

Homework 11

Staffing of Call Centers

Question 1 and 2 are based on data taken from two sources. These data sources will be referred to as **Italian** and **American**.

The two sources are based on ACD data:

Italian describes a **medium-size** call center of a large tele-bank in Italy;

American summarizes the activities of a **large** call-center that is one of many run by a U.S. medical insurance company.

Question 1: ITALIAN DATA

Description of the Italian data. Questions 1.1-1.6 below are based on the ACD data from Tables 1 and 2, at the end of the homework. Worksheet *Italian* in file *staffing_italian_US_2009W.xls*, contains some relevant parts of these tables (see Technical Appendix).

Tables 1-2 constitute typical ACD data. They describe *Skill Quotazioni* service (stock market activities, equivalent to NE service type in our Call Center database) during 17/02/2000. The data is summarized by half-hour intervals. You should focus on the time intervals between 8:30 and 18:00.

The following columns of **Table 1** are relevant for the assignment:

Avg Speed Ans Average Speed of Answer (ASA) (sec.) = average waiting time in queue of customers *that received service*.

Avg Aban Time Average Abandon Time (sec.) = average waiting time in queue of customers that abandoned.

ACD Calls Number of customers that received service.

Avg ACD Time Average ACD time (sec.) = average *actual* service time.

Avg ACW Time Average ACW time (sec.) = average *After-Call-Work* time.

Aban Calls Number of abandoning calls.

% Ans Calls Fraction of answered calls, out of all incoming calls.

Avg Pos Staff Average number of agents logged in. (In Question 1.4 you will check if these numbers are trustable).

Table 2 contains *utilization profile* data. In particular, it includes columns:

Staffed Time Overall login time (the sum of all login times over all servers).

ACD Time Actual service overall login time.

ACW Time After work overall login time.

AUX Time Non-phone activity overall login time.

Avail Time Available time = overall idle time.

Other Time Overall login time of a phone activity dedicated to other service types.

The last six columns in Table 2, all starting with %, include the fractions of the above utilization characteristics out of the overall **Staffed Time**.

Analysis of the Italian ACD Report: Utilization Profiles (Questions 1.1-1.5)

Question 1.1 Add to the ACD data the following characteristics (per half-hour and overall):

- Average waiting time (of all customers: served and abandoned).
- Number of arrivals.
- Fraction of abandoning customers, out of all incoming calls.

We suggest that you create a table that includes the relevant ACD data, then add to it the above characteristics, as well as additional ones to be calculated below.

Question 1.2: Definition and calculation of utilization.

Define

$$\text{Utilization} = \frac{\text{Staffed Time} - \text{Avail Time}}{\text{Staffed Time}}.$$

Add a “Utilization” column to your table.

Question 1.3: Definition and calculation of average service times.

Remark. We cannot take service time = ACD time or (ACD time + ACW time) and ignore other activities. On the other hand, we do not know enough about those other activities (AUX and “Other” in the ACD report) in order to model and analyze the call center as a system with several service types. (To this need we would need detailed information about staffing, skills of servers and priorities between different service activities, if any.)

Therefore, we define

$$\text{Average service time} = \frac{\text{Staffed Time} - \text{Avail Time}}{\text{ACD Calls}}.$$

Calculate average service times (per 1/2 hour and overall). Can you suggest any alternative approaches to the definition of service time?

Question 1.4: Calculating the number of agents.

Derive the average number of logged-in agents per 1/2 hour using Staffed Time. Compare the results with the “Avg Pos Staff” column in Table 2. What about lunch hours (13:00 and 13:30)?

Question 1.5: How does the call center succeed in sustaining a reasonable service level during lunch hours?

Italian Staffing Problems (Questions 1.6-1.8)

Choose the way to calculate staffing that seems to you more reasonable and use it in the following questions.

Question 1.6: The square-root safety-staffing principle.

The square-root safety-staffing principle recommends a number of servers N given by

$$N = R + \beta\sqrt{R}, \quad -\infty < \beta < \infty,$$

where $R = \frac{\lambda}{\mu}$ is the *offered load* (λ =arrival rate, μ =service rate) and β represents *service grade*.

