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Colin Hinson

In the village of Blunham, Bedfordshire.

M.C.A.P 59



MINISTRY OF CIVIL AVIATION

**CONSOL**  
AN AID TO NAVIGATION

LONDON: HIS MAJESTY'S STATIONERY OFFICE

1948

ONE SHILLING NET

# CONSOL

*A brief description of its use, with details of the service and cover provided by existing stations*

## INTRODUCTION

1. Consol is an accurate long range navigational aid using a special kind of automatic M.F. beacon at the ground station emitting signals which can be received and interpreted in the aircraft as dots and dashes by any M.F. receiver fitted with a beat frequency oscillator.

2. The number of dots or dashes heard locates the observer on one of a number of position lines. The correct position line can be selected by taking a D/F loop bearing on the Consol station or, in most cases, by reference to the D.R. position of the aircraft.

## THE PRINCIPLE OF CONSOL

3. A Consol station employs three aerials sited in a straight line, and by changing the relative phases of the currents in these aerials, a radiation pattern is produced which consists of alternate sectors of dot and dash signals separated by equisignals. The width of these sectors is about  $15^\circ$  on the average, but varies, being smallest on the normals, *i.e.* the direction at right angles to the line of the aerials, and largest in the direction of the line of the aerials. (See Fig. 1.) The equisignals and sectors rotate uniformly until the dot sectors replace the dash sectors (and vice versa). After this cycle the pattern reverts to its original position. The pattern on one side of the line of the aerials is the mirror image of the pattern on the other side, and the two patterns rotate in opposite directions.

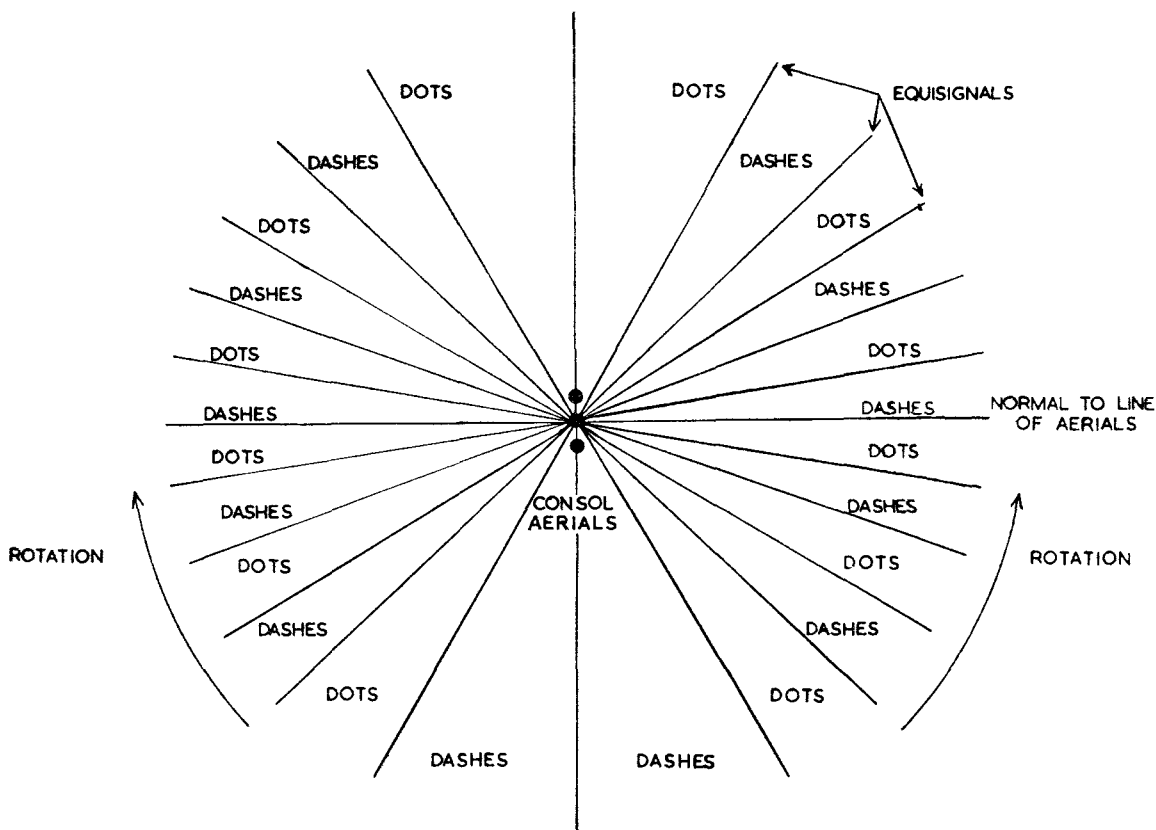


FIG. 1

4. An observer will hear the equisignal once in each cycle, and his angular position in the pattern sector is determined by the number of dot or dash characters heard before the equisignal.

## METHOD OF USE

5. The receiver is tuned to the frequency of the particular Consol station, and a series of dots (or dashes) followed by dashes (or dots) is heard. The series of dots (or dashes) appears to merge with the series of dashes (or dots) as the equisignal is reached, giving a short steady note. Each complete cycle of dots and dashes is separated from a long continuous signal by a short interval. This long continuous signal is interrupted to give morse letters of the particular Consol station call sign in order to ensure correct identification.

6. In order to obtain a Consol bearing, the number of dots and the number of dashes heard in a complete cycle are determined either by counting or by timing with a stop watch. As one character is heard every second or every half-second, depending on the particular station in use, it is easy to convert the time in seconds for which dots or dashes are heard, into the number of dots and the number of dashes. The time of the Consol observation is the time when the equisignal is heard.

7. The total number of dots *and* dashes heard should add up to 60, but in practice, since the exact change from dots (or dashes) to dashes (or dots) is masked by the width of the equisignal, one or more characters are lost and the total count is usually less than 60. The number of lost characters can be obtained by subtracting from 60 the total observed count of dots *and* dashes. Half the number of lost characters therefore are dots, and half dashes, and so the observed count of dots and dashes can be corrected, as in the following examples :—

<i>Example (i)</i>	Observed count	.. ..	38 dashes—equisignal—18 dots
	Number of characters	.. ..	$38 + 18 = 56$
	Lost characters	.. ..	$60 - 56 = 4$
	Corrected count	.. ..	$(38 + \frac{4}{2})$ dashes, $(18 + \frac{4}{2})$ dots = 40 dashes, 20 dots
<i>Example (ii)</i>	Observed count	.. ..	Equisignal—56 dashes
	Number of characters	.. ..	56
	Lost characters	.. ..	$60 - 56 = 4$
	Corrected count	.. ..	$(\frac{4}{2})$ dots, $(56 + \frac{4}{2})$ dashes = 2 dots, 58 dashes

8. The corrected count is interpreted as a position line by reference either to special Consol charts, or where these are not available, to specially prepared Consol tables. Consol charts are plotting or topographical sheets overprinted with position lines corresponding to selected Consol counts. Generally these position lines are printed at intervals of 10 characters; intermediate counts can be easily interpolated. Similarly the tables tabulate true bearings from the Consol station against an entry for type of character and its count. For example, a corrected count of 40 dashes/20 dots is applied to the chart or tables as 40 dashes.

9. It is advantageous to take the average of several bearings before entering the tables or using the chart.

10. Since the Consol system uses type A1 transmissions, the frequency band occupied by the signal is small, and consequently it is preferable to use a receiver of narrow band-width so that the accuracy of the count and the range of reception may be increased by the reduction of noise. Reception may also be improved, under conditions of static interference, by using the D/F loop for receiving the Consol signal; but care must be taken that the loop is not near its null setting, with reference to the Consol station, when the count is taken, otherwise large errors may result.

Automatic gain control *must be switched off* when receiving Consol signals. The “magic eye” form of tuning device, which is fitted to some receivers, can, under favourable circumstances, enhance the determination of the equisignal and hence the accuracy of the count.

## **THE RANGE AND ACCURACY OF CONSOL**

11. When the interference level is low, ranges of at least 1,000 n.miles over sea and 700 n.miles over flat land are to be expected on about 90 per cent. of occasions under daylight conditions. Ranges of at least 1,200 n.miles are to be expected on about 90 per cent. of occasions at night time.

12. Coverage from a single Consol station is given through 360°, but the accuracy of the system depends on the bearing of the aircraft from the beacon. The errors are always least on the normal to the line of the aerials, and increase as the line of the aerials is approached; errors are twice the minimum value at 60° to the normal and about 20 times the minimum value in the direction of the line of the aerials, where errors are greatest. In the neighbourhood of the direction of the aerial line there is also danger of ambiguity, as alternative positions corresponding to the same Consol signal are close together. In this region, therefore, Consol signals should be used with caution.

