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**A COMPARISON OF THE IBM 370/168 MODEL 3
WITH THE AMDAHL 470V/6 AND THE
IBM 370/168 USING BENCHMARKS**

by

J. E. Miller, R. L. Haddock, and R. R. Wicks

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ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60439

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D. R. Snider, J. L. Midlock, and A. R. Hinds

Applied Mathematics Division

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April 1977

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ABSTRACT

As part of the studies preliminary to the acquisition of additional computing capability at Argonne National Laboratory, six groups of jobs were run on the IBM 370/195 at the Applied Mathematics Division of Argonne National Laboratory, on an Amdahl 470V/6 at the Amdahl manufacturing facilities in Sunnyvale, California, and on an IBM 370/168 MODEL 3 at the IBM Field Support Center in Gaithersburg, Maryland. This report compares the performance of the IBM 370/168 MOD 3 with that of the other two machines.

Differences in machine configurations were minimized. The memory size on each machine was identical, the I/O configurations were as similar as possible, and the same versions of OS/MVT 21.7 and ASP 3.1 were used on all three machines. This allowed the comparison to be based on the relative performance of the three CPUs.

I. INTRODUCTION

At Argonne, an ambitious benchmark study was conducted in 1971,¹ preparatory to the acquisition of the current production IBM 370/195 computer.² The benchmark library used in that study consisted of two parts:

- a) 28 applications problems representative of, and essential to, the Laboratory's research programs current in 1971, and
- b) a model jobstream simulating the Central Computing Facility 1971 daytime workload.

As part of Argonne's present planning for a computer acquisition, the existing benchmark library was updated, and four new groups of jobs were added to represent the somewhat different workload and research programs now current at the Laboratory. The original jobstream and applications code collections were augmented by a modified model jobstream, a set of current user application codes, a set of small program kernels (drawn mostly from large production codes but including some written specifically for the benchmark), and the Naval Research Laboratory benchmark kernel collection. These six groups were run on the IBM 370/195 at Argonne using the current production versions of OS/360 MVT 21.7 and ASP 3.1, and then on an AMDAHL 470V/6 and an IBM 370/168 MOD 3, using the same operating systems. The memory sizes and I/O configurations of the three machines were held as similar as possible. Every effort was made to eliminate variables such as operator intervention or job dependencies. The result of these efforts is a comparison of the performance of the three machines on the current A.N.L. workload, and a breakdown of the CPU performance of each machine on a variety of particular classes of programs.

This report describes the second benchmark study completed by the Applied Mathematics Division of A.N.L., conducted on the IBM 370/168 MODEL 3 at IBM in Gaithersburg, Maryland. The first study³ compared the CPU performance of the AMDahl 470V/6 with that of Argonne's currently installed 370/195, and was published as ANL-76-50 in March 1976. That report describes the efforts required to execute the benchmark on the 470V/6 and the 370/195, and contains a complete description of the benchmark job mix, information that will not be repeated here. However, all of the performance statistics from the former report are included here, and some small computational errors in the AMDAHL to 195 comparison are corrected.

As an adjunct to Argonne's benchmark of the 370/168, IBM System Engineers modified the Job Control Language for the benchmark Model Jobstream to allow it to run under MVS/JES2. This jobstream was run on the 370/168 in both Uniprocessor (UP) and

Attached-processor (AP) modes, permitting comparisons of MVS to MVT and the 168-UP to the 168-AP to be included in this report.

Some additional kernels, run on the 370/168, but not the 470V/6, are described in Appendix A. In addition, the standard timing study of the EISPACK⁴ subroutine collection, performed by A.N.L. personnel on the 370/195 and 370/168, and by local personnel on the University of Michigan 470V/6 (under MTS), is included in Appendix D.

II. DESIGN OF THE EXPERIMENT

The primary goal of the experiment was to compare the CPU speed of the 370/168 MODEL 3 (with the high speed multiply feature) to that of the AMDAHL 470V/6 and the IBM 370/195. Secondary goals included comparison of the MVS (Multiple Virtual Systems) and MVT operating systems, and comparison of the 168 to the 168 AP (Attached Processor).