- Calculate R and β for each 1/2 hour, given the current staffing levels.
- Create a scatterplot of the probability of abandonment versus β .
- Describe (qualitatively) the relation between β , the average wait and the probability of abandonment. Note exceptions to the “general rule”, if any.
- Classify the half-hour intervals into several “service-level regimes” according to their β -values.

Question 1.7: M/M/N+M model evaluation.

- Assume exponential patience with a constant parameter over the day. Estimate the average patience using the ACD data.
- Using *4CallCenters* software: Consider the 10 time intervals between 13:00 and 17:30. Use the relevant ACD data and the average patience value that you have just calculated as input. Compare the theoretical results (ASA and $P\{Ab\}$) from the software with the empirical ACD data and summarize your findings.
- Consider the “catastrophic” time intervals between 16:30 and 17:30. Which value of patience gives rise to the observed ASA within the M/M/m+M model? Does the fraction of abandonment and the ASA sensitive to the mean patience? Use *4CallCenters* to illustrate this issue.
- Do you think that the M/M/m+M model provides a good approximation for the **Italian** operation?

Question 1.8: Comparison between months.

Tables 3 and 4 contain monthly data of the “Quotazioni” service type for the two months: February and October. (The headers of the relevant columns are the same as in Tables 1 and 2.) Assume that approximately the same staffing levels were assigned during the two months. Compare the service levels. Provide recommendations for improvements in October. Be as concrete as possible.

Question 2: AMERICAN DATA

Description of the American data. Questions 2.1-2.3 below are based on the ACD data from Table 5. (See worksheet *American* of the *staffing_italian_US_2009W.xls* file).

Table 5 contains ACD data from the Charlotte Site call center on 7/6/2000. It includes the following columns:

Recvd Number of incoming calls.

Answrd Number of answered calls.

Aban Number of abandoning calls.

Aban% Fraction of abandoning customers.

ASA Average Speed of Answer (ASA) = average waiting time in queue of customers that received service.

AHT Average Handling Time = Average Service Time.

OCC% Server utilization.

Total on Prod FTE Average staffing (number of servers).

Question 2.1 Compare the format of the two ACD reports: Italian and American. Can you see any deficiencies in one of them that are not present in the other?

Question 2.2 Recall that **OCC%** denotes utilization in the ACD report. Find an alternative way to calculate utilization (use column **AHT**). Compare the results with the **OCC%** column.

Question 2.3 Redo Question 1.6 for **American**. Create scatterplots of the probability of abandonment versus β . Comment on your findings.

Question 2.4. Scheduling

Assume that the required staffing levels in order to have a certain service level are as follows.

Time	Required Staffing	Time	Required Staffing
8:00	61	13:30	199
8:30	112	14:00	218
9:00	159	14:30	216
9:30	203	15:00	233
10:00	229	15:30	221
10:30	248	16:00	218
11:00	250	16:30	176
11:30	244	17:00	125
12:00	211	17:30	94
12:30	192	18:00	8
13:00	187		

Use these staffing levels to answer the following questions:

First Scenario

Assume that the possible shifts in the call center are as follows:

- Each shift is 8 hours long. A shift must start at the beginning of an hour or at the half hour (i.e. 08:00, 08:30 etc.).
- Each shift must include a half hour break. Breaks can begin on each half hour; The earliest possible beginning time for a break is 4 hours after the beginning of the shift and the latest is 5.5 hours after the beginning of the shift (four breaks are possible for each shift start time). Assume that a worker gets pay for the half hour break.

The salary costs are as follows:

- 5\$ per hour for a working hour between 8:00-16:00.
- 6\$ per hour for a working hour between 16:00-18:30.
- In addition, each agent gets a fixed amount of 20\$ per shift.

You should decide on the shifts structure, as well as on how many workers to assign to each shift, all that in order to minimize the salary costs.

1. Formulate an Integer Programming problem, that corresponds to the above scenario.
2. Solve the problem and build a table of the schedule that you recommend.