13. By day over sea the 95 per cent. error is two Consol characters (dots or dashes), that is the error only exceeds two characters on 5 per cent. of occasions. This corresponds to  $\frac{1}{3}^\circ$  at positions on the normal to the line of aerials. Over flat land the error is about twice this value.

14. At night the errors are larger and variable with range, and are usually at a maximum between 350 and 450 miles from the station, where the sky and ground wave signals have comparable amplitudes. At these distances the 95 per cent. error is about 15 characters, equivalent to  $2\frac{1}{2}^\circ$  on the normal to the line of the aerials; at greater distances the error decreases until at all ranges greater than about 600 n.miles the 95 per cent. error is about four to six characters, equivalent to  $\frac{2}{3}^\circ$  to  $1^\circ$  at positions on the normal to the line of the aerials.

## **EXISTING CONSOL STATIONS**

15. The table in Appendix I gives the following operational details for the existing Consol stations :  
Station position ; call signs ; frequencies ; operating cycles ; times of operation ; orientation of normals to the aerials and charts available.

## **TABLES FOR CONVERTING CONSOL COUNTS TO BEARINGS**

16. The tables in Appendix II have been prepared so that Consol bearings may be plotted when specially prepared charts are not available. The bearings given are, in all cases, true bearings from the station, and conversion angle must be applied where appropriate.

17. The tables show clearly where a given count may give two adjacent bearings, and where the bearing accuracy is low. Care must be exercised in using such bearings. The tables for Bushmills and Stavanger tabulate count for every unit whereas those for Lugo and Seville tabulate only for every two counts.

18. In Appendix III tables are given showing the conversion angle to be applied to bearings from the Consol stations. The latitude shown in the tables is the observer's actual latitude.

## **THE FIXING AND POSITION LINE COVER PROVIDED BY EXISTING STATIONS**

19. The service provided by the existing Consol stations is indicated in the diagrams at Appendices IV and V which show the coverage and accuracy provided by day and night respectively.

20. In the areas shaded horizontally, the accuracy of fixing is better than 5 n.miles on 95 per cent. of occasions, while in those shaded vertically, the accuracy is better than 10 n.miles on 95 per cent. of occasions. By night the areas where the accuracy of fixing is better than 20 n.miles on 95 per cent. of occasions are left unshaded.

21. Outside these more accurate fixing areas, position lines are shown where their accuracy is better than 10 n.miles by day (20 n.miles by night) on 95 per cent. of occasions.

MINISTRY OF CIVIL AVIATION  
(C.N. 2)

*November, 1948.*

## APPENDIX I

<i>Name of Station</i>	<i>Geographical Position</i>	<i>Call Sign</i>	<i>Frequency</i>	<i>Period of Operating Cycle</i>	<i>Daily Times of Operation</i>	<i>Bearing of Normal to line of Aerials</i>	<i>Details of Special Consol Charts available for general use</i>
BUSHMILLS (N. Ireland)	55° 12' 20" N 06° 28' 02" W	MWN	263 Kc/s	60 OR 40 secs. for complete cycle. 30 secs. for dot/dash period in the cycle.	24 hours	130·2° 310·2°	<p>1. Gt. Britain Topographical Consol Charts, sheets 1 and 2. Scale 1 : 1,000,000. Ref. : G.S.G.S. Misc. 509. Price 1s. 9d. per sheet. Bearings from Bushmills and Stavanger printed on each sheet.</p> <p>2. Europe Topographical Consol Charts. Sheet B.1. available—Gt. Britain and France. Scale 1 : 2,000,000. Ref. : G.S.G.S. 4626. Price 3s. 6d. per sheet. Bearings from Bushmills and Stavanger printed on each sheet</p>
STAVANGER (Norway)	58° 37' 31" N 05° 37' 49" E	LEC	319 Kc/s	120 secs. for complete cycle, to be changed to 40 secs. at later date. 60 secs. for dot/dash period; will be 30 secs. at later date.	24 hours	067·0° 247·0°	
LUGO (CORUNNA) (Spain)	43° 15' 00" N 07° 29' 00" W	—	303 Kc/s	120 secs. for complete cycle. 60 secs. for dot/dash period in the cycle.	0900-- 1600 G.M.T.	089·5° 269·5°	
SEVILLE (SAN PABLO) (Spain)	37° 31' 23" N 06° 01' 55" W	HT	311 Kc/s	120 secs. for complete cycle. 60 secs. for dot/dash period in the cycle.	0830-- 1900 G.M.T.	081·4° 261·4°	

# APPENDIX II

## STAVANGER CONSOL STATION DOT SECTORS

Count of Dots	True Bearings from Station											
	023.0	046.7	067.0	087.3	111.0			203.0	226.7	247.0	267.3	291.0
1	022.7	046.5	066.8	087.2	110.8			203.2	226.8	247.2	267.5	291.3
2	022.5	046.3	066.7	087.0	110.6			203.4	227.0	247.3	267.7	291.5
3	022.2	046.1	066.5	086.8	110.3			203.7	227.2	247.5	267.9	291.8
4	022.0	045.9	066.3	086.6	110.1			203.9	227.4	247.7	268.1	292.0
5	021.7	045.8	066.2	086.5	109.9			204.1	227.5	247.8	268.2	292.3
6	021.5	045.6	066.0	086.3	109.7			204.3	227.7	248.0	268.4	292.5
7	021.3	045.4	065.8	086.1	109.4			204.6	227.9	248.2	268.6	292.7
8	021.0	045.2	065.7	085.9	109.2			204.8	228.1	248.3	268.8	293.0
9	020.8	045.0	065.5	085.8	109.0			205.0	228.2	248.5	269.0	293.2
10	020.6	044.9	065.3	085.6	108.8			205.2	228.4	248.7	269.1	293.4
11	020.3	044.7	065.2	085.4	108.5			205.5	228.5	248.8	269.3	293.7
12	020.1	044.5	065.0	085.2	108.3			205.7	228.8	249.0	269.5	293.9
13	019.8	044.3	064.8	085.1	108.1			205.9	228.9	249.2	269.7	294.2
14	019.6	044.1	064.7	084.9	107.9			206.1	229.1	249.3	269.9	294.4
15	019.3	044.0	064.5	084.7	107.7	157.0	157.0	206.3	229.3	249.5	270.0	294.7
16	019.1	043.8	064.3	084.5	107.4	152.6	161.4	206.6	229.5	249.7	270.2	294.9
17	018.8	043.6	064.2	084.4	107.2	150.8	163.2	206.8	229.6	249.8	270.4	295.2
18	018.6	043.4	064.0	084.2	107.0	149.4	164.6	207.0	229.8	250.0	270.6	295.4
19	018.3	043.2	063.8	084.0	106.8	148.3	165.7	207.2	230.0	250.2	270.8	295.7
20	018.1	043.1	063.7	083.8	106.6	147.2	166.8	207.4	230.2	250.3	270.9	295.9
21	017.8	042.9	063.5	083.7	106.4	146.3	167.7	207.6	230.3	250.5	271.1	296.2
22	017.6	042.7	063.3	083.5	106.2	145.4	168.6	207.8	230.5	250.7	271.3	296.4
23	017.3	042.5	063.2	083.3	106.0	144.6	169.4	208.0	230.7	250.8	271.5	296.7
24	017.1	042.3	063.0	083.2	105.7	143.9	170.1	208.3	230.8	251.0	271.7	296.9
25	016.8	042.2	062.8	083.0	105.5	143.2	170.8	208.5	231.0	251.2	271.8	297.2
26	016.6	042.0	062.7	082.8	105.3	142.5	171.5	208.7	231.2	251.3	272.0	297.4
27	016.3	041.8	062.5	082.6	105.1	141.8	172.2	208.9	231.4	251.5	272.2	297.7
28	016.0	041.6	062.3	082.5	104.9	141.2	172.8	209.1	231.5	251.7	272.4	298.0
29	015.8	041.4	062.2	082.3	104.7	140.6	173.4	209.3	231.7	251.8	272.6	298.2
30	015.5	041.2	062.0	082.1	104.5	140.0	174.0	209.5	231.9	252.0	272.8	298.5
31	015.2	041.1	061.8	082.0	104.3	139.5	174.5	209.7	232.0	252.2	272.9	298.8
32	015.0	040.9	061.7	081.8	104.1	138.9	175.1	209.9	232.2	252.4	273.1	299.0
33	014.7	040.7	061.5	081.6	103.8	138.4	175.6	210.2	232.4	252.6	273.3	299.3
34	014.4	040.5	061.3	081.4	103.6	137.9	176.1	210.4	232.6	252.7	273.5	299.6
35	014.1	040.3	061.2	081.3	103.4	137.4	176.6	210.6	232.7	252.9	273.7	299.9
36	013.9	040.1	061.0	081.1	103.2	136.9	177.1	210.8	232.9	253.1	273.9	300.1
37	013.6	039.9	060.8	080.9	103.0	136.4	177.6	211.0	233.1	253.2	274.1	300.4
38	013.3	039.8	060.7	080.8	102.8	136.0	178.0	211.2	233.2	253.3	274.2	300.7
39	013.0	039.6	060.5	080.6	102.6	135.5	178.5	211.4	233.4	253.5	274.4	301.0
40	012.8	039.4	060.3	080.4	102.4	135.1	178.9	211.6	233.6	253.6	274.6	301.2
41	012.5	039.2	060.2	080.2	102.2	134.6	179.4	211.8	233.8	253.8	274.8	301.5
42	012.2	039.0	060.0	080.1	102.0	134.2	179.8	212.0	233.9	254.0	275.0	301.8
43	011.9	038.8	059.8	079.9	101.8	133.8	180.2	212.2	234.1	254.1	275.2	302.1
44	011.6	038.6	059.7	079.7	101.6	133.3	180.7	212.4	234.3	254.3	275.4	302.4
45	011.3	038.4	059.5	079.6	101.4	132.9	181.1	212.6	234.4	254.5	275.6	302.7
46	011.0	038.2	059.3	079.4	101.2	132.5	181.5	212.8	234.6	254.7	275.8	303.0
47	010.7	038.1	059.2	079.2	101.0	132.1	181.9	213.0	234.8	254.8	276.0	303.3
48	010.4	037.9	059.0	079.0	100.8	131.7	182.3	213.2	235.0	255.0	276.1	303.6
49	010.1	037.7	058.8	078.9	100.6	131.4	182.7	213.4	235.1	255.2	276.3	303.9
50	009.8	037.5	058.7	078.7	100.4	131.0	183.0	213.6	235.3	255.3	276.5	304.2
51	009.5	037.3	058.5	078.5	100.2	130.6	183.4	213.8	235.5	255.5	276.7	304.5
52	009.2	037.1	058.3	078.4	100.0	130.2	183.8	214.0	235.6	255.7	276.9	304.8
53	008.9	036.9	058.2	078.2	099.8	129.8	184.2	214.2	235.8	255.8	277.1	305.1
54	008.6	036.7	058.0	078.0	099.6	129.5	184.5	214.4	236.0	256.0	277.3	305.4
55	008.2	036.5	057.8	077.8	099.4	129.1	184.9	214.6	236.2	256.2	277.5	305.8
56	007.9	036.3	057.7	077.7	099.2	128.8	185.2	214.8	236.3	256.3	277.7	306.1
57	007.6	036.1	057.5	077.5	099.0	128.4	185.6	215.0	236.5	256.5	277.9	306.4
58	007.3	036.0	057.3	077.3	098.8	128.1	185.9	215.2	236.7	256.7	278.0	306.7
59	006.9	035.8	057.2	077.2	098.6	127.7	186.3	215.4	236.8	256.8	278.2	307.1
60	006.6	035.6	057.0	077.0	098.4	127.4	186.6	215.6	237.0	257.0	278.4	307.4

