

SAS AND THE MICRO IN THE SPORTS, ENERGY AND FINANCIAL ARENAS

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Small business applications of computer-aided functions are rapidly moving forward. With the rapid expansion of the small business and home computer industries it is entirely feasible for most small businesses to begin to utilize this capability. In many cases the owner of a small business or personal microcomputer realizes that it would greatly enhance their capabilities if they could bring some of the more powerful analytical techniques to bear on the data they have on their microcomputer data bases. They also find that as their data base grows, the micro provides answers more slowly. At this point the question is how to increase computational efficiency in a cost-effective manner? This is where commercially available software systems such as SAS can be utilized to fulfill the small business manager's desires and needs.

BENEFITS OF THIS COMBINATION

There are several benefits to be gained by utilizing a combination of high technology software packages such as SAS and a microcomputer. First one can easily gain a more cost effective use of your resources. This is brought about through a significantly lower requirement for capital equipment investment, lower operating costs by better utilization of available resources (both dollars and manpower), and the overall system is more readily upgradeable.

You can increase accessibility to both the online data bases on the micro and interactive use of the high technology packages on a main-frame computer. Storing your input runstreams and the results of the SAS runs on floppy diskettes on the micro provides more ready and timely access

to changes you may deem either necessary or desirable.

Through use of a state-of-the-art word processing capability on the micro you can customize the output from SAS and merge it with results from company proprietary programs and provide products to your customer which are improved in both style and quality.

In addition, storage of your raw data sets, SAS runstreams, and SAS output products, along with your other company proprietary programs and products, on the micro provides better local control and improved security.

CHARACTERISTICS OF THIS COMBINATION

Combining a microcomputer and the capabilities which it possesses with high technology software packages such as SAS, which are available on main-frame computers, represents a tremendous resource.

SAS and the main-frame software gives access to "large number crunching" capabilities, and a high degree of sophistication in data handling and analysis capability. However, to get high quality output products that can be readily integrated into a customer's report requires a high degree of manual manipulation of the main-frame output along with access to expensive main-frame peripherals. Also online storage on public disk of your data sets and SAS products can easily become prohibitively expensive.

The microcomputer provides a relatively inexpensive capability for a word processing station, a stand alone data analysis station, an online [floppy diskette] data base, and an intelligent terminal for connecting to the main-frame computer. The word

processing system provides a readily available means of interacting with the output from the mainframe to customize the results and therefore, an improved saleability of your output products.

HOW DO WE UTILIZE THE COMBINATION?

We represent a combination of three separate but related small businesses. One of the companies is involved with historical and current information for oil and gas exploration, drilling, and production in Texas. A second company is involved in providing statistical services to the coaching staffs at the major college level and in the National Basketball Association, and providing a service in which we provide regular status reports on the financial aspects of large-scale, multi-agency, research projects. The third business is related to providing commercially available and custom software packages.

In these various endeavors we are utilizing three different microcomputer systems. The first one is a TRS-80 Model I system with two disk drives, 48 K of RAM, and a dot matrix printer and a letter quality printer; the second system is a TRS-80 Model III system with two disk drives, 48 K of RAM, and a dot matrix printer and a letter quality printer; and the third system is a TRS-80 Model II system with two disk drives, 64 K of RAM, and a dot matrix and letter quality printer.

The word processing program provides us the capability to customize a customer's report and imbed customized SAS results directly into the report at the time of printing. The script capabilities permit us to select up to 50 different types of fonts, and to intermix these fonts at will throughout the report. We also have the capability to intermix up to four different colors of ink in the printing process.

In the energy related activities we are tracking oil and gas information on approximately 100,000 oil and gas wells with up to 500 variables per well. This disk data

base covers a geographic area of 127 counties in Texas. We have compiled historical drilling information for the whole state for the last 7 years, historical monthly production information for the last 14 years, and historical cumulative production over the total life of each well. We generated the disk data base using SAS to strip out the information from a tape data base (100 nine-track, 1600bpi, 2400 ft tapes).

In the financial related activities we are working with a large scale research program wherein we are providing regular status reports for the budget allocations within the program. The program is comprised of some 150 detailed tasks divided among 8 loosely integrated projects that are implemented by 15 different organizations at 12 different geographic locations throughout the United States. We are using SAS to build and track the data base and to provide detailed progress reports which are sorted and ranked by organization and funding level.