Instructions: In order to solve the IP problem, you can use either Excel's Solver or MPL. **Using the Excel's Solver, initialize the decision variables with the value 1.**

Second Scenario

Assume now that after negotiations with the workers union you have reached an agreement which allows you to add also shorter 5-hours shifts. The costs remain the same. Note that 5 hour shifts do not include breaks. How would this new addition change your recommended schedule - what happens to the total cost ?

Assume an M/M/m queue to compare the performance of the system under the two different schedules you have obtained for the two scenarios. Use two performance measures in your comparison: $P\{Wait > 0\}$ and $E\{Wait|Wait > 0\}$. Assume also that the cost of one hour waiting is 45\$. Compare now the costs of the two different schedules.

Hint. Here and in the following questions use the *Import* feature of the 4CallCenters software in order to calculate the performance measures. See Technical Appendix for its detailed description.

Technical Appendix

Part 1. Description of the Italian/American data file.

The file *staffing_italian_US_2009W.xls* includes two worksheets: Italian and American.

Italian Contains columns “ASA”, “Aban Time”, “ACD Calls”, “Aban Calls” from Table 1 and columns “Avail Time”, “Staffed Time” from Table 2.

American Contains columns “Recvd”, “Answrd”, “Aban”, “Aban%”, “ASA”, “AHT”, “OCC%”, and “Total on Prod FTE” from Table 5. The last column is called “Staffing” for simplicity.

Part 2. Description of the Import feature of the 4CallCenters software (cited from 4CallCenters online Help.)

How can Import help me?

If you would like your query or profile inputs be imported from an MS-Excel sheet, perhaps one that contains real data, sampled during your call center work, use the import feature. The import button or menu item works only while in the “Advanced Profiling” tab or the “Advanced Queries” tab. The idea is to import rows containing all the “inputs” that one enters before pressing the “Compute” button to make either a profile or a query. For each such row, the program will compute the desired result and add it to the table as a new row.

How to make a successful import?

First, prepare the import file. This is usually an excel sheet containing a table similar to the one displayed by our program. The table must have a first row containing the title of the columns and additional rows containing the inputs. There should be nothing else besides that table in the sheet.

The table must include columns for all the inputs that one is required to enter before pressing the “Compute” button. If this is the “Advanced Profiling” tab, the table must include a matching column for each yellow column (call center parameter) in the program’s table. If this is the “Advanced Queries” tab, the table must include a column for each yellow column, except the column that one queries for (A column with a check mark in the “Query” row). Additionally, all the checked goal columns (white columns with check marks in the “Goals” row) must be present as well.

The titles of the table must match exactly the titles of the program’s table. You will be informed if during the import procedure, 4CC cannot find a required column. The best way to make the format of the import file right, is to export a table containing only one row first (by pressing the “Export” button) and then use this file as a template, by erasing its data (preserving the titles) and adding data just to the required columns (There is nothing wrong with having unused columns in the import file).

The row’s data must have the following format: “Time” inputs are specified in seconds and can have values between 1 and 3599. The only exception to this rule is the “Basic Interval” column which is stated in minutes and can be between 15 and 60. “Percentage” inputs must be specified as real numbers strictly bigger than 0 and smaller than 1. All “amount” inputs must be between 1 and 3999.

When the worksheet is ready, save it in a “CSV” format (One of the available options in the Save As dialog of MS-Excel). CSV format should only be used to generate the import file. If you want to edit the sheet later in MS-Excel, save it in .xls (native MS-Excel) format as well.

Next, while in the right tab, press the import button. A standard file-opening dialog helps you locate the justly saved import file. After pressing "Open", the table should be filled with the newly computed rows.

You will be informed if a row contains invalid values or has one of the values missing.

An Additional Teaching Assistant Remark. It seems impossible to import "Basic Interval" and "Target Time to Answer" columns. Therefore, use "Settings" menu to assign the right values in these columns (e.g. 30 minutes for Basic Interval).

