VIII and XV to XVI	
6	0·3	1·2	0·6	0·9	0·3	1·2	0·6	0·9	4·14
7	0·35	1·4	0·7	1·05	0·35	1·4	0·7	1·05	4·83
8	0·4	1·6	0·8	1·2	0·4	1·6	0·8	1·2	5·52
9	0·45	1·8	0·9	1·35	0·45	1·8	0·9	1·35	6·21
10	0·5	2·0	1·0	1·5	0·5	2·0	1·0	1·5	6·90
11	0·55	2·2	1·1	1·65	0·55	2·2	1·1	1·65	7·59
12	0·6	2·4	1·2	1·8	0·6	2·4	1·2	1·8	8·28
13	0·65	2·6	1·3	1·95	0·65	2·6	1·3	1·95	8·97
14	0·7	2·8	1·4	2·1	0·7	2·8	1·4	2·1	9·66
15	0·75	3·0	1·5	2·25	0·75	3·0	1·5	2·25	10·35
16	0·8	3·2	1·6	2·4	0·8	3·2	1·6	2·4	11·04

Facing new Zig-Zag Diagram No. 44 insert:—

NIGHT ZIG-ZAG

The Night zig-zag is 20 degrees either side of the mean course, course being altered 30 degrees to port at five minutes past the hour; 40 degrees to port at twenty minutes past the hour; 40 degrees to starboard at thirty-five minutes past the hour; 40 degrees to port at fifty-five minutes past the hour; and 20 degrees to port at the hour. Thus, the mean course will be steered from fifty-five minutes past the hour to twenty minutes past the hour, and is then to commence with an alteration of an exact ten minutes past the hour and is then to commence with an alteration of twenty degrees in the appropriate direction.

Insert new Zig-zag No. 45 as follows:—

CONTINUOUS RUDDER ZIGZAG

When the signal for Zigzag No. 45 is executed, the ship of the Senior Officer will apply the equivalent of 5 degrees of starboard rudder and will start a weaving zigzag 30 degrees on either side of the mean course.

Notes:—

(a) The principle underlying this form of zigzag is that the ship's head is continuously swinging one way or the other. There are no specific "legs" and the track of the ship will in fact be a continuous succession of arcs.

(b) On approaching the limit of a turn (which will, of course, be at a certain compass heading) the rudder should be reversed so as to end the current swing and start the subsequent one on to the lifelining heading.

(c) To be as it is, it is possible, the rate of swing should be constant; in order to achieve this it will generally be necessary to employ "rudder" equivalent which will vary with the weather conditions. For instance, it may be necessary to use 10 degrees of rudder when turning to leeward and to keep the rudder amidships for the turn to windward.

(d) All ships are to preserve compass bearing on the Senior Officer.

(e) Variations of this zigzag can be arranged locally, but a total swing of less than 60 degrees (that is to say 30 degrees on either side of the mean course) is not recommended.

(f) This form of zigzag is most confusing to submarines which must necessarily carry out their attacks unseen, and by day are therefore confined to occasional short glimpses through the periscope.