In the sports related activities we have implemented a hybrid system which utilizes a combination of SAS programs and company developed software. We are working with the coaching staffs at selected major colleges and in the National Basketball Association. We take the standard box scores from each game and compile a set of reports which delineate individual player and team performance relative to 25 variables. These reports contain individual game results along with a cumulative result across the season to date.

EXAMPLE PRODUCTS FROM THE COMBINATION

The following examples were produced from the combined system. In the original figures we had integrated the use of different colors of ink to provide the customer with a product he had requested. Suffice it to say at this point that you can utilize this capability with very little effort relative to the degree of positive response we have received from our customers.

In the financial aspects of our efforts we are tracking the activities based on a detailed work breakdown structure. An example of a typical work breakdown structure is shown in Figure 1.

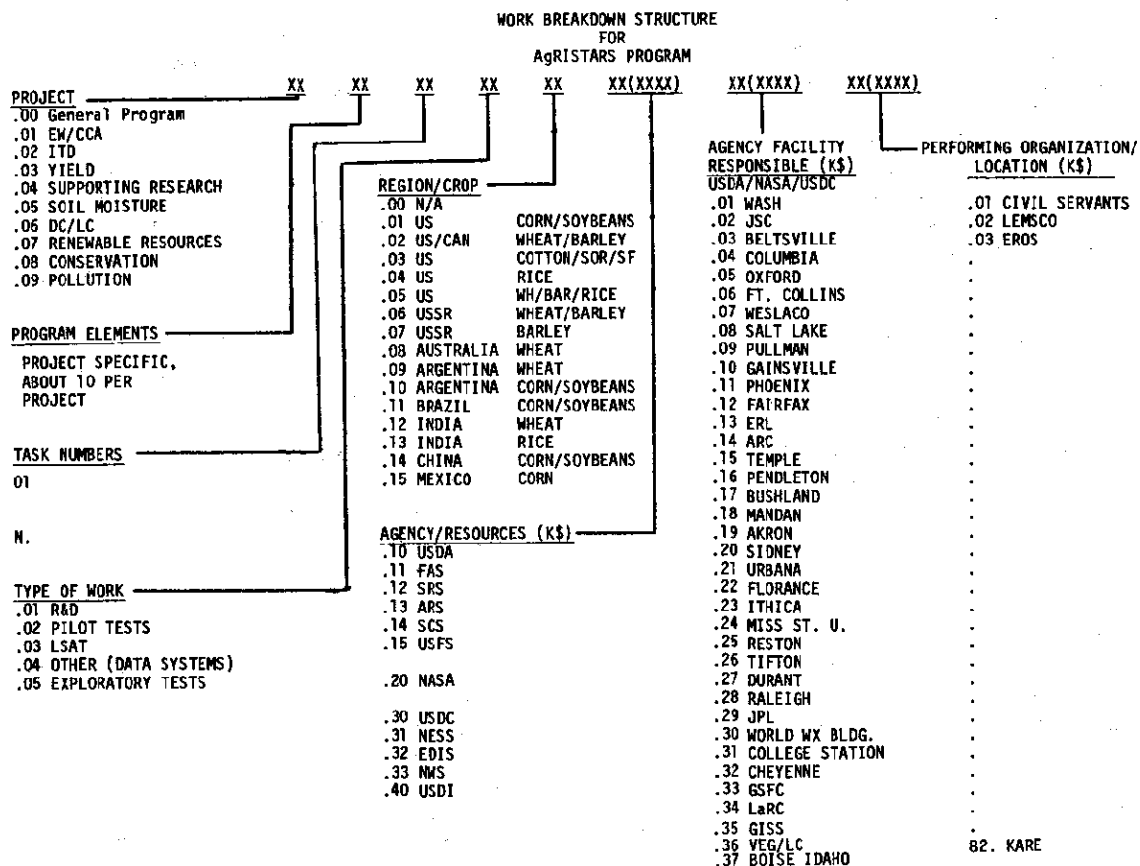


FIGURE 1. TYPICAL WORK BREAKDOWN STRUCTURE

Figures 2 and 3 are examples of the use of **SAB CHART** Procedure to generate a pie chart of the resource allocations by project. Figure 2 is a standard output from **SAB CHART** as it was transmitted from the main-frame listing file and printed using our dot matrix printer. Figure 3 is an example of how we quickly custom edit the listing file to add more detail

and customize it to our customer's specifications. We simply brought the **SAB** listing file back across a telephone line to our micro and stored it in the form of an **ASCII** file. Then we used our word processing software to edit the chart and then printed the results on our printers. The original customized product was produced using three different colors of ink.