Table 1

Skill Quotazioni (stock info) 17/2/2000

	Avg Speed Ans	Avg Aban Time	ACD Calls	Avg ACD Time	Avg ACW Time	Aban Calls	Max Delay	Flow In	Flow Out	Extn Out Calls	Avg Extn Out Time	%ACD Time	%Ans Calls	Avg Pos Staff	Calls Per Pos	Svc Lvl	Abn < 10
Totals	29.99286	126.2379	6719	103.5922	68.17279	929	4532	0	0	2264	13.52827	28.37	87.85	50.6	133	67	0.04
8.00	475	0	1	94	28800	0	475	0	0	0	0	3.45	100	27.2	0	0	0
8.30	8.725664	15.54545	113	85.9646	51.49557	11	102	0	0	68	8.161765	24.49	91.13	47.7	2	77	5
9.00	4.85774	0	239	93.50628	55.72803	0	82	0	0	113	11.44248	24.57	100	83.8	3	90	0
9.30	17.0844	16.46154	391	105.7724	56.11253	39	90	0	0	137	11.48175	40.86	90.93	89.7	4	64	4
10.00	25.03241	10.71429	432	111.1944	68.89815	28	98	0	0	178	10.56742	42.28	93.91	106.3	4	56	3
10.30	1.158163	0	392	106.3061	71.54847	0	51	0	0	125	8.832	34.46	100	109.2	4	98	0
11.00	0.148459	4.5	357	104.0616	58.4958	2	9	0	0	126	10.70635	29.62	99.44	107.9	3	99	1
11.30	0.002857	0	350	111.2286	63.82	0	1	0	0	113	15.72566	28.43	100	120.1	3	100	0
12.00	5.592814	13.16667	334	109.006	76.06586	12	55	0	0	113	11.72566	30.19	96.53	117.1	3	84	2
12.30	1.89614	9.842105	337	106.4421	70.38279	19	75	0	0	108	7.851852	28.04	94.66	117.7	3	73	4
13.00	7.395973	9.4	298	112.5638	61.80201	15	68	0	0	104	27.79808	26.39	95.21	115.2	3	84	3
13.30	1.42561	13.08696	289	109.3218	74.26298	23	64	0	0	110	16.49091	25.21	92.63	114.6	3	68	4
14.00	6.352941	15.09091	323	104.3901	63.10836	22	80	0	0	143	10.20979	28.67	93.62	110.5	3	83	3
14.30	6.402899	13.09524	345	109.6348	70.76232	21	46	0	0	164	14.42683	29.51	94.26	115.7	3	81	3
15.00	22.76389	18.04545	432	98.11574	63.56944	22	101	0	0	140	10.09286	33.78	95.15	116.6	4	56	2
15.30	2.412892	4.571429	574	88.3223	58.89373	7	68	0	0	43	10.83721	37.27	98.8	115.9	5	97	1
16.00	1.084428	5	533	82.66792	48.57411	1	32	0	0	44	50	34.28	99.81	116.3	5	99	0
16.30	50.27586	36.57025	406	102.3941	74.70689	121	171	0	0	158	19.70253	35.73	77.04	118.6	3	37	8
17.00	163.9861	50.97476	431	112.7587	54.60789	317	292	0	0	211	12.03791	37.63	57.62	107.8	4	0	14
17.30	426.6953	214.2454	128	132.1563	80.27344	216	986	0	0	56	9.339286	17.74	37.21	63.3	2	0	9
18.00	584.6923	737.2653	13	271.8462	157.1538	49	2163	0	0	9	15.11111	1.78	20.97	52.3	0	0	2
18.30	0	2288.667	0	0	0	3	2544	0	0	0	0	0	0	34.2	0	0	0
19.00	149	4532	1	10	1	1	4532	0	0	1	1	0	50	33.5	0	0	0
19.30	0	0	0	0	0	0	0	0	0	0	0	0	0	29.9	0	0	0
20.00	0	0	0	0	0	0	0	0	0	0	0	0	0	21.8	0	0	0
20.30	0	0	0	0	0	0	0	0	0	0	0	0	0	21.4	0	0	0
21.00	0	0	0	0	0	0	0	0	0	0	0	0	0	21.8	0	0	0
21.30	0	0	0	0	0	0	0	0	0	0	0	0	0	20.8	0	0	0

