THE RUNNING OF MENUS

Several days ago we had occasion to run an 11.1 + 2 menu on a Chaffinch key. This menu gives 46 stops per w.o., and it was though that it might be quicker to run it as an 11.1+2+2 (on two banks only); a rough calculation confirmed this view and the menu was run two-at-a-time.

Since then several more calculations of the same sort have been done in order to find out when it is quicker to run a stronger menu on two banks in preference to a weaker menu on three banks (supposing always that the additional links are available and do not increase the turnover risk).

The results are rather surprising, and seem to alter several of our preconceived ideas about the running of menus.

Average values for the plugging time, running time, etc. of the Bombes have been taken, and the results worked out on an average basis. It must be emphasised that the figures <u>are</u> only average figures, and that both the basic times and the general behaviour of the different Bombes varies considerably.. The figures are expressed as "times (in minutes) per w.o." – for ease of comparison. The time of a run – including wheel-changing – is of course two or three times this value for a two-or three-bank job. The figures do not include plugging time – which is given in a subsidiary table as "number of minutes per w.o."

Details

From the figures we see that the time for running a 12.1 three times on a Jumboid and without C.S.K.O. is greater than for running the same job twice as a 13.1 or a 14.1. Most Jumboids at the moment have not got C.S.K.O., and in any case it cannot be used for Army keys. Further, the plugging time saved when using two banks instead of three will increase the advantage of running the job only twice. Also, and most important, the machine will not suffer so much from 20 or 30 stops per run as from 90! In practice it might be better to run the job as a 13.1 rather than a 14.1 since no check stops will then be necessary: these are rather a nuisance on a Jumboid.

The figures for an 11.2 without C.S.K.O., and the same job run twice only as a 12.2 are 13.0 mins. and 13.3 mins. respectively. The "plugging times per wheel-order" will be approximately 3 mins. And 2 mins. respectively for a 32 w.o. job, and so the total times will be 16.0 mins. and 15.3 mins. It will be better, therefore, to run the job only twice – quite apart from the consideration of kindness to the checkers!

<u>With</u> C.S.K.O. it is almost always best, if possible, to run a job three times. All the evidence above applies only to cases where C.S.K.O. either cannot or must not be used. Incidentally, the case for C.S.K.O. on some of the remaining Jumboids now becomes stronger.

<u>Rules</u>

From the practical point of view the following rules appear to be indicated:-

A.   Whenever C.S.K.O $\left.\begin{array}{c}\text{Cannot}\\\text{Must not}\end{array}\right)$ be used,

1)   12.1 on a Jumboid should always, if possible, be run as a 13.1 (or 14.1)

2)   11.1 + 2 "   "   "   "   "   "   "   "   "   11.1+3 or 11.1+4

3)   10.1 + 3 "   "   "   "   "   "   "   "   "   10.1+4 or
                                              10.1+5 or
                                              10.1+6

(This even if C.S.K.O. <u>can be</u> used)

4)   11.2 on an O.B. "   "   "   "   "   "   "   "   12.2

B. Whenever C.S.K.O. <u>can</u> be used,

5)   Always run a menu three times if possible (except for the rare case of 10.1 +3 instanced in 3) above).

<u>N.B.</u> None of the above rules applies when the extra links are not available or would increase the turnover risk. E.g. for short stretches and single menus we shall still often have to run 12.1's and 11.2's without the C.S.K.O.

<u>Example</u> For a Chaffinch crib making up into a 14.1 and an 11.2 the old policy was to try to run the 14.1 as a 12.1 on Jumboids and the 11.2 on O.B's. The new policy will be to run it the other way round: the 14.1 on O.B.'s and the 11.2 – if possible – on Jumboids. The latter policy appears to be at least 10% faster.

All the above arguments are mainly theoretical, though the times given for running, etc. are based on practical evidence in Hut 11A.

I have spoken to P.O.Jones about the matter. He agrees with the average figures I have taken, but he made several very relevant remarks on the results from the practical point of view,

a)   When the Bombe Hut first of all took over some of the checking rough experiments were tried on 11.2's without C.S.K.O., and the results appeared to favour running them three-at-a-time if the checkers could keep up with the machine.

b)   Running a job twice is a slight nuisance for the I.C. Ops and the operators who have to number up a menu twice – allowing for the odd one or two enigmas in excess of the twelve. For three-

bank jobs the numbering need only be done once, and is then the same on each bank.

c)   Following from b), the tracing of wrong stops is rather easier when the pluggings are separate on the three banks than when a two-bank job is being run. So more time might be lost in the latter case.

Practical conditions are always most important, and it may be that the above points will quite nullify any advantage which theory indicates. However, P.O.Jones agrees that the experiment is worth trying, and if the result is an improvement on the old system so much the better. He has warned the Controllers that this slight change of policy is contemplated, and that they may expect menus to be put on in slightly different ways in the near future.

All the ideas are at the moment very tentative, and a good deal more thinking should be done on the subject. The above is simply how the problem appears to me now.

O.H.L.

12/12/42

Postscript

It will be realised that if more jobs are run on two banks only more spare enigmas will be available for Orange – and this would appreciably alter the running times, and probably destroy any gain of time which had been obtained.