**APPENDIX II (continued)**

**STAVANGER CONSOL STATION  
DASH SECTORS**

Count of Dashes	True Bearings from Station											
	035.6	057.0	077.0	098.4	127.4	186.6	215.6	237.0	257.0	278.4	307.4	006.6
0												
1	035.4	056.8	076.8	098.2	127.1	186.9	215.8	237.2	257.2	278.6	307.7	006.3
2	035.2	056.7	076.7	098.0	126.7	187.3	216.0	237.3	257.3	278.8	308.1	005.9
3	035.0	056.5	076.5	097.9	126.4	187.6	216.1	237.5	257.5	279.0	308.4	005.6
4	034.8	056.3	076.3	097.7	126.1	187.9	216.3	237.7	257.7	279.2	308.8	005.2
5	034.6	056.2	076.2	097.5	125.8	188.2	216.5	237.8	257.8	279.4	309.1	004.9
6	034.4	056.0	076.0	097.3	125.4	188.6	216.7	238.0	258.0	279.6	309.5	004.5
7	034.2	055.8	075.8	097.1	125.1	188.9	216.9	238.2	258.2	279.8	309.8	004.2
8	034.0	055.6	075.7	096.9	124.8	189.2	217.1	238.3	258.4	280.0	310.2	003.8
9	033.8	055.5	075.5	096.7	124.5	189.5	217.3	238.5	258.5	280.2	310.6	003.4
10	033.6	055.3	075.3	096.5	124.2	189.8	217.5	238.7	258.7	280.4	311.0	003.0
11	033.4	055.1	075.2	096.3	123.9	190.1	217.7	238.8	258.9	280.6	311.4	002.7
12	033.2	055.0	075.0	096.1	123.6	190.4	217.9	239.0	259.0	280.8	311.7	002.3
13	033.0	054.8	074.8	095.9	123.3	190.7	218.1	239.2	259.2	281.0	312.1	001.9
14	032.8	054.6	074.7	095.8	123.0	191.0	218.2	239.3	259.4	281.2	312.5	001.5
15	032.6	054.4	074.5	095.6	122.7	191.3	218.4	239.5	259.6	281.4	312.9	001.1
16	032.4	054.3	074.3	095.4	122.4	191.6	218.6	239.7	259.7	281.6	313.3	000.7
17	032.2	054.1	074.2	095.2	122.1	191.9	218.8	239.8	259.9	281.8	313.8	000.2
18	032.0	053.9	074.0	095.0	121.8	192.2	219.0	240.0	260.1	282.0	314.2	359.8
19	031.8	053.8	073.8	094.8	121.5	192.5	219.2	240.2	260.2	282.2	314.6	359.4
20	031.6	053.6	073.7	094.6	121.2	192.8	219.4	240.3	260.4	282.4	315.1	358.9
21	031.4	053.4	073.5	094.4	121.0	193.0	219.6	240.5	260.6	282.6	315.5	358.5
22	031.2	053.2	073.3	094.2	120.7	193.3	219.8	240.7	260.8	282.8	316.0	358.0
23	031.0	053.1	073.2	094.1	120.4	193.6	219.9	240.8	260.9	283.0	316.4	357.6
24	030.8	052.9	073.0	093.9	120.1	193.9	220.1	241.0	261.1	283.2	316.9	357.1
25	030.6	052.7	072.8	093.7	119.9	194.1	220.3	241.2	261.3	283.4	317.4	356.6
26	030.4	052.6	072.7	093.5	119.6	194.4	220.5	241.3	261.4	283.6	317.9	356.1
27	030.2	052.4	072.5	093.3	119.3	194.7	220.7	241.5	261.6	283.8	318.4	355.6
28	029.9	052.2	072.3	093.1	119.0	195.0	220.9	241.7	261.8	284.1	318.9	355.1
29	029.7	052.0	072.2	092.9	118.8	195.2	221.1	241.8	262.0	284.3	319.5	354.5
30	029.5	051.9	072.0	092.8	118.5	195.5	221.2	242.0	262.1	284.5	320.0	354.0
31	029.3	051.7	071.8	092.6	118.2	195.8	221.4	242.2	262.3	284.7	320.6	353.4
32	029.1	051.5	071.7	092.4	118.0	196.0	221.6	242.3	262.5	284.9	321.2	352.8
33	028.9	051.4	071.5	092.2	117.7	196.3	221.8	242.5	262.6	285.1	321.8	352.2
34	028.7	051.2	071.3	092.0	117.4	196.6	222.0	242.7	262.8	285.3	322.5	351.5
35	028.5	051.0	071.1	091.8	117.2	196.8	222.2	242.8	263.0	285.5	323.2	350.8
36	028.3	050.8	071.0	091.7	116.9	197.1	222.3	243.0	263.2	285.7	323.9	350.1
37	028.0	050.7	070.8	091.5	116.7	197.3	222.5	243.2	263.3	286.0	324.6	349.4
38	027.8	050.5	070.7	091.3	116.4	197.6	222.7	243.3	263.5	286.2	325.4	348.6
39	027.6	050.3	070.5	091.1	116.2	197.8	222.9	243.5	263.7	286.4	326.3	347.7
40	027.4	050.2	070.3	090.9	115.9	198.1	223.1	243.7	263.8	286.6	327.2	346.8
41	027.2	050.0	070.2	090.8	115.7	198.3	223.2	243.8	264.0	286.8	328.3	345.7
42	027.0	049.8	070.0	090.6	115.4	198.6	223.4	244.0	264.2	287.0	329.4	344.6
43	026.8	049.6	069.8	090.4	115.2	198.8	223.6	244.2	264.4	287.2	330.8	343.2
44	026.6	049.5	069.7	090.2	114.9	199.1	223.8	244.3	264.5	287.4	332.6	341.4
45	026.3	049.3	069.5	090.0	114.7	199.3	224.0	244.5	264.7	287.7	337.0	337.0
46	026.1	049.1	069.3	089.9	114.4	199.6	224.1	244.7	264.9	287.9		
47	025.9	048.9	069.2	089.7	114.2	199.8	224.3	244.8	265.1	288.1		
48	025.7	048.8	069.0	089.5	113.9	200.1	224.5	245.0	265.2	288.3		
49	025.5	048.6	068.8	089.3	113.7	200.3	224.7	245.2	265.4	288.5		
50	025.2	048.4	068.7	089.1	113.4	200.6	224.9	245.3	265.6	288.8		
51	025.0	048.2	068.5	089.0	113.2	200.8	225.0	245.5	265.8	289.0		
52	024.8	048.1	068.3	088.8	113.0	201.0	225.2	245.7	265.9	289.2		
53	024.6	047.9	068.2	088.6	112.7	201.3	225.4	245.8	266.1	289.4		
54	024.3	047.7	068.0	088.4	112.5	201.5	225.6	246.0	266.3	289.7		
55	024.1	047.5	067.8	088.2	112.3	201.7	225.8	246.2	266.5	289.9		
56	023.9	047.4	067.7	088.1	112.0	202.0	225.9	246.3	266.6	290.1		
57	023.7	047.2	067.5	087.9	111.8	202.2	226.1	246.5	266.8	290.3		
58	023.4	047.0	067.3	087.7	111.5	202.5	226.3	246.7	267.0	290.6		
59	023.2	046.8	067.2	087.5	111.3	202.7	226.5	246.8	267.2	290.8		
60	023.0	046.7	067.0	087.3	111.0	203.0	226.7	247.0	267.3	291.0		