Table 2

Skill Quotazioni (stock info) 17/2/2000

	ACD Time	ACW Time	Ring Time	AUX Time	Avail Time	Other Time	Staffed Time	%ACD Time	%ACW Time	%Ring Time	%AUX Time	%Avail Time	%Other Time	%Staffed Time
Totals	193.10.00	129.19.00	0.00.00	270.00.00	63.27.00	432.54.00	1088.50.00	18%	12%	0%	25%	6%	40%	100%
8.00	0.00.00	0.28.00	0.00.00	2.31.00	5.25.00	5.08.00	13.32.00	0%	3%	0%	19%	40%	38%	100%
8.30	3.31.00	2.19.00	0.00.00	4.56.00	3.06.00	9.56.00	23.48.00	15%	10%	0%	21%	13%	42%	100%
9.00	6.24.00	3.53.00	0.00.00	6.58.00	7.39.00	16.57.00	41.51.00	15%	9%	0%	17%	18%	41%	100%
9.30	12.10.00	8.08.00	0.00.00	7.07.00	1.05.00	18.18.00	44.48.00	27%	14%	0%	16%	2%	41%	100%
10.00	13.36.00	8.51.00	0.00.00	8.34.00	1.21.00	20.44.00	53.06.00	26%	17%	0%	16%	3%	39%	100%
10.30	11.16.00	7.32.00	0.00.00	10.35.00	5.12.00	19.59.00	54.34.00	21%	14%	0%	19%	10%	37%	100%
11.00	10.17.00	5.41.00	0.00.00	12.16.00	6.48.00	18.54.00	53.56.00	19%	11%	0%	23%	13%	35%	100%
11.30	10.45.00	6.19.00	0.00.00	13.16.00	9.12.00	20.30.00	60.02.00	18%	11%	0%	22%	15%	34%	100%
12.00	10.29.00	7.10.00	0.00.00	17.16.00	3.00.00	20.34.00	58.29.00	18%	12%	0%	30%	5%	35%	100%
12.30	9.23.00	7.06.00	0.00.00	23.54.00	1.05.00	17.19.00	58.47.00	16%	12%	0%	41%	2%	29%	100%
13.00	9.09.00	6.02.00	0.00.00	4.21.00	1.57.00	12.06.00	33.35.00	27%	18%	0%	13%	6%	36%	100%
13.30	8.51.00	5.35.00	0.00.00	3.35.00	1.27.00	13.47.00	33.15.00	27%	17%	0%	11%	4%	41%	100%
14.00	10.05.00	5.45.00	0.00.00	21.08.00	1.27.00	16.48.00	55.13.00	18%	10%	0%	38%	3%	30%	100%
14.30	10.08.00	6.55.00	0.00.00	16.53.00	1.51.00	22.01.00	57.48.00	18%	12%	0%	29%	3%	38%	100%
15.00	11.52.00	7.49.00	0.00.00	15.38.00	1.28.00	21.30.00	58.17.00	20%	13%	0%	27%	3%	37%	100%
15.30	13.28.00	8.07.00	0.00.00	18.34.00	2.35.00	15.11.00	57.55.00	23%	14%	0%	32%	4%	26%	100%
16.00	12.16.00	7.39.00	0.00.00	17.41.00	4.38.00	15.52.00	58.06.00	21%	13%	0%	30%	8%	27%	100%
16.30	12.23.00	8.48.00	0.00.00	16.02.00	1.00.00	21.04.00	59.17.00	21%	15%	0%	27%	2%	36%	100%
17.00	13.32.00	6.44.00	0.00.00	9.58.00	0.00.00	23.39.00	53.53.00	25%	12%	0%	18%	0%	44%	100%
17.30	3.24.00	2.12.00	0.00.00	7.01.00	0.00.00	19.00.00	31.37.00	11%	7%	0%	22%	0%	60%	100%
18.00	0.11.00	0.16.00	0.00.00	5.17.00	0.00.00	20.24.00	26.08.00	1%	1%	0%	20%	0%	78%	100%
18.30	0.00.00	0.00.00	0.00.00	2.42.00	0.00.00	14.23.00	17.05.00	0%	0%	0%	16%	0%	84%	100%
19.00	0.00.00	0.00.00	0.00.00	5.04.00	0.00.00	11.39.00	16.43.00	0%	0%	0%	30%	0%	70%	100%
19.30	0.00.00	0.00.00	0.00.00	5.05.00	0.00.00	9.49.00	14.54.00	0%	0%	0%	34%	0%	66%	100%
20.00	0.00.00	0.00.00	0.00.00	4.38.00	0.00.00	6.15.00	10.53.00	0%	0%	0%	43%	0%	57%	100%
20.30	0.00.00	0.00.00	0.00.00	3.12.00	0.00.00	7.28.00	10.40.00	0%	0%	0%	30%	0%	70%	100%
21.00	0.00.00	0.00.00	0.00.00	2.04.00	0.22.00	8.27.00	10.53.00	0%	0%	0%	19%	3%	78%	100%
21.30	0.00.00	0.00.00	0.00.00	2.36.00	2.45.00	5.03.00	10.24.00	0%	0%	0%	25%	26%	49%	100%