FISCAL YR=80
SUM PIE CHART OF AGRES GROUPED BY PROJECT

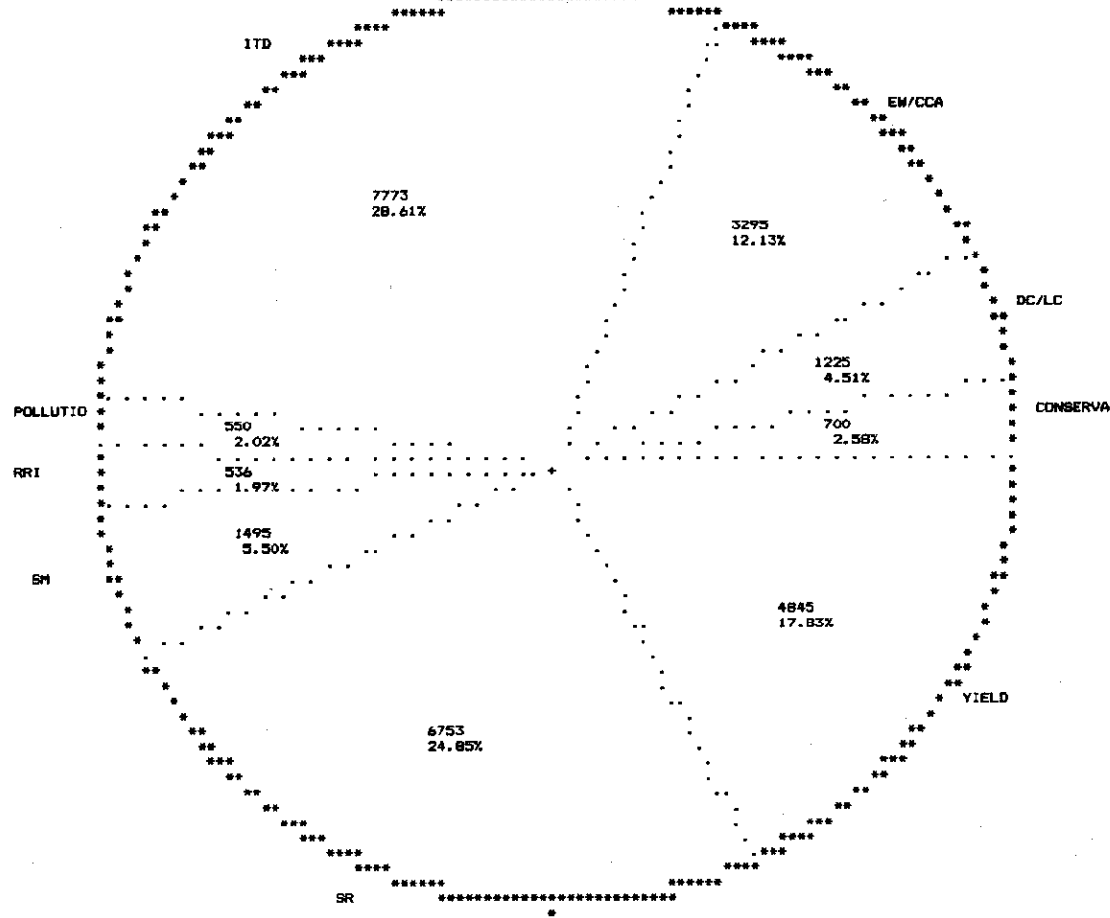


FIGURE 2. STANDARD SAS PROC CHART OUTPUT

Statistical Services Companies

FISCAL YEAR = 1980
 PROGRAMMATIC RESOURCES ALLOCATION BY PROJECT

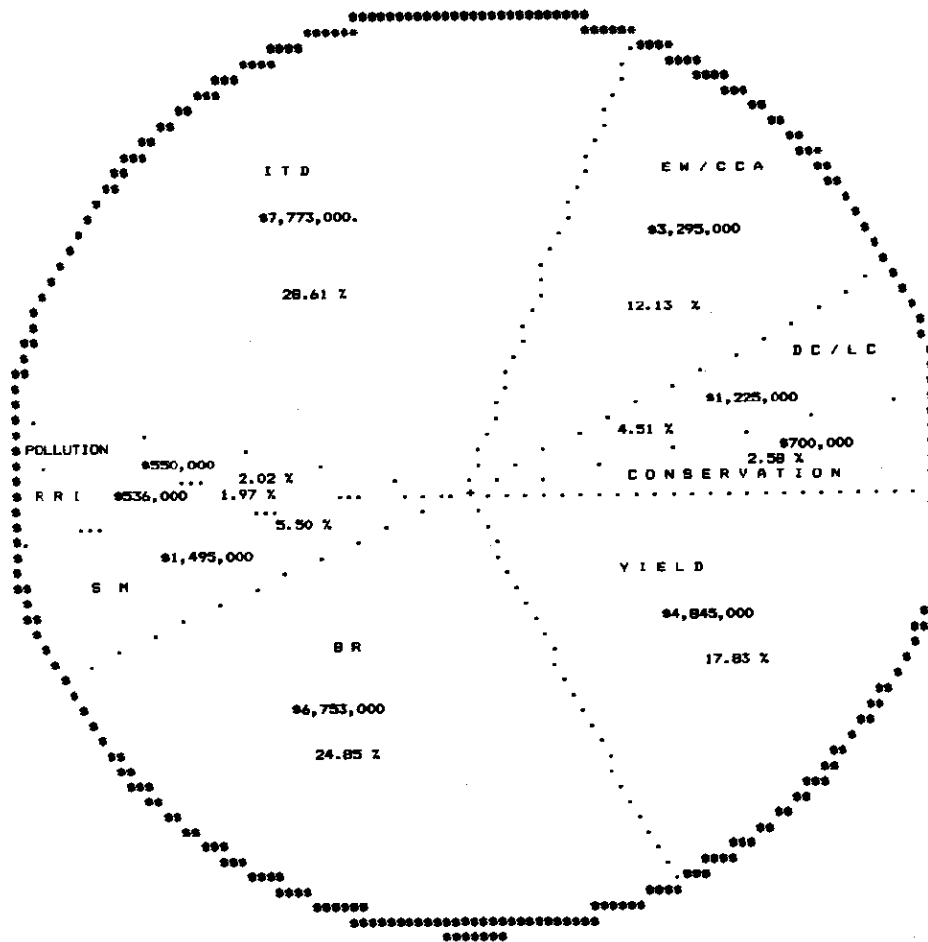


FIGURE 3. CUSTOMIZED SAS PROC CHART OUTPUT

In the sports related activities we generate a series of reports which provides the coaching staff with a quantitative look at how well his basketball squad is performing. We use SAS PROC SORT and PROC RANK to generate the SAS products. We then combine these output with results from our company proprietary programs to finalize the customer's report.

Figures 4 and 5 provide a comparison of a standard SAS Listing with a customized SAS product which we imbed into the customer's report. Again these products were printed using our dot matrix printer and the word processing software. The customized original was printed in three different colors to provide the customer's desired emphasis.

STATISTICAL ANALYSIS SYSTEM
12:19 MONDAY, JANUARY 10, 1983

T	N	P	T	M	H	I	M	N	O
G	A	E	A	A	R	A	A	A	T