To accomplish these goals, the following procedures were undertaken. An I/O SYSGEN was done for the 168 I/O configuration; the Nucleus Initialization Program (IEAANIPO), I/O Supervisor (IEAASU00), error recovery modules, and modules to support the newer unit record equipment were merged with our current version of OS/360 MVT 21.7. The ASP initialization deck was likewise modified to match the 168 configuration, but no modifications were made to the ASP 3.1 code. All the remaining software and system control parameters were identical for all three machines.

One difficulty arose in modifying our MVT system to support the 3066 integrated CRT console on the 168. The SYSGEN required the MCS (Multiple Console Support) option to be selected when specifying the 3066. MCS is redundant under ASP, adding unnecessary overhead. Module SGGEN100 in SYS1.GENLIB was modified to remove all checks for inclusion of MCS for a 3066, and the SYSGEN worked fine.

The hardware configurations of the three machines were similar, as illustrated in figures 13, 14, and 15. All three had identical memory size (4 megabytes), identical fixed head storage, identical types of tape and disk drives, and identical numbers of paths to those drives. The same number of disk drives were used for the same purpose in each configuration.

The benchmark library used in the evaluation of the three machines consisted of the following six parts:

- a model jobstream simulating the Central Computing Facility daytime workload (this jobstream was used in a 1971 study² to represent the overall workload on the then current system and is somewhat outdated)
- an updated model jobstream simulating the current daytime workload
- old application programs (also from the 1971 study)
- a set of current user application programs
- a set of small program kernels drawn mostly from large production codes but including some written specifically for the benchmark study.

- the Naval Research Laboratory benchmark kernel collection

The programs in the benchmark library are described in 1 and 2 and will not be described again in this report.

All six parts of the benchmark library were run on the 168 in Gaithersburg. The two model jobstreams were run individually by reading all the jobs into the ASP queue in the same order used for the other runs before allowing any jobs to be started, then the SLACMON software monitor was started, and finally the jobs were allowed to start running. The ASP scheduling parameters used during the day shift on weekdays at the Argonne Central Computing Facility were used for running the model jobstreams on all three machines. These parameters cause four initiators to be started in the top 800K of memory of EXPRESS class jobs and six initiators to be started in 2200K of memory for the bigger jobs. The rest of the memory was used for ASP and OS, with ASP running in 738K. Only one printer was used for the benchmarks and only the SYSMSG files were printed. The printer was active while the streams were run. The run time for a stream was defined as the time from when jobs were allowed to start running until the last job completed execution. As soon as the last job ended, SLACMON was stopped. When the SYSMSG files finished printing, ASP was terminated to get the CPU time used by ASP for the stream as measured by the operating system. The SLACMON outputs were later used to measure the overall CPU utilization of the runs and to check for any significant differences in the utilization of the I/O equipment.

The application codes, user codes, and the two sets of kernels were all run together. The important statistic for each of these jobs was the CPU time required on the different machines. The elapsed time required to run each group of jobs was not measured because the additional comparisons of the I/O speeds of the machines were not considered to be worth the time and effort of running the jobs as separate timed streams.

III. RESULTS

A. Jobstream Summary

Tables 1 and 2 summarize the relative performance of the IBM 370/168, the AMDAHL 470V/6 and the IBM 370/195 for the model and modified model jobstreams. Jobstream elapsed times were measured from the start of the first job to the completion of the last job on MAIN using time stamped console messages. Total job CPU time and ASP CPU time were obtained from SMF, WAIT time from local accounting modifications, and percent CPU utilization from the SLACMON software monitor.

More detailed results are given in the following sections and in Appendix C.

TABLE 1
MODEL JOBSTREAM SUMMARY

	<u>IBM 370/168</u>	<u>AMDAHL 470V/6</u>	<u>IBM 370/195</u>	<u>168/470</u>	<u>168/195</u>
Elapsed Time (min:sec)	29:57	27:27	30:02	1.091	0.997
Total Job CPU Time (min:sec)	24:17.73	18:12.07	16:46.22	1.335	1.449
Total Job Wait Time (min:sec)	31:52.43	40:50.62	49:03.19	0.780	0.650
ASP CPU Time (min:sec)	2:10.34	1:41.55	1:55.09	1.284	1.133
Total CPU Time (min:sec)	27:37	20:58	20:22	1.317	1.356
CPU Utilization	92.21%	76.36%	67.79%	1.208	1.360

