

### Block Stecker Restriction

An eleven month sample (Feb/April on Dolphin, Oyster and Limpet Mar/April on Shark) on 4 naval keys shows a marked tendency for letters close together to be steckered together and for letters some way apart in the alphabet not to be steckered together. The following table gives an idea of the strength of this tendency: it is compiled from a sample of 1800 stecker (excluding self stecker).

Table I

Average No of cases of a particular letter being steckered to a letter 'n' ahead of it.

'n'	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Av.	5.4	4.9	12.0	12.4	11.0	9.8	8.3	5.6	4.7	3.6	3.2	2.4	1.9	1.8	1.7	.9	.8	1.2	.2						

Thus the stecker C/G (4 ahead) is about 7 times as likely as C/Q (14 ahead) and 60 times as likely as C/W (20 ahead).

Use could be made of this fact to run weaker menus on the bombe, especially in Shark, at comparatively small risk. It might also be valuable sometimes to be able to run weaker Oyster and Winkle menus. The following table shows the type of menu that could be run, with the risk of missing the right stop, by prohibiting blocks of stecker at various distances.

TABLE II

Menus runnable with various stecker restrictions.

<u>Menu</u>	<u>No. of Stops</u>	<u>% chance of coming out</u>	<u>Stecker distances prohibited*</u>
15∞0	1.5	95	17 and over
14∞0	1.4	85	13 and over
13∞0	1.1	65	11 and over
11∞0	1	45	8 and over
13∞1	2.2	30	7 and over
12∞1	1.5	95	17 and over
11∞1	1.4	85	13 and over
10∞1	1.8	70	11 and over
9∞1	1.9	55	9 and over
11∞2	1.7	35	7 and over
10∞2	<1	95	17 and over
9∞2	1.7	90	15 and over
8∞1	1.5	80	12 and over
7∞2	1	50	8 and over
8∞3	1	40	7 and over
7∞3	<1	95	17 and over
	1	93	16 and over

I would like to emphasize strongly that these figures and the whole report are provisional and given to show the scope of the scheme rather than as a final statement. There are a number of problems as to whose solution I am not at all clear yet. However I am satisfied that the table above is roughly correct and would continue to apply as long as the present method of making up the stecker continues.

The following is a summary of the present position and indicates the various points which are still not clear.

(1) By use of this method we shall certainly be able to run much weaker menus than at present, which will be an advantage in two ways:

(a) We will be able to run days that we cannot attempt at present owing to the material being insufficient for a menu.

(b) We will be able to run better menus than at present by excluding pairings at present necessary to make the menu run whose chance is worse than that given by the stecker restriction.

(2) It is not clear what the best type of restriction is. The crude method of excluding all steckers over a certain distance is probably fairly good but not the best. Also the effect produced by having an undue proportion either of letters at the ends of the alphabet or of letters in the middle has not been examined but must be very great.

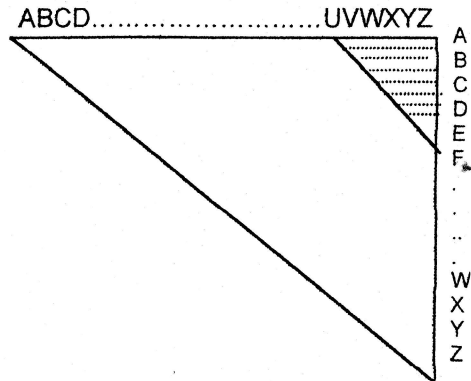
I suspect that we could get nearly as good a result as we could want if we had Welchman's scheme of being able to cut out any rows we liked of a series of fixed (probably triangular) sets of stecker, imagining the whole stecker to be written out on a triangle.

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\* It is assumed that the stecker restriction is applied to letters off the menu so that confirmations on the menu at any distance are permitted.

E.g.

If we barred the dotted part of the small triangle in the sketch that would exclude A steckered to U-Z, B to V-Z, C to W-Z and might be the kind of thing it would be best to do.



(3) It is pretty clear that we should want to be able to bar a large range of stecker; if we could prohibit anything from steckers distant 20 and more to steckers distant 7 and more that should be adequate but less than that range would probably prove inconvenient. Also owing to the stickwort the alphabet would not run from A to Z normally but 'round the corner', so that we should want to prohibit say W – D from being steckered to E – I. This stickwort is liable to change once a month on average.

# Stecker distances

<u>Stop/stecker</u>	<u>Menu</u>	<u>No. of stops</u>	<u>%chance</u>	<u>Distances prohibited</u>	<u>No of stecker</u>	<u>% chance</u>	<u><math>\chi^2</math></u>
7 $\frac{1}{2}$ -	15 <sub>0</sub>	1.5	95	17 and over	-	100	
40/-	14 <sub>0</sub>	1.4	85	13 " "	-	100	
187/2	13 <sub>0</sub>	1.1	65	11 " "	2	100	
730/18	12 <sub>0</sub>	1	45	8 " "	1.4	80	6
2430/132	11 <sub>0</sub>	2.2	30	7 " "	<1	34	4
7/-	13 <sub>1</sub>	1.5	95	17 " "	-	100	
28/ $\frac{1}{2}$	12 <sub>1</sub>	1.4	85	13 " "	$\frac{1}{2}$	100	
93/5	11 <sub>1</sub>	1.8	70	11 " "	1.2	94	7
268/30	10 <sub>1</sub>	1.9	55	9 " "	.8	64	5
673/133	9 <sub>1</sub>	1.9	35	7 " "	1	44	4
4/-	11 <sub>2</sub>	<1	95	17 " "	-	100	
10/1	10 <sub>2</sub>	1.9	90	15 " "	1	100	
26/5	9 <sub>2</sub>	1.5	80	12 " "	1.9	98	7
55/9	8 <sub>2</sub>	1	50	8 " "	.8	(70)	?
109/53	7 <sub>2</sub>	1	40	7 " "			
2/1	8 <sub>3</sub>	<1	95	17 " "			
4/2	7 <sub>3</sub>	1	93	16 " "			