**APPENDIX II (continued)**

**BUSHMILLS CONSOL STATION  
DOT SECTORS**

Count of Dots	True Bearings from Station									
	015-0	065-4	103-3	130-2	157-1	195-0	245-4	283-3	310-2	337-1
1	015-6	064-8	103-1	130-0	156-9	194-5	245-9	283-5	310-4	337-3
2	016-1	064-3	102-8	129-8	156-6	194-0	246-4	283-8	310-6	337-6
3	016-7	063-7	102-6	129-6	156-4	193-6	246-8	284-0	310-8	337-8
4	017-2	063-2	102-3	129-3	156-1	193-1	247-3	284-3	311-1	338-1
5	017-8	062-6	102-1	129-1	155-9	192-6	247-8	284-5	311-3	338-3
6	018-3	062-1	101-8	128-9	155-7	192-1	248-3	284-7	311-5	338-6
7	018-9	061-5	101-6	128-7	155-4	191-6	248-8	285-0	311-7	338-8
8	019-5	060-9	101-3	128-4	155-2	191-2	249-2	285-2	312-0	339-1
9	020-1	060-3	101-1	128-2	155-0	190-7	249-7	285-4	312-2	339-3
10	020-7	059-7	100-8	128-0	154-7	190-3	250-1	285-7	312-4	339-6
11	021-4	059-0	100-6	127-8	154-5	189-9	250-5	285-9	312-6	339-8
12	022-1	058-3	100-3	127-6	154-2	189-5	250-9	286-2	312-8	340-1
13	022-8	057-6	100-1	127-4	154-0	189-1	251-3	286-4	313-0	340-3
14	023-6	056-8	099-9	127-2	153-8	188-6	251-8	286-6	313-2	340-5
15	024-4	056-0	099-6	127-0	153-5	188-2	252-2	286-9	313-4	340-8
16	025-2	055-2	099-4	126-7	153-3	187-8	252-6	287-1	313-7	341-0
17	026-0	054-4	099-1	126-5	153-1	187-4	253-0	287-3	313-9	341-3
18	026-9	053-5	098-9	126-3	152-8	187-0	253-4	287-6	314-1	341-5
19	027-9	052-5	098-6	126-1	152-6	186-6	253-8	287-8	314-3	341-8
20	028-9	051-5	098-4	125-9	152-3	186-3	254-1	288-1	314-5	342-0
21	030-1	050-3	098-1	125-7	152-1	185-9	254-5	288-3	314-7	342-3
22	031-4	049-0	097-9	125-4	151-9	185-5	254-9	288-5	315-0	342-5
23	033-0	047-4	097-6	125-2	151-7	185-2	255-2	288-7	315-2	342-8
24	035-0	045-4	097-3	125-0	151-4	184-8	255-6	289-0	315-4	343-1
25	038-6	041-8	097-0	124-8	151-2	184-4	256-0	289-2	315-6	343-4
26			096-8	124-6	151-0	184-0	256-4	289-4	315-8	343-6
27			096-6	124-4	150-7	183-6	256-8	289-7	316-0	343-8
28			096-3	124-1	150-5	183-3	257-1	289-9	316-3	344-1
29			096-0	123-9	150-3	182-9	257-5	290-1	316-5	344-4
30			095-8	123-7	150-0	182-6	257-8	290-4	316-7	344-6
31			095-5	123-5	149-8	182-3	258-1	290-6	316-9	344-9
32			095-2	123-3	149-6	181-9	258-5	290-8	317-1	345-2
33			095-0	123-1	149-3	181-5	258-9	291-1	317-3	345-4
34			094-7	122-8	149-1	181-2	259-2	291-3	317-6	345-7
35			094-5	122-6	148-9	180-8	259-6	291-5	317-8	345-9
36			094-2	122-4	148-6	180-5	259-9	291-8	318-0	346-2
37			093-9	122-2	148-4	180-1	260-3	292-0	318-2	346-5
38			093-7	122-0	148-2	179-8	260-6	292-2	318-4	346-7
39			093-4	121-7	148-0	179-5	260-9	292-4	318-7	347-0
40			093-1	121-5	147-7	179-1	261-3	292-7	318-9	347-3
41			092-8	121-3	147-5	178-8	261-6	292-9	319-1	347-6
42			092-5	121-1	147-3	178-5	261-9	293-1	319-3	347-9
43			092-3	120-9	147-1	178-1	262-3	293-3	319-5	348-1
44			092-0	120-7	146-8	177-8	262-6	293-6	319-7	348-4
45			091-7	120-4	146-6	177-5	262-9	293-8	320-0	348-7
46			091-5	120-2	146-4	177-2	263-2	294-0	320-2	348-9
47			091-2	120-0	146-2	176-9	263-5	294-2	320-4	349-2
48			090-9	119-8	145-9	176-6	263-8	294-5	320-6	349-5
49			090-6	119-6	145-7	176-2	264-2	294-7	320-8	349-8
50			090-3	119-3	145-5	175-9	264-5	294-9	321-1	350-1
51			090-0	119-1	145-3	175-6	264-8	295-1	321-3	350-4
52			089-8	118-9	145-0	175-3	265-1	295-4	321-5	350-6
53			089-5	118-7	144-8	175-0	265-4	295-6	321-7	350-9
54			089-2	118-5	144-6	174-7	265-7	295-8	321-9	351-2
55			088-9	118-2	144-4	174-4	266-0	296-0	322-2	351-5
56			088-6	118-0	144-1	174-1	266-3	296-3	322-4	351-8
57			088-3	117-8	143-9	173-8	266-6	296-5	322-6	352-1
58			088-0	117-6	143-7	173-6	266-8	296-7	322-8	352-4
59			087-7	117-4	143-5	173-3	267-1	296-9	323-0	352-7
60			087-4	117-1	143-3	173-0	267-4	297-1	323-3	353-0