TABLE 2
MODIFIED MODEL JOBSTREAM SUMMARY

	<u>IBM 370/168</u>	<u>AMDAHL 470V/6</u>	<u>IBM 370/195</u>	<u>168/470</u>	<u>168/195</u>
Elapsed Time (min:sec)	56:32	45:02	39:44	1.255	1.423
Total Job CPU Time (min:sec)	51:48.80	39:35.43	33:15.79	1.309	1.558
Total Job Wait Time (min:sec)	34:24.98	50:36.86	50:20.54	0.680	0.684
ASP CPU time (min:sec)	2:29.79	1:56.05	2:15.58	1.291	1.105
Total CPU Time (min:sec)	55:13	42:21	36:44	1.304	1.503
CPU Utilization	97.66%	94.03%	92.47%	1.039	1.056

B. The Model Jobstream

The Model Jobstream consists of 60 unique jobs, some of which are repeated to yield a total of 105 jobs comprising 318 separate job steps. These steps include 52 Assemblies, 17 FORTRAN G compilations, 23 FORTRAN H (OPT=0) compilations, and 123 "GO" steps. This jobstream was assembled in 1971 to represent the daytime workload on the production 360/75; currently it more closely resembles the 370/195 EXPRESS class workload.

Table 1 shows the stream to be I/O bound on the 195 and the 470--more so on the 195 since it uses less CPU time but the I/O device speeds are the same. The 168 and the 195 required almost identical times to complete this jobstream. The 168 required much more CPU time to run the jobstream, but the elapsed times for the 195 and the 168 appear to be controlled by the I/O speeds. The 470 completed the jobstream in 9 percent less elapsed time than either the 195 or the 168. The lower CPU time for ASP on the 470 suggests that its superior elapsed time is partially attributable to ASP running faster and providing system services to the jobstream faster.

The relative performance of the three machines varies across the jobstream. The ratio of job CPU time used on the 168 to CPU time used on the 470 ranges from .85 to 1.875. This large variation is attributed to the inaccurate method OS/360 uses to calculate CPU time, and the shortness of the jobs at the extremes. The inaccurate CPU time calculation averages out on the longer jobs, and for groups of even very short jobs. The mean ratio of CPU times if each unique job is counted once is 1.305. Weighting each job by the number of times it occurs in the jobstream shifts the mean to 1.285 and gives 1.334 for the ratio of the total job CPU times. The ratio of job CPU time used on the 168 to CPU time used on the 195 ranges from .944 to 2.561, with a mean ratio of 1.235. Weighting each job by the number of times it occurs in the jobstream shifts the mean to 1.198 and gives 1.446 for the ratio of the total job CPU times. Figures 1 through 6 summarize the relative performance distribution in histogram format. These figures show that the 470 is from 20 to 50 percent faster than the 168 on most of the jobs. The 195 is much faster than either the 168 or the 470 on a few jobs (these jobs are test runs of production jobs with substantial GO steps--not very short jobs with inaccurate CPU calculations).

<u>MIDPOINT</u>	<u>COUNT</u>	
.90	3	XXX
1.00	4	XXXX
1.10	6	XXXXXX
1.20	8	XXXXXXXX
1.30	11	XXXXXXXXXXX
1.40	17	XXXXXXXXXXXXXXXXXX
1.50	6	XXXXXX
1.60	2	XX
1.70	2	XX
1.80	0	
1.90	1	X

Total of 60 Unique Jobs

Mean Ratio of Job CPU Times = 1.305
 Total Job CPU Time on 370/168 = 1313.42
 Total Job CPU Time on 470V/6 = 975.77
 Ratio of Total Job CPU Times = 1.346

Figure 1. Distribution of CPU Time Ratios for Model Jobstream - 370/168 vs. 470V/6 - Each Unique Job Counted Only Once.

<u>MIDPOINT</u>	<u>COUNT</u>	
.80	1	X
.90	3	XXX
1.00	8	XXXXXXXX
1.10	14	XXXXXXXXXXXXXXXX
1.20	20	XXXXXXXXXXXXXXXXXXXX
1.30	14	XXXXXXXXXXXXXXXX
1.40	34	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.50	7	XXXXXXX
1.60	2	XX
1.70	2	XX
1.80	0	
1.90	1	X

Total of 105 Jobs

Mean Ratio of Job CPU Times	=	1.285
Total Job CPU Time on 370/168	=	1454.29
Total Job CPU Time on 470V/6	=	1089.82
Ratio of Total Job CPU Times	=	1.334

Figure 2. Distribution of CPU Time Ratios for Model Jobstream - 370/168 vs. 470V/6 - All Jobs in Jobstream Included.