B	M	E	R	A	A	A	A	A	R
0	1	2	3	4	5	6	7	8	9
1	PHOENIX	MCCULLOUGH	1.10	SPURS	MOORE	3.01	SPURS	KONAKOR	2.59
2	SPURS	BERVIN	1.10	BULLETS	LUCAS	3.52	CHICAGO	BILMORRE	2.64
3	DETROIT	TRIPUCKA	1.17	SPURS	BRATZ	3.69	WARRIORS	SMITH	2.72
4	UTAH	DANTLEY	1.31	SIXERS	CHEEKS	3.75	DETROIT	LAIHBEER	2.75
5	CLIPPERS	WILLIAMS	1.32	BOSTON	ARCHIBAL	4.01	NETS	WILLIAM	2.81
6	DENVER	IBSEL	1.33	LAKERS	EJOHNSON	4.03	LAKERS	LANDBER	2.83
7	SPURS	BREWER	1.34	CAVALIER	HUSTON	4.08	HOUSTON	MALONE	2.86
8	HOUSTON	MALONE	1.35	DENVER	HIGGS	4.29	BULLETS	RULAND	2.91
9	DENVER	THOMPSON	1.38	DETROIT	THOMAS	4.31	BOSTON	PARISH	2.93
10	ATLANTA	WILLIAMS	1.38	KINGS	FORD	4.33	SEATTLE	BIKMA	2.94
11	SIXERS	ERVINS	1.41	PORTLAND	RANBEY	4.36	KNICKS	LUCAS	2.96
12	DENVER	ENGLISH	1.45	UTAH	GREEN	4.48	TOTAL	LAIHBEER	2.96
13	DETROIT	LONG	1.46	KNICKS	WESTPHAL	4.51	CLIPPERS	NATER	2.99
14	LAKERS	JABBAR	1.47	DALLAS	BRISTON	4.54	BUCKS	LISTER	3.06
15	PORTLAND	BATES	1.48	LAKERS	NIXON	4.64	ATLANTA	ROUNDIE	3.07
16	PHOENIX	DAVIS	1.49	LAKERS	JORDAN	4.64	CAVALIER	LAIHBEER	3.23
17	SIXERS	TONEY	1.50	NETS	WALKER	4.68	DETROIT	CARR	3.24
18	DALLAS	AQUIRRE	1.50	DETROIT	LEE	5.00	LAKERS	RAMBIS	3.25