**APPENDIX II (continued)**

**BUSHMILLS CONSOL STATION**

**DASH SECTORS**

Count of Dashes	True Bearings from Station									
	0	087.4	117.1	143.3	173.0			267.4	297.1	323.3
1	087.1	116.9	143.0	172.7			267.7	297.4	323.5	353.3
2	086.8	116.7	142.8	172.4			268.0	297.6	323.7	353.6
3	086.6	116.5	142.6	172.1			268.3	297.8	323.9	353.8
4	086.3	116.3	142.4	171.8			268.6	298.0	324.1	354.1
5	086.0	116.0	142.2	171.5			268.9	298.2	324.4	354.4
6	085.7	115.8	141.9	171.2			269.2	298.5	324.6	354.7
7	085.4	115.6	141.7	170.9			269.5	298.7	324.8	355.0
8	085.1	115.4	141.5	170.6			269.8	298.9	325.0	355.3
9	084.8	115.1	141.3	170.4			270.0	299.1	325.3	355.6
10	084.5	114.9	141.1	170.1			270.3	299.3	325.5	355.9
11	084.2	114.7	140.8	169.8			270.6	299.6	325.7	356.2
12	083.8	114.5	140.6	169.5			270.9	299.8	325.9	356.6
13	083.5	114.2	140.4	169.2			271.2	300.0	326.2	356.9
14	083.2	114.0	140.2	168.9			271.5	300.2	326.4	357.2
15	082.9	113.8	140.0	168.7			271.7	300.4	326.6	357.5
16	082.6	113.6	139.7	168.4			272.0	300.7	326.8	357.8
17	082.3	113.3	139.5	168.1			272.3	300.9	327.1	358.1
18	081.9	113.1	139.3	167.9			272.5	301.1	327.3	358.5
19	081.6	112.9	139.1	167.6			272.8	301.3	327.5	358.8
20	081.3	112.7	138.9	167.3			273.1	301.5	327.7	359.1
21	080.9	112.4	138.7	167.0			273.4	301.7	328.0	359.5
22	080.6	112.2	138.4	166.7			273.7	302.0	328.2	359.8
23	080.3	112.0	138.2	166.5			273.9	302.2	328.4	000.1
24	079.9	111.8	138.0	166.2			274.2	302.4	328.6	000.5
25	079.6	111.5	137.8	165.9			274.5	302.6	328.9	000.8
26	079.2	111.3	137.6	165.7			274.7	302.8	329.1	001.2
27	078.9	111.1	137.3	165.4			275.0	303.1	329.3	001.5
28	078.5	110.8	137.1	165.2			275.2	303.3	329.6	001.9
29	078.1	110.6	136.9	164.9			275.5	303.5	329.8	002.3
30	077.8	110.4	136.7	164.6			275.8	303.7	330.0	002.6
31	077.5	110.1	136.5	164.4			276.0	303.9	330.3	002.9
32	077.1	109.9	136.3	164.1			276.3	304.1	330.5	003.3
33	076.8	109.7	136.0	163.8			276.6	304.4	330.7	003.6
34	076.4	109.4	135.8	163.6			276.8	304.6	331.0	004.0
35	076.0	109.2	135.6	163.4	218.6	221.8	277.0	304.8	331.2	004.4
36	075.6	109.0	135.4	163.1	215.0	225.4	277.3	305.0	331.4	004.8
37	075.2	108.7	135.2	162.8	213.0	227.4	277.6	305.2	331.7	005.2
38	074.9	108.5	135.0	162.5	211.4	229.0	277.9	305.4	331.9	005.5
39	074.5	108.3	134.7	162.3	210.1	230.3	278.1	305.7	332.1	005.9
40	074.1	108.1	134.5	162.0	208.9	231.5	278.4	305.9	332.3	006.3
41	073.8	107.8	134.3	161.8	207.9	232.5	278.6	306.1	332.6	006.6
42	073.4	107.6	134.1	161.5	206.9	233.5	278.9	306.3	332.8	007.0
43	073.0	107.3	133.9	161.3	206.0	234.4	279.1	306.5	333.1	007.4
44	072.6	107.1	133.7	161.0	205.2	235.2	279.4	306.7	333.3	007.8
45	072.2	106.9	133.4	160.8	204.4	236.0	279.6	307.0	333.5	008.2
46	071.8	106.6	133.2	160.5	203.6	236.8	279.9	307.2	333.8	008.6
47	071.3	106.4	133.0	160.3	202.8	237.6	280.1	307.4	334.0	009.1
48	070.9	106.2	132.8	160.1	202.1	238.3	280.3	307.6	334.2	009.5
49	070.5	105.9	132.6	159.8	201.4	239.0	280.6	307.8	334.5	009.9
50	070.1	105.7	132.4	159.6	200.7	239.7	280.8	308.0	334.7	010.3
51	069.7	105.4	132.2	159.3	200.1	240.3	281.1	308.2	335.0	010.7
52	069.2	105.2	132.0	159.1	199.5	240.9	281.3	308.4	335.2	011.2
53	068.8	105.0	131.7	158.8	198.9	241.5	281.6	308.7	335.4	011.6
54	068.3	104.7	131.5	158.6	198.3	242.1	281.8	308.9	335.7	012.1
55	067.8	104.5	131.3	158.3	197.8	242.6	282.1	309.1	335.9	012.6
56	067.3	104.3	131.1	158.1	197.2	243.2	282.3	309.3	336.1	013.1
57	066.8	104.0	130.8	157.8	196.7	243.7	282.6	309.6	336.4	013.6
58	066.4	103.8	130.6	157.6	196.1	244.3	282.8	309.8	336.6	014.0
59	065.9	103.5	130.4	157.3	195.6	244.8	283.1	310.0	336.9	014.5
60	065.4	103.3	130.2	157.1	195.0	245.4	283.3	310.2	337.1	015.0

**APPENDIX II** (continued)

**LUGO CONSOL STATION  
DOT SECTORS**

Count of Dots	True Bearings from Station											
0	44.2	68.2	88.8	109.2	133.2			224.2	248.2	268.8	289.2	313.2
2	43.7	67.9	88.5	108.8	132.7			224.6	248.6	269.2	289.6	313.7
4	43.2	67.6	88.2	108.5	132.2			225.1	249.0	269.5	289.9	314.1
6	42.7	67.2	87.8	108.2	131.8			225.6	249.3	269.8	290.3	314.6
8	42.2	66.8	87.5	107.8	131.4			226.0	249.6	270.1	290.7	315.1
10	41.7	66.4	87.1	107.5	131.0			226.5	250.0	270.4	291.0	315.6
12	41.3	66.0	86.8	107.2	130.5			227.0	250.3	270.7	291.3	316.1
14	40.8	65.7	86.5	106.8	130.1			227.4	250.7	271.0	291.7	316.6
16	40.3	65.3	86.2	106.5	129.7			227.9	251.0	271.4	292.1	317.1
18	39.8	65.0	85.8	106.1	129.2	178.7	178.7	228.3	251.4	271.7	292.5	317.6
20	39.2	64.6	85.5	105.7	128.8	172.6	184.7	228.7	251.8	272.0	292.9	318.1
22	38.7	64.2	85.2	105.4	128.3	169.8	187.5	229.2	252.1	272.4	293.3	318.6
24	38.2	63.8	84.8	105.0	127.8	168.0	189.5	229.6	252.4	272.7	293.6	319.1
26	37.7	63.5	84.5	104.7	127.4	166.3	191.1	230.0	252.8	273.0	294.0	319.7
28	37.2	63.1	84.2	104.4	127.0	164.8	192.6	230.4	253.1	273.4	294.3	320.3
30	36.7	62.7	83.8	104.0	126.6	163.6	193.9	230.8	253.5	273.7	294.7	320.9
32	36.1	62.4	83.5	103.6	126.1	162.3	195.1	231.2	253.8	274.0	295.1	321.4
34	35.6	62.0	83.2	103.2	125.6	161.1	196.2	231.7	254.2	274.3	295.4	322.0
36	35.0	61.6	82.8	102.9	125.2	160.0	197.4	232.1	254.6	274.6	295.8	322.5
38	34.4	61.2	82.5	102.6	124.8	159.0	198.5	232.5	254.9	275.0	296.2	323.1
40	33.8	60.8	82.1	102.2	124.3	158.0	199.5	232.9	255.2	275.3	296.6	323.7
42	33.2	60.5	81.8	101.9	123.9	157.1	200.4	233.3	255.6	275.7	296.9	324.2
44	32.6	60.1	81.4	101.6	123.5	156.3	201.2	233.7	255.9	276.0	297.3	324.8
46	32.0	59.6	81.1	101.2	123.1	155.4	202.0	234.1	256.2	276.3	297.7	325.4
48	31.4	59.2	80.8	100.8	122.7	154.6	202.8	234.6	256.6	276.7	298.0	326.0
50	30.8	58.9	80.4	100.5	122.3	153.9	203.6	235.0	257.0	277.0	298.4	326.6
52	30.2	58.5	80.1	100.2	121.9	153.1	204.4	235.4	257.3	277.4	298.8	327.2
54	29.5	58.1	79.8	99.9	121.5	152.3	205.2	235.8	257.7	277.7	299.2	327.9
56	28.8	57.8	79.4	99.5	121.1	151.5	206.0	236.2	258.0	278.0	299.6	328.6
58	28.2	57.4	79.0	99.1	120.7	150.7	206.7	236.6	258.3	278.4	300.0	329.2
60	27.5	57.0	78.7	98.8	120.3	149.9	207.5	237.0	258.7	278.8	300.3	329.9