<u>MIDPOINT</u>	<u>COUNT</u>	
.90	2	XX
1.00	5	XXXXX
1.10	21	XXXXXXXXXXXXXXXXXXXXXXX
1.20	14	XXXXXXXXXXXXXXXXXX
1.30	5	XXXXX
1.40	5	XXXXX
1.50	4	XXXX
1.60	1	X
1.70	0	
1.80	0	
1.90	1	X
2.00	1	X

2.60	1	X

Total of 60 Unique Jobs

Mean Ratio of Job CPU Times	=	1.235
Total Job CPU Time on 370/168	=	1313.42
Total Job CPU Time on 370/195	=	885.92
Ratio of Total Job CPU Times	=	1.483

Figure 3. Distribution of CPU Time Ratios for Model Jobstream - 370/168 vs. 370/195 - Each Job Counted Only Once.

<u>MIDPOINT</u>	<u>COUNT</u>	
.90	2	XX
1.00	10	XXXXXXXXXX
1.10	41	XX
1.20	31	XX
1.30	4	XXXX
1.40	9	XXXXXXXXXX
1.50	4	XXXX
1.60	1	X

1.90	1	X
2.00	1	X

2.60	1	X

Total of 105 Jobs

Mean Ratio of Job CPU Times	=	1.198
Total Job CPU Time on 370/168	=	1454.29
Total Job CPU Time on 370/195	=	1005.91
Ratio of Total Job CPU Times	=	1.446

Figure 4. Distribution of CPU Time Ratios for Model Jobstream - 370/168 vs. 370/195 - All Jobs in Jobstream Included.

<u>MIDPOINT</u>	<u>COUNT</u>	
.70	1	X
.80	17	XXXXXXXXXXXXXXXXXXXX
.90	15	XXXX^XXXXXXXXXXXXX
1.00	17	XXXXXXXXXXXXXXXXXXXX
1.10	7	XXXXXXX
1.20	0	
1.30	0	
1.40	0	
1.50	1	X
1.60	0	
1.70	1	X
----	0	
2.30	1	X

Total of 60 Unique Jobs

Mean Ratio of Job CPU Times = .961
 Total Job CPU Time on 470V/6 = 975.77
 Total Job CPU Time on 370/195 = 885.92
 Ratio of Total Job CPU Times = 1.101

Figure 5. Distribution of CPU Time Ratios for Model Jobstream - 470 vs. 195 - Each Unique Job Counted Only Once.

<u>MIDPOINT</u>	<u>COUNT</u>	
.70	1	X
.80	29	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.90	32	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.00	31	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.10	9	XXXXXXXXXX
1.20	0	
1.30	0	
1.40	0	
1.50	1	X
1.60	0	
1.70	1	X
----	0	
2.30	1	X

Total of 105 Jobs

Mean Ratio of Job CPU Times = .944
 Total Job CPU Time on 470V/6 = 1089.82
 Total Job CPU Time on 370/195 = 1005.91
 Ratio of Total Job CPU Times = 1.083

Figure 6. Distribution of CPU Time Ratios for Nodel Jobstream - 470 vs. 195 - All Jobs in Jobstream Included.

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 MODEL JOBSTREAM

AMDAHL 470V/6

IBM 370/195

470V6 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	121	7.54	6.83	121	6.56	11.40	1.151	0.599
ASH	52	0.26	5.21	52	0.29	6.52	0.900	0.800
EDT	37	0.30	10.33	37	0.36	9.11	0.840	1.134
PTG	17	1.51	2.02	17	1.95	2.33	0.773	0.868
PTH (0)	23	4.20	13.91	23	5.02	10.24	0.836	1.359
GO	87	8.56	3.86	87	6.86	7.05	1.247	0.547
IEBUTIL	33	0.21	9.34	33	0.22	11.03	0.966	0.847
IEHUTIL	25	0.22	9.06	25	0.23	6.50	0.960	1.395
LOAD&GO	34	4.94	14.44	34	5.77	22.54	0.857	0.641
PL1	8	2.20	9.88	8	2.85	10.49	0.773	0.942
UTILITY	58	0.21	9.22	58	0.22	9.07	0.964	1.016