FIGURE 4. STANDARD SAS PROC RANK OUTPUT

Statistical Services Companies

NBA RANKINGS (ALL POSITIONS) (GAMES 1 TO 49) (1981 - 1982 SEASON)

TEAM	PLAYER	N/PT	TEAM	PLAYER	N/AS	TEAM	PLAYER	N/TR	
1	PHOENIX	MCCULLOUGH	1.10	SPURS	MOORE	3.01	SPURS	KONAKOR	2.59
2	SPURS	BERVIN	1.10	BULLETS	LUCAS	3.52	CHICAGO	BILMORRE	2.64
3	DETROIT	TRIPUCKA	1.17	SPURS	BRATZ	3.69	WARRIORS	SMITH	2.72
4	UTAH	DANTLEY	1.31	SIXERS	CHEEKS	3.75	DETROIT	LAIHBEER	2.75
5	CLIPPERS	WILLIAMS	1.32	BOSTON	ARCHIBAL	4.01	NETS	WILLIAM	2.81
6	DENVER	IBSEL	1.33	LAKERS	EJOHNSON	4.03	LAKERS	LANDBER	2.83
7	SPURS	BREWER	1.34	CAVALIER	HUSTON	4.08	HOUSTON	MALONE	2.86
8	HOUSTON	MALONE	1.35	DENVER	HIGGS	4.29	BULLETS	RULAND	2.91
9	DENVER	THOMPSON	1.38	DETROIT	THOMAS	4.31	BOSTON	PARISH	2.93
10	ATLANTA	WILLIAMS	1.38	KINGS	FORD	4.33	SEATTLE	BIKMA	2.94
11	SIXERS	ERVINS	1.41	PORTLAND	RANBEY	4.36	KNICKS	LUCAS	2.96
12	DENVER	ENGLISH	1.45	UTAH	GREEN	4.48	TOTAL	LAIHBEER	2.96
13	DETROIT	LONG	1.46	KNICKS	WESTPHAL	4.51	CLIPPERS	NATER	2.99
14	LAKERS	JABBAR	1.47	DALLAS	BRISTON	4.54	BUCKS	LISTER	3.06
15	PORTLAND	BATES	1.48	LAKERS	NIXON	4.64	ATLANTA	ROUNDIE	3.07
16	PHOENIX	DAVIS	1.49	LAKERS	JORDAN	4.64	CAVALIER	LAIHBEER	3.23
17	SIXERS	TONEY	1.50	NETS	WALKER	4.68	DETROIT	CARR	3.24
18	DALLAS	AQUIRRE	1.50	DETROIT	LEE	5.00	LAKERS	RAMBIS	3.25

FIGURE 5. CUSTOMIZED SAS PROC RANK OUTPUT

Figures 6, 7, and 8 were produced using the standard game box score data along with our company programs. These results are integrated into the customer's report along with the customized SAS output shown above.

THE HOUSTON ROCKETTS
VERSUS
SAN ANTONIO
2-11-81

HOUSTON	MIN	FBZ	FTX	OFF	DEF	TOT	AST	STL	PTS	OVERALL
REID	94	71	43	96	71	87	63	99	79	78.11
WILDOUSH	87	84	58	61	96	89	70	20	68	70.33
MALONE	92	59	81	97	97	98	77	20	82	78.11
DUNLEAVY	66	77	91	17	37	26	72	35	83	58.22
LEAVELL	90	68	DNS	79	30	51	79	88	52	67.63
PAULTZ	48	75	58	92	94	75	40	69	87	73.11
MURPHY	23	53	DNS	17	17	15	70	20	72	35.88
HENDERS										
BARRETT	61	83	DNS	82	39	59	57	58	68	63.38
JONES										
STROUD										
NOBHOW										