**APPENDIX II** *(continued)*

**LUGO CONSOL STATION  
DASH SECTORS**

Count of Dashes	True Bearings from Station											
0	27.5	57.0	78.7	98.8	120.3	149.9	207.5	237.0	258.7	278.8	300.3	329.9
2	26.7	56.6	78.3	98.4	120.0	149.2	208.2	237.4	259.0	279.1	300.7	330.7
4	26.0	56.2	78.0	98.0	119.6	148.6	208.8	237.8	259.4	279.5	301.1	331.5
6	25.2	55.8	77.7	97.7	119.2	147.9	209.5	238.1	259.8	279.9	301.5	332.3
8	24.4	55.4	77.3	97.4	118.8	147.2	210.2	238.5	260.1	280.2	301.9	333.1
10	23.6	55.0	77.0	97.0	118.4	146.6	210.8	238.9	260.4	280.5	302.3	333.9
12	22.8	54.6	76.6	96.7	118.0	146.0	211.4	239.2	260.8	280.8	302.7	334.6
14	22.0	54.1	76.2	96.3	117.7	145.4	212.0	239.6	261.1	281.2	303.1	335.4
16	21.2	53.7	75.9	96.0	117.3	144.8	212.6	240.1	261.4	281.6	303.5	336.3
18	20.4	53.3	75.6	95.7	116.9	144.2	213.2	240.5	261.8	281.9	303.9	337.1
20	19.5	52.9	75.2	95.3	116.6	143.7	213.8	240.8	262.1	282.2	304.3	338.0
22	18.5	52.5	74.9	95.0	116.2	143.1	214.4	241.2	262.5	282.6	304.8	339.0
24	17.4	52.1	74.6	94.6	115.8	142.5	215.0	241.6	262.8	282.9	305.2	340.0
26	16.2	51.7	74.2	94.3	115.4	142.0	215.6	242.0	263.2	283.2	305.6	341.1
28	15.1	51.2	73.8	94.0	115.1	141.4	216.1	242.4	263.5	283.6	306.1	342.3
30	13.9	50.8	73.5	93.7	114.7	140.9	216.7	242.7	263.8	284.0	306.6	343.6
32	12.6	50.4	73.1	93.4	114.3	140.3	217.2	243.1	264.2	284.4	307.0	344.8
34	11.1	50.0	72.8	93.0	114.0	139.7	217.7	243.5	264.5	284.7	307.4	346.3
36	9.5	49.6	72.4	92.7	113.6	139.1	218.2	243.8	264.8	285.0	307.8	348.0
38	7.5	49.2	72.1	92.4	113.3	138.6	218.7	244.2	265.2	285.4	308.3	349.8
40	4.7	48.7	71.8	92.0	112.9	138.1	219.2	244.6	265.5	285.7	308.8	352.6
42	358.7	48.3	71.4	91.7	112.5	137.6	219.8	245.0	265.8	286.1	309.2	358.7
44		47.9	71.0	91.4	112.1	137.1	220.3	245.3	266.2	286.5	309.7	
46		47.4	70.7	91.0	111.7	136.6	220.8	245.7	266.5	286.8	310.1	
48		47.0	70.3	90.7	111.3	136.1	221.3	246.0	266.8	287.2	310.5	
50		46.5	70.0	90.4	111.0	135.6	221.7	246.4	267.1	287.5	311.0	
52		46.0	69.6	90.1	110.7	135.1	222.2	246.8	267.5	287.8	311.4	
54		45.6	69.3	89.8	110.3	134.6	222.7	247.2	267.8	288.2	311.8	
56		45.1	69.0	89.5	109.9	134.1	223.2	247.6	268.2	288.5	312.2	
58		44.6	68.6	89.2	109.6	133.7	223.7	247.9	268.5	288.8	312.7	
60		44.2	68.2	88.8	109.2	133.2	224.2	248.2	268.8	289.2	313.2	

**APPENDIX II** (continued)

**SEVILLE CONSOL STATION  
DOT SECTORS**

Count of Dots	True Bearings from Station												
	0	38.6	62.6	83.2	103.9	128.1			218.6	242.6	263.2	283.9	308.1
2	38.1	62.2	82.8	103.5	127.6			219.1	242.9	263.6	284.3	308.6	
4	37.6	61.9	82.5	103.2	127.1			219.5	243.3	263.9	284.6	309.0	
6	37.1	61.6	82.2	102.8	126.6			219.9	243.6	264.3	284.9	309.5	
8	36.6	61.2	81.9	102.4	126.2			220.4	244.0	264.6	285.2	310.0	
10	36.1	60.8	81.5	102.0	125.7			220.8	244.3	264.9	285.5	310.5	
12	35.5	60.5	81.2	101.6	125.2			221.2	244.7	265.2	285.9	311.0	
14	35.0	60.2	80.9	101.3	124.7			221.7	245.1	265.6	286.3	311.5	
16	34.4	59.8	80.6	101.0	124.3			222.2	245.5	265.9	286.7	312.0	
18	33.9	59.4	80.3	100.6	123.9			222.6	245.8	266.3	287.0	312.5	
20	33.4	59.0	79.9	100.2	123.4	170.1	176.4	223.0	246.2	266.6	287.4	313.0	
22	32.9	58.7	79.6	99.9	123.0	166.2	180.4	223.4	246.5	266.9	287.8	313.6	
24	32.4	58.3	79.2	99.6	122.5	164.0	182.7	223.8	246.8	267.3	288.2	314.2	
26	31.9	57.9	78.9	99.3	122.1	162.0	184.5	224.2	247.2	267.6	288.6	314.8	
28	31.3	57.5	78.5	99.0	121.7	160.4	186.1	224.7	247.6	267.9	288.9	315.4	
30	30.8	57.1	78.2	98.6	121.3	159.0	187.4	225.1	248.0	268.3	289.3	315.9	
32	30.3	56.7	77.9	98.2	120.9	157.6	188.8	225.5	248.4	268.6	289.6	316.5	
34	29.7	56.4	77.5	97.8	120.4	156.5	190.1	225.9	248.7	269.0	290.0	317.0	
36	29.1	56.0	77.2	97.4	120.0	155.2	191.5	226.4	249.1	269.4	290.3	317.6	
38	28.6	55.6	76.8	97.1	119.6	154.2	192.3	226.8	249.4	269.7	290.7	318.1	
40	28.0	55.2	76.5	96.7	119.2	153.3	193.2	227.2	249.7	270.0	291.1	318.7	
42	27.4	54.8	76.2	96.4	118.8	152.4	194.1	227.6	250.0	270.3	291.5	319.3	
44	26.7	54.4	75.9	96.0	118.4	151.4	195.1	228.1	250.4	270.6	291.9	319.8	
46	26.1	54.0	75.6	95.6	118.0	150.5	196.0	228.5	250.7	270.9	292.3	320.4	
48	25.5	53.6	75.2	95.3	117.6	149.6	196.9	228.9	251.1	271.3	292.7	321.0	
50	24.9	53.3	74.9	94.9	117.2	148.8	197.7	229.3	251.5	271.6	293.1	321.6	
52	24.2	52.9	74.5	94.6	116.7	148.0	198.5	229.7	251.8	272.0	293.5	322.3	
54	23.5	52.5	74.2	94.3	116.3	147.2	199.3	230.1	252.1	272.3	293.9	322.9	
56	22.8	52.1	73.8	93.9	115.9	146.4	200.0	230.5	252.5	272.7	294.3	323.6	
58	22.2	51.7	73.5	93.6	115.5	145.6	200.8	230.9	252.8	273.0	294.7	324.3	
60	21.5	51.3	73.2	93.3	115.1	144.9	201.5	231.3	253.2	273.3	295.1	324.9	