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	34	10.02	9.83	34	8.66	16.62	1.018	1.231
ASH	5	0.47	8.15	5	0.52	12.48	0.896	0.730
EDT	21	0.31	9.90	21	0.36	9.01	0.863	1.199
PTG	10	2.20	2.19	10	2.85	2.64	0.770	0.916
PTH (0)	23	4.20	13.91	23	5.02	10.24	0.840	1.417
GO	20	12.92	4.93	20	9.92	9.64	1.093	1.362
IEBUTIL	16	0.23	11.48	16	0.24	11.82	0.949	1.205
IEHUTIL	9	0.26	11.28	9	0.27	8.20	0.944	1.441
LOAD&GO	14	5.86	16.82	14	6.86	26.60	0.910	1.046
PL1	3	4.04	13.73	3	5.35	16.74	0.791	1.026
UTILITY	23	0.24	11.83	23	0.25	11.04	0.949	1.290

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

TABLE 3. Summary of Results for Model Jobstream -
 Performance Ratios by Program Type.
 470V/6 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	121	9.98	5.99	121	6.56	11.40	1.523	0.525
ASH	52	0.32	3.67	52	0.29	6.52	1.104	0.563
EDT	37	0.43	7.61	37	0.36	9.11	1.222	0.835
PTG	17	2.17	1.80	17	1.95	2.33	1.114	0.774
PTH (0)	23	5.85	9.25	23	5.02	10.24	1.165	0.904
GO	87	11.00	4.16	87	6.86	7.05	1.603	0.591
IEBUTIL	33	0.27	6.96	33	0.22	11.03	1.236	0.632
IEHUTIL	25	0.26	6.76	25	0.23	6.50	1.105	1.041
LOADGO	34	7.37	10.65	34	5.77	22.54	1.274	0.472
PL1	8	3.35	8.87	8	2.85	10.49	1.175	0.446
UTILITY	58	0.26	6.88	58	0.22	9.07	1.178	0.754

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	34	13.49	8.29	34	8.66	16.62	1.325	1.771
ASH	5	0.59	5.87	5	0.52	12.48	1.121	0.516
EDT	21	0.43	7.38	21	0.36	9.01	1.203	0.852
PTG	10	3.19	2.02	10	2.85	2.64	1.089	0.826
PTH (0)	23	5.85	9.25	23	5.02	10.24	1.150	0.459
GO	20	16.82	5.38	20	9.92	9.64	1.400	1.326
IEBUTIL	16	0.30	8.35	16	0.24	11.82	1.150	0.845
IEHUTIL	9	0.30	8.47	9	0.27	8.20	1.112	1.017
LOADGO	14	8.74	12.44	14	6.86	26.60	1.217	0.707
PL1	3	6.34	12.39	3	5.35	16.74	1.164	0.906
UTILITY	23	0.30	8.77	23	0.25	11.04	1.135	0.933

"ALL GO" COMBINES ALL GO, LOADGO, AND EDTGO STEPS.

"IEBUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY" COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

TABLE 4. Summary of Results for Model Jobstream -
Performance Ratios by Program Type.
370/168-3 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470V6

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	121	9.98	5.99	121	7.54	6.83	1.323	0.876
ASH	52	0.32	3.67	52	0.26	5.21	1.227	0.703
RDT	37	0.43	7.61	37	0.30	10.33	1.455	0.736
PTG	17	2.17	1.00	17	1.51	2.02	1.441	0.891
PTH (0)	23	5.85	9.25	23	4.20	13.91	1.394	0.665
GO	87	11.00	4.16	87	8.56	3.86	1.294	1.040
IEBUTIL	33	0.27	6.96	33	0.21	9.34	1.279	0.746
IEHUTIL	25	0.26	6.76	25	0.22	9.06	1.151	0.744
LOADGO	34	7.37	10.65	34	4.94	14.44	1.491	0.737
PL1	9	3.35	8.87	8	2.20	9.88	1.521	0.499
UTILITY	54	0.26	6.88	58	0.21	9.22	1.222	0.746