VISITORS	MIN	FBZ	FTX	OFF	DEF	TOT	AST	STL	PTS	OVERALL
JOHNSON	40	31	DNS	67	52	59	17	20	23	38.63
OLBERDI	90	85	91	67	70	70	46	48	71	69.56
JOHNSON	48	48	DNS	61	17	32	17	71	21	41.50
BERVIN	91	44	75	58	86	78	66	86	77	73.67
SILAS	51	60	DNS	17	74	49	86	66	45	58.50
GRIFFIN	80	43	DNS	67	85	80	88	77	16	67.00
CORZINE	76	89	16	90	74	84	48	80	75	70.22
MOORE	32	43	DNS	17	17	15	99	20	27	33.75
HILEY	40	96	89	67	85	80	17	99	97	74.44
BREWER	61	68	91	17	17	15	17	20	88	43.78
BERARD										
NOBHOW										

FIGURE 6. STANDARD GAME BOX SCORES

PLAYER RANKINGS
ON A
PHASE OF GAME BASIS

MIN	FBZ	FTX
REID	94	81
MALONE	92	81
LEAVELL	90	77
WILDOUSH	87	75
DUNLEAVY	66	71
BARRETT	61	68
PAULTZ	48	59
MURPHY	23	53
JONES	DNP	DNP
STROUD	DNP	DNP
NOBHOW	DNP	DNP

AST	STL	PTS
LEAVELL	99	99
MALONE	77	88
DUNLEAVY	72	69
WILDOUSH	70	58
MURPHY	70	55
LEAVELL	63	20
BARRETT	57	20
PAULTZ	40	20
JONES	DNP	DNP
STROUD	DNP	DNP
NOBHOW	DNP	DNP

FIGURE 7. PLAYER PERFORMANCE

PHASE OF GAME RANKINGS
FOR EACH PLAYER

REID	WILDOUSH	MALONE
STL... 99	DRB... 96	TOT... 98
DRB... 96	TOT... 89	DRB... 97
MIN... 94	MIN... 87	DRB... 97
TOT... 87	FBZ... 84	MIN... 92
PTS... 79	AST... 70	AST... 82
DRB... 71	PTS... 68	FTX... 81
FBZ... 71	DRB... 61	AST... 77
AST... 63	FTX... 58	FBZ... 59
FTX... 43	STL... 20	STL... 20

DUNLEAVY	LEAVELL	PAULTZ
FTX... 91	AST... 99	TOT... 95
PTS... 83	MIN... 90	DRB... 94
FBZ... 77	STL... 88	DRB... 92
AST... 72	DRB... 79	PTS... 87
MIN... 66	FBZ... 68	FBZ... 75
STL... 55	PTS... 52	STL... 69
DRB... 37	TOT... 51	FTX... 58
TOT... 26	DRB... 30	MIN... 48
DRB... 17	FTX... DNS	AST... 40

MURPHY	HENDERSON	GARRETT
PTS... 72	MIN... DNS	FBZ... 83
AST... 70	FBZ... DNS	DRB... 82
FBZ... 53	FTX... DNS	PTS... 68
MIN... 23	DRB... DNS	MIN... 61
STL... 20	ORB... DNS	TOT... 59
DRB... 17	TOT... DNS	STL... 58
ORB... 17	AST... DNS	AST... 57
TOT... 15	STL... DNS	DRB... 39
FTX... DNS	PTS... DNS	FTX... DNS

JONES	STROUD	NOBHOW
MIN... DNP	MIN... DNP	MIN... DNP
FBZ... DNP	FBZ... DNP	FBZ... DNP
FTX... DNP	FTX... DNP	FTX... DNP
ORB... DNP	ORB... DNP	ORB... DNP
DRB... DNP	DRB... DNP	DRB... DNP
TOT... DNP	TOT... DNP	TOT... DNP
AST... DNP	AST... DNP	AST... DNP
STL... DNP	STL... DNP	STL... DNP

FIGURE 8. TEAM PERFORMANCE
BY PHASE OF GAME

SUMMARY AND CONCLUSIONS

Our experience to date in combining the capabilities of our microcomputer systems with the detailed output from high technology software such as SAS has provided us with fantastic results. Our customers are happier and the products which we are producing are in our opinion more professional and of higher quality than when we were using only one of the systems.

We can hardly wait until the SAS Institute Inc. repackages the SAS programs and procedures so they will be directly compatible with our microsystems. At that point it will be possible for any small business to implement a cost effective data processing, data analysis and word processing system which will be the envy of the academic, the business, the professional consultant, and the scientific communities.

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