**APPENDIX II** *(continued)*

**SEVILLE CONSOL STATION  
DASH SECTORS**

Count of Dashes	True Bearings from Station											
0	21.5	51.3	73.2	93.3	115.1	144.9	201.5	231.3	253.2	273.3	295.1	324.9
2	20.8	50.9	72.8	93.0	114.7	144.3	202.2	231.7	253.5	273.6	295.5	325.6
4	20.0	50.5	72.5	92.7	114.3	143.6	202.8	232.1	253.8	273.9	295.9	326.4
6	19.3	50.1	72.1	92.3	113.9	142.9	203.5	232.5	254.2	274.3	296.3	327.2
8	18.5	49.7	71.8	92.0	113.5	142.3	204.2	232.9	254.5	274.6	296.7	328.0
10	17.7	49.3	71.5	91.6	113.1	141.6	204.9	233.3	254.9	274.9	297.2	328.8
12	16.9	48.9	71.1	91.3	112.7	141.0	205.5	233.6	255.2	275.3	297.6	329.6
14	16.0	48.5	70.7	90.9	112.3	140.4	206.1	234.0	255.6	275.6	298.0	330.5
16	15.1	48.1	70.4	90.6	111.9	139.8	206.7	234.4	255.9	276.0	298.4	331.4
18	14.1	47.6	70.0	90.3	111.5	139.3	207.4	234.8	256.2	276.4	298.8	332.4
20	13.2	47.2	69.7	90.0	111.1	138.7	208.0	235.2	256.5	276.7	299.2	333.3
22	12.3	46.8	69.4	89.7	110.7	138.1	208.6	235.6	256.8	277.1	299.6	334.2
24	11.3	46.4	69.1	89.4	110.3	137.6	209.1	236.0	257.2	277.4	300.0	335.2
26	10.1	45.9	68.7	89.0	110.0	137.0	209.7	236.4	257.5	277.8	300.4	336.4
28	8.8	45.5	68.4	88.6	109.6	136.5	210.3	236.7	257.9	278.2	300.9	337.6
30	7.4	45.1	68.0	88.3	109.3	135.9	210.8	237.1	258.2	278.6	301.3	339.0
32	6.1	44.7	67.6	87.9	108.9	135.4	211.3	237.5	258.5	279.0	301.7	340.4
34	4.5	44.2	67.2	87.6	108.6	134.8	211.9	237.9	258.9	279.3	302.1	342.0
36	2.7	43.8	66.8	87.3	108.2	134.2	212.4	238.3	259.2	279.6	302.5	344.0
38	0.4	43.4	66.5	86.9	107.8	133.6	212.9	238.7	259.6	279.9	303.0	346.2
40	356.4	43.0	66.2	86.6	107.4	133.0	213.4	239.0	259.9	280.2	303.4	350.1
42		42.6	65.8	86.3	107.0	132.5	213.9	239.4	260.3	280.6	303.9	
44		42.2	65.5	85.9	106.7	132.0	214.4	239.8	260.6	281.0	304.3	
46		41.7	65.1	85.6	106.3	131.5	215.0	240.2	260.9	281.3	304.7	
48		41.2	64.7	85.2	105.9	131.0	215.5	240.5	261.2	281.6	305.2	
50		40.8	64.3	84.9	105.5	130.5	216.1	240.8	261.5	282.0	305.7	
52		40.4	64.0	84.6	105.2	130.0	216.6	241.2	261.9	282.4	306.2	
54		39.9	63.6	84.3	104.9	129.5	217.1	241.6	262.2	282.8	306.6	
56		39.5	63.3	83.9	104.6	129.0	217.6	241.9	262.5	283.2	307.1	
58		39.1	62.9	83.6	104.3	128.6	218.1	242.2	262.8	283.5	307.6	
60		38.6	62.6	83.2	103.9	128.1	218.6	242.6	263.2	283.9	308.1	

## APPENDIX III

Half Convergency Corrections to be *added* to the Great Circle Bearing when the aircraft is to the east of the station and *subtracted* when the aircraft is to the west of the station.

### Stavanger Consol Station

58° 37' 31" N 05° 37' 49" E

Difference of Longitude	Latitude															
	35° N		40° N		45° N		50° N		55° N		60° N		65° N		70° N	
10°	3·7	Diff.	3·9	Diff.	4·0	Diff.	4·1	Diff.	4·2	Diff.	4·3	Diff.	4·4	Diff.	4·5	Diff.
		3·8		3·8		3·9		4·1		4·2		4·3		4·4		4·6
20°	7·5		7·7		7·9		8·2		8·4		8·6		8·8		9·1	
		3·8		3·9		4·1		4·1		4·3		4·4		4·5		4·6
30°	11·3		11·6		12·0		12·3		12·7		13·0		13·3		13·7	
		3·9		4·0		4·1		4·2		4·3		4·4		4·5		4·6
40°	15·2		15·6		16·1		16·5		17·0		17·4		17·8		18·3	
		4·0		4·1		4·2		4·3		4·4		4·5		4·6		4·7
50°	19·2		19·7		20·3		20·8		21·4		21·9		22·4		23·0	
		4·1		4·2		4·3		4·4		4·4		4·5		4·6		4·7
60°	23·3		23·9		24·6		25·2		25·8		26·4		27·0		27·7	

### Lugo Consol Station

43° 15' 00" N 07° 29' 00" W

Difference of Longitude	Latitude															
	30° N		35° N		40° N		45° N		50° N		55° N		60° N		65° N	
10°	3·0	Diff.	3·2	Diff.	3·3	Diff.	3·5	Diff.	3·6	Diff.	3·8	Diff.	4·0	Diff.	4·1	Diff.
		3·0		3·2		3·4		3·5		3·7		3·8		4·0		4·2
20°	6·0		6·4		6·7		7·0		7·3		7·6		8·0		8·3	
		3·1		3·2		3·4		3·6		3·7		3·9		4·0		4·2
30°	9·1		9·6		10·1		10·6		11·0		11·5		12·0		12·5	
		3·2		3·4		3·5		3·6		3·8		4·0		4·1		4·2
40°	12·3		13·0		13·6		14·2		14·8		15·5		16·1		16·7	
		3·3		3·4		3·6		3·8		4·0		4·0		4·2		4·3
50°	15·6		16·4		17·2		18·0		18·8		19·5		20·3		21·0	
		3·5		3·7		3·8		3·9		4·0		4·2		4·3		4·5
60°	19·1		20·1		21·0		21·9		22·8		23·7		24·6		25·5	