No satisfactory method has yet been devised for the complete elimination of Orange from the Bombes – (it is a beastly nuisance to all concerned)! Suggestions for its elimination will be welcomed.

RESULTS

The following average values have been taken:-

Plugging time	=	15 mins. per bank
Running time	=	15 mins for an O.B.
		20 mins for a Jumboid
Wheel-changing	=	5 mins per bank
Stopping time	=	¾ min. for an O.B.
		10 secs. for a Jumboid (+5 secs for a stecker)

Reduction factor for C.S.K.O. = 2.3 (10 chain); 2.5 (11 chain); 2.7 (12 chain)

Basic Figures:-

	O.B.			Jumboid	
	3 banks	2 banks		3 banks	2 banks
1 stop per w.o.	10.8	13.3	1 stop per w.o.	11.8	15.2
4 stops per w.o.	13.0	15.5	4 stops per w.o	12.3	15.7

Jumboid Figures

Menu	12.1	12.1+2	12.1+3	12.1+4	13.1	14.1
Without C.S.K.O	16.3	16.9	15.7	15.2	16.2	15.3 mins
With C.S.K.O.	13.3	15.7	15.3	15.1	15.1	15.1 mins

Menu	11.1+2	11.1+3	11.1+4	11.1+5
Without C.S.K.O	19.3	18.0	16.1	15.3 mins
With C.S.K.O.	14.7	16.2	15.7	15.2 mins

Menu	10.1+3	10.1+4	10.1+5	10.1+6
Without C.S.K.O	23.5	19.9	16.9	15.8 mins
With C.S.K.O.	16.8	17.2	15.9	15.3 mins

Plugging times "per w.o."

The w.o.'s are the w.o.'s run by one machine – not the total number for the job.

	10 w.o.'s	20 w.o.'s	30 w.o.'s	40 w.o.'s	50 w.o.'s	60 w.o.'s
3 banks	4.5	2.3	1.5	1.1	0.9	0.8 mins
2 banks	3.0	1.5	1.0	0.8	0.6	0.5 mins

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From the figures we see that the time for running a 12.1 three times on a Jumboid and without C.S.K.O. is greater than for running the same job twice as a 13.1 or a 14.1 . Most Jumboids at the moment have not got C.S.K.O., and in any case it cannot be used for Army keys. Further, the plugging time saved when using two banks instead of three will increase the advantage of running the job only twice. Also, and most important, the machine will not suffer so much from 20 or 3 stops per run as from 90 ! In practice it might be better to run the job as a 13.1 rather than a 14.1 since no check stops will then be necessary: these are rather a nuisance on a Jumboid.

<u>20 or 30 ?</u>

The figures for an 11.2 without C.S.K.O., and the same job run twice only as a 12.2 are 13.0 mins. and 13.3 mins. respectively. The "plugging times per wheel-order" will be approximately 3 mins. and 2 mins. respectively for a 32 w.o. job, and so the total times will be 16.0 mins. and 15.3 mins. It will be better, therefore, to run the job only twice - quite apart from the consideration of kindness to the checkers !

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3) 10.1 + 3 "   "   "   "   "   "   "   "   "   10.1 + 4 or
                                                       10.1 + 5 or
                                                       10.1 + 6

   (this even if C.S.K.O. <u>can</u> be used)

4) 11.2 on an O.B.   "   "   "   "   "   "   "   12.2

<u>B.</u> Whenever C.S.K.O. <u>can</u> be used,

5) Always run a menu three times if possible (except for the rare case of 10.1 + 3 instanced in 3) above).

<u>A.B.</u> None of the above rules applies when the extra links are not available or would increase the turnover risk. E.g. for short stretches and single menus we shall still often have to run 12.1's and 11.2's without C.S.K.O.

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    Running time = 15 mins. for an O.B.
                 20 mins. for a Jumboid
    Wheel-changing = 5 mins. per bank
    Stopping time = ¾ min. for an O.B.
                 10 secs. for a Jumboid (+ 5 secs. for a Stecker)
    Reduction factor for C.S.K.O. = 2.3(10 chain); 2.5(11 chain); 2.7(12 chain).

Basic Figures:-

	O.B.			Jumboid	
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Jumboid Figures:-

Menu	12.1	12.1 + 2	12.1 + 3	12.1 + 4	13.1	14.1
Without C.S.K.O.	16.3	16.9	15.7	15.2	16.2	15.3 mins.
With C.S.K.O.	13.3	15.7	15.3	15.1	15.4	15.1 mins.

Menu	11.1 + 2	11.1 + 3	11.1 + 4	11.1 + 5
Without C.S.K.O.	19.3	18.0	16.1	15.3 mins.
With C.S.K.O.	14.7	16.2	15.7	15.2 mins.

Menu	10.1 + 3	10.1 + 4	10.1 + 5	10.1 + 6
Without C.S.K.O.	23.5	19.9	16.9	15.8 mins.
With C.S.K.O.	16.8	17.2	15.9	15.3 mins.

Plugging times "per w.o."-

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