Table 3

Split/Skill Summary Daily - QUOTAZIONI Printed: 03/11/00 13.17

Split/Skill: QUOTAZIONI (stock info)

Date	Avg Speed Ans	Avg Aban Time	ACD Calls	Avg ACD Time	Avg ACW Time	Aban Calls	Max Delay	Flow In	Flow Out	Extn Out Calls	Avg Extn Out Time	De-queued Calls	%ACD Time	%Ans Calls
Totals	1.20	1.20	131898	1.52	1.01	33137	88.59	0	0	61237	.10	0	30.28	79.92
01/02/00	.13	1.13	4725	1.41	.53	319	25.31	0	0	2005	.06	0	36.93	93.68
02/02/00	.34	.59	5971	1.47	.51	932	6.58	0	0	2964	.07	0	44.84	86.50
03/02/00	.20	1.30	6243	1.48	.55	707	23.23	0	0	3089	.08	0	38.42	89.83
04/02/00	.25	.44	6811	1.45	.50	772	5.12	0	0	3026	.08	0	39.82	89.82
05/02/00	1.46	2.37	10	2.27	.47	35	25.24	0	0	1	.01	0	8.17	22.22
07/02/00	.54	1.00	6014	1.52	.53	1317	17.58	0	0	2808	.08	0	42.61	82.04
08/02/00	2.11	1.15	6316	1.55	.57	2366	36.22	0	0	3345	.07	0	44.17	72.75
09/02/00	2.24	1.22	6438	1.52	.56	2324	27.46	0	0	3883	.07	0	44.63	73.48
10/02/00	2.38	1.15	6629	1.57	1.04	3403	56.29	0	0	4258	.07	0	35.52	66.08
11/02/00	3.44	1.22	6336	2.08	1.07	3790	10.59	0	0	4156	.07	0	28.43	62.57
12/02/00			0			0	.00	0	0	0		0	.00	
14/02/00	4.33	2.01	5408	1.51	.57	3710	0	0	0	3210	.10	0	23.91	59.31
15/02/00	2.34	1.41	6220	2.00	1.09	2773	0	0	0	3546	.09	0	28.83	69.16
16/02/00	.35	1.50	6909	1.53	1.08	835	59.32	0	0	2720	.11	0	30.59	89.22
17/02/00	.30	2.06	6719	1.44	1.08	929	75.32	0	0	2264	.14	0	28.37	87.85
18/02/00	.30	.44	6223	1.49	1.06	693	15.43	0	0	2343	.12	0	28.69	89.98
19/02/00			0			0	.00	0	0	0		0	.00	
21/02/00	.27	1.24	5349	1.48	1.01	508	24.19	0	0	1824	.12	0	21.96	91.33
22/02/00	.16	.51	5960	1.52	1.02	444	8.54	0	0	2265	.14	0	24.23	93.07
23/02/00	.07	.23	6295	1.53	1.00	196	3.14	0	0	2358	.13	0	24.04	96.98
24/02/00	.14	.23	7376	1.50	.59	495	3.46	0	0	2936	.13	0	27.80	93.71
25/02/00	.36	.32	7296	1.50	1.02	1109	5.00	0	0	3025	.12	0	27.94	86.81
26/02/00			0			0	.00	0	0	0		0	.00	
28/02/00	1.05	.55	6507	1.56	1.06	1471	5.53	0	0	2551	.12	0	28.51	81.56
29/02/00	3.28	1.13	6143	2.07	1.12	4009	12.47	0	0	2660	.13	0	29.05	60.51