### Bushmills Consol Station

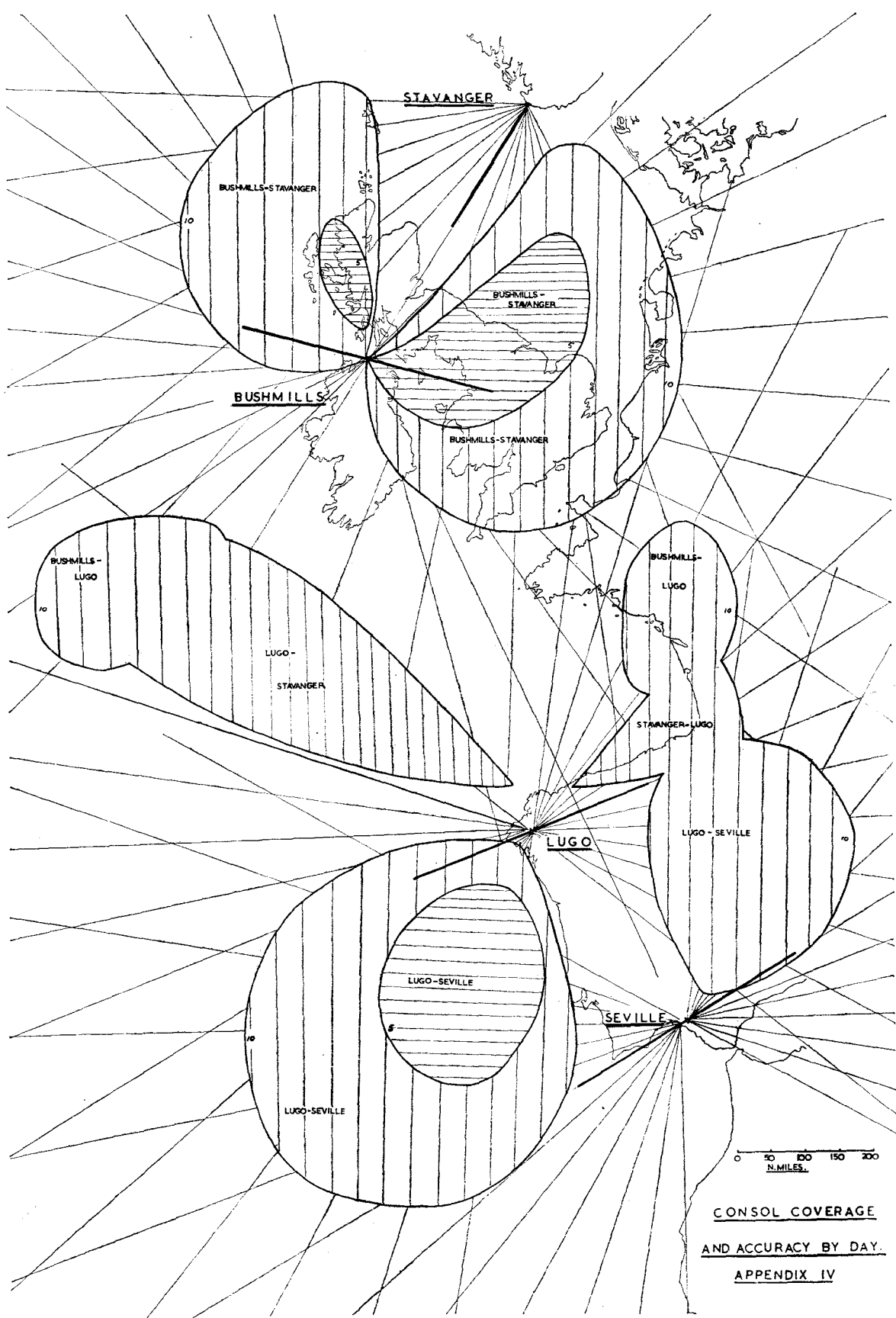
55° 12' 20" N 06° 28' 02" W

Difference of Longitude	Latitude															
	35° N		40° N		45° N		50° N		55° N		60° N		65° N		70° N	
10°	3·6	Diff.	3·7	Diff.	3·9	Diff.	4·0	Diff.	4·1	Diff.	4·2	Diff.	4·3	Diff.	4·5	Diff.
		3·6		3·8		3·8		4·0		4·1		4·2		4·4		4·5
20°	7·2		7·5		7·7		8·0		8·2		8·4		8·7		9·0	
		3·7		3·8		3·9		4·0		4·2		4·3		4·4		4·5
30°	10·9		11·3		11·6		12·0		12·4		12·7		13·1		13·5	
		3·8		3·9		4·0		4·1		4·2		4·3		4·5		4·5
40°	14·7		15·2		15·6		16·1		16·6		17·0		17·6		18·0	
		3·8		3·9		4·1		4·2		4·3		4·4		4·5		4·6
50°	18·5		19·1		19·7		20·3		20·9		21·4		22·1		22·6	
		4·0		4·1		4·2		4·3		4·4		4·6		4·6		4·7
60°	22·5		23·2		23·9		24·6		25·3		26·0		26·7		27·3	

### Seville Consol Station

37° 31' 23" N 06° 01' 55" W

Difference of Longitude	Latitude															
	30° N		35° N		40° N		45° N		50° N		55° N		60° N		65° N	
10°	2·8	Diff.	3·0	Diff.	3·1	Diff.	3·3	Diff.	3·5	Diff.	3·7	Diff.	3·8	Diff.	4·0	Diff.
		2·8		3·0		3·2		3·3		3·5		3·6		3·9		4·1
20°	5·6		6·0		6·3		6·6		7·0		7·3		7·7		8·1	
		2·9		3·0		3·2		3·4		3·6		3·8		3·9		4·0
30°	8·5		9·0		9·5		10·0		10·6		11·1		11·6		12·1	
		3·0		3·2		3·3		3·5		3·6		3·8		4·0		4·2
40°	11·5		12·2		12·8		13·5		14·2		14·9		15·6		16·3	
		3·1		3·2		3·5		3·6		3·8		3·9		4·1		4·2
50°	14·6		15·4		16·3		17·1		18·0		18·8		19·7		20·5	
		3·2		3·5		3·6		3·8		3·9		4·1		4·2		4·4
60°	17·8		18·9		19·9		20·9		21·9		22·9		23·9		24·9	



CONSOL COVERAGE  
AND ACCURACY BY DAY.  
APPENDIX IV



CONSOL COVERAGE  
AND ACCURACY BY  
NIGHT.

APPENDIX V

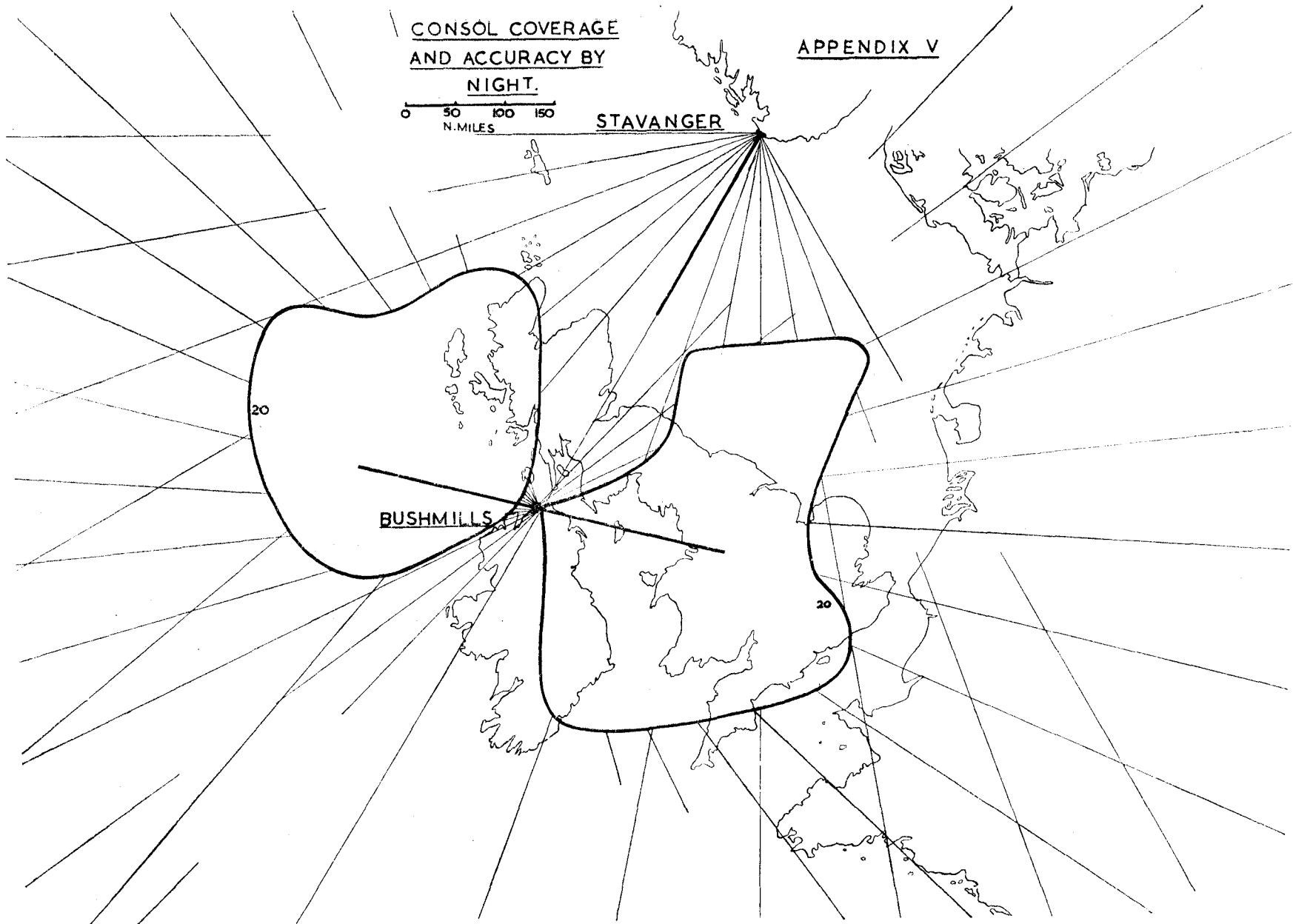
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