Table 4

Split/Skill Summary Daily - QUOTAZIONI Printed: 03/11/00 12.49

Split/Skill: QUOTAZIONI (stock info)

Date	Avg Speed Ans	Avg Aban Time	ACD Calls	Avg ACD Time	Avg ACW Time	Aban Calls	Max Delay	Flow In	Flow Out	Extn Out Calls	Avg Extn Out Time	De-queued Calls	%ACD Time	%Ans Calls
Totals	.00	.10	79965	1.45	.28	160	3.42	2934	0	24120	.15	0	16.24	19.80
02/10/00	.01	.23	3403	1.43	.38	11	3.42	0	0	1107	.22	0	13.67	99.68
03/10/00	.00	.07	3994	1.27	.25	31	.53	1912	0	1256	.15	0	12.00	99.23
04/10/00	.00	.06	3160	1.46	.28	2	.32	0	0	1026	.15	0	10.83	99.94
05/10/00	.00	.05	3130	1.45	.29	1	.20	0	0	979	.17	0	11.10	99.97
06/10/00	.00	.02	3075	1.46	.28	3	.18	0	0	1008	.13	0	11.67	99.90
07/10/00			0			0	.00	0	0	0		0	.00	
09/10/00	.01	.08	3431	1.49	.31	8	1.15	0	0	1164	.15	0	14.65	99.77
10/10/00	.00	.04	3739	1.42	.31	8	.35	649	0	1194	.17	0	16.41	99.79
11/10/00	.00	.05	3635	1.49	.28	6	.54	0	0	1294	.15	0	16.90	99.84
12/10/00	.00	.09	3782	1.50	.29	6	1.01	0	0	1240	.15	0	16.22	99.84
13/10/00	.00	.04	3655	1.47	.28	2	1.08	0	0	1246	.15	0	17.01	99.95
14/10/00			0			0	.00	0	0	0		0	.00	
16/10/00	.00	.19	3273	1.47	.27	3	1.14	0	0	1016	.15	0	18.38	99.91
17/10/00	.00	.19	2626	1.49	.27	4	.51	0	0	696	.17	0	14.49	99.85
18/10/00	.00	.04	2920	1.50	.28	2	.25	0	0	888	.14	0	13.57	99.93
19/10/00	.00	.09	3920	1.50	.27	4	2.55	0	0	1287	.16	0	19.39	99.90
20/10/00	.00	.10	4555	1.44	.27	4	.37	0	0	1486	.16	0	22.75	99.91
21/10/00	.00		1	.19	.03	0	.00	1	0	0		0	.01	100.00
23/10/00	.00	.11	4470	1.44	.27	7	.43	94	0	1121	.14	0	20.98	99.84
24/10/00	.01	.08	4142	1.48	.27	11	1.09	0	0	1118	.14	0	20.63	99.74
25/10/00	.00	.08	4090	1.45	.27	8	.37	0	0	1107	.13	0	21.09	99.80
26/10/00	.00	.05	3967	1.44	.28	4	1.47	156	0	1017	.15	0	21.21	99.90
27/10/00	.00	.06	3760	1.49	.28	15	1.01	0	0	1077	.14	0	21.77	99.60
28/10/00	.00		1	2.45	.08	0	.00	0	0	0		0	.07	100.00
30/10/00	.00	.04	3447	1.51	.26	5	1.09	0	0	947	.15	0	19.22	99.86
31/10/00	.01	.26	3789	1.41	.31	15	2.11	122	0	846	.15	0	21.10	99.61

Table 5

Date: 6/7/00 Wed Custom Report: NSO Split C_INT Owner: P.O.

	Recvd Calls	Answrd Calls	Aban Calls	Aban% Calls	S L %	MAX	ASA	AHT	ATT	AUX I/O	ACW	Out%	Xfer%	OCC%	Total On Prod FTE	Total Off Prod FTE	Total At Work FTE
Totals:	20520	19997	523	2.5%	75.9%	740	39	302	219	18	65	39.4%	22.9%	95.1%	221.6	31.6	253.1
7:30-8:00	0	0	0	%	%							%	%	17.0%	0.5	1.2	1.7
8:00-8:30	279	274	5	1.8%	89.1%	198	12	332	250	17	64	35.0%	14.2%	84.0%	60.9	9.1	70.0
8:30-9:00	616	609	7	1.1%	87.0%	170	14	287	214	15	58	37.9%	19.5%	94.5%	103.9	20.0	123.9
9:00-9:30	864	830	34	3.9%	62.7%	335	52	298	217	20	61	37.8%	24.5%	99.3%	139.1	25.7	164.8
9:30-10:00	1077	1070	7	0.6%	81.5%	333	33	308	231	18	59	40.2%	22.8%	91.9%	200.2	52.4	252.6
10:00-10:30	1285	1284	1	0.1%	99.4%	59	4	293	216	17	60	37.2%	22.8%	96.0%	218.6	40.5	259.1
10:30-11:00	1355	1297	58	4.3%	71.8%	354	48	302	228	15	58	36.6%	22.1%	99.4%	219.3	38.0	257.3
11:00-11:30	1390	1317	73	5.3%	57.6%	336	62	297	217	20	60	34.2%	21.2%	99.7%	218.3	37.0	255.2
11:30-12:00	1409	1363	46	3.3%	58.9%	346	75	284	208	19	57	37.6%	23.6%	98.3%	219.5	34.0	253.5
12:00-12:30	1164	1156	8	0.7%	89.2%	314	15	298	213	20	65	43.7%	25.4%	96.0%	199.8	26.3	226.1
12:30-1:00	1073	1068	5	0.5%	98.5%	95	5	293	201	20	72	45.8%	24.9%	89.1%	196.1	20.2	216.3
1:00-1:30	1044	1041	3	0.3%	100.0%	38	1	293	213	17	63	39.5%	22.1%	89.6%	189.5	13.8	203.3
1:30-2:00	1097	1076	21	1.9%	86.2%	285	19	297	217	15	65	39.4%	23.9%	98.5%	180.4	16.4	196.8
2:00-2:30	1036	964	72	6.9%	54.6%	740	104	346	242	21	83	35.3%	20.5%	98.9%	187.6	25.5	212.8
2:30-3:00	1234	1190	44	3.6%	57.4%	535	82	288	207	18	63	40.4%	24.9%	94.1%	202.8	22.5	224.3
3:00-3:30	1199	1159	40	3.3%	69.2%	378	35	320	232	19	69	42.3%	23.5%	99.1%	208.4	29.4	237.0
3:30-4:00	1239	1202	37	3.0%	67.6%	419	49	293	211	17	65	38.9%	23.4%	96.8%	202.2	25.9	228.1
4:00-4:30	1163	1118	45	3.9%	65.4%	305	48	308	219	20	70	36.9%	21.9%	98.7%	194.3	30.3	224.6
4:30-5:00	898	888	10	1.1%	70.9%	280	42	318	227	19	72	44.4%	24.4%	94.0%	167.2	19.6	186.8
5:00-5:30	617	616	1	0.2%	95.6%	189	7	323	223	24	76	46.6%	24.2%	82.0%	135.4	10.2	145.6
5:30-6:00	431	425	6	1.4%	88.2%	321	24	342	226	21	95	38.8%	19.8%	85.2%	95.4	7.6	103.1
6:00-6:30	50	50	0	0.0%	98.0%	247	7	160	111	5	43	32.0%	20.0%	80.4%	5.6	0.6	6.2
6:30-7:00	0	0	0												0.0	0.0	0.0
7:00-7:30	0	0	0												0.0	0.0	0.0
7:30-8:00	0	0	0												0.0	0.0	0.0