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	34	13.49	8.29	34	10.02	9.83	1.316	0.935
ASH	5	0.59	5.87	5	0.47	8.15	1.252	0.724
EDT	21	0.43	7.38	21	0.31	9.90	1.406	0.763
PTG	10	3.19	2.02	10	2.20	2.19	1.416	0.954
PTH (0)	23	5.85	9.25	23	4.20	13.91	1.372	0.697
GO	20	16.82	5.38	20	12.92	4.93	1.249	1.022
IEBUTIL	16	0.30	8.35	16	0.23	11.48	1.236	0.844
IEHUTIL	9	0.30	8.47	9	0.26	11.28	1.191	0.772
LOADGO	14	8.74	12.44	14	5.86	16.82	1.340	0.811
PL1	3	6.34	12.39	3	4.04	13.73	1.478	0.992
UTILITY	23	0.30	8.77	23	0.24	11.83	1.219	0.867

*ALL GO * COMBINES ALL GO, LOADGO, AND EDTGO STEPS.

*IEBUTIL * COMBINES ALL IEB UTILITIES WITH THE "IEB" PREFIX.

*IEHUTIL * COMBINES ALL IEB UTILITIES WITH THE "IEH" PREFIX.

*UTILITY * COMBINES ALL IEB UTILITIES ("IEB" AND "IEH").

TABLE 6. Summary of Results for Model Jobstream -
Performance Ratios by Type.
370/168-3 vs. 470V/6

C. The Modified Model Jobstream

The Modified Model Jobstream consists of the Model Jobstream augmented by additional CPU bound jobs some of which are run several times to more closely represent the current daytime computing workload of the 370/195. A total of 117 jobs, of which 64 are unique, contribute 362 job steps to this stream.

Table 2 shows the modified stream to be CPU bound on all three machines, with CPU utilizations exceeding 90 percent. The extra CPU load has extended the 470 stream time nearly twice as much as the 195 stream time, overwhelming the small advantage the 470 had on the Model Jobstream. The 168 stream time increased almost three times more than the 195, modifying its position relative to the 195 from equal on the Model Jobstream to more than 40 percent slower. The 470 has established a substantial 15 percent performance edge on the 168 for running this stream. This stream starts to give an idea of the relative CPU speeds of each machine. The I/O activity no longer dominates the elapsed times, and the elapsed time ratios approach the Total Job CPU Time ratios.

Figures 7 through 12 represent the relative speeds of the three machines in yet another way, using the CPU time used by each job in the stream. The ratio of job CPU time used on the 168 to CPU time used on the 470 ranges from 0.692 to 1.710 with a mean of 1.276 if each job is counted once. Weighting each job by the number of times it occurs in the jobstream shifts the mean to 1.252 and gives 1.310 for the ratio of the total job CPU times. The ratio of job CPU time used on the 168 to CPU time used on the 195 ranges from 0.75 to 2.637 with a mean of 1.258 if each job is counted once. Weighting each job by the number of times it occurs in the jobstream shifts the mean to 1.234 and gives 1.557 for the ratio of the total job CPU times.

Tables 6 through 8 break down the stream into the different classes of programs. The numbers are very similar to the ratios in Tables 3 through 5 with the exception of the LOAD&GO steps and the ALLGO steps which include LOAD&GO steps. The four jobs that were added to the Model Jobstream to make the Modified Model Job stream are all FTH (FORTRAN H) compiler and LOAD&GO jobs with substantial execution steps. The 195 shows a bit more of its CPU speed superiority over the 168 and the 470 for doing the kind of execution steps the scientists and engineers at Argonne run. The rest of the classes of programs in these charts are useful for cross checking the repeatability of the ratios. The identical jobs were run in both streams and the ratios should, and in fact do, come out about the same.

<u>MIDPOINT</u>	<u>COUNT</u>	
.70	1	X
.80	1	X
.90	2	XX
1.00	6	XXXXXX
1.10	7	XXXXXXX
1.20	6	XXXXXX
1.30	19	XXXXXXXXXXXXXXXXXXXXX
1.40	9	XXXXXXXXXX
1.50	7	XXXXXXX
1.60	5	XXXXX
1.70	1	X

Total of 64 Jobs

Mean Ratio of Job CPU Times	=	1.276
Total Job CPU Time on 370/168	=	2166.24
Total Job CPU Time on 470V/6	=	1636.44
Ratio of Total Job CPU Times	=	1.324

Figure 7. Distribution of CPU Time Ratios for Modified Model Jobstream - 370/168 vs. 470V/6 - Each Unique Job Counted Only Once.

<u>MIDPOINT</u>	<u>COUNT</u>	
.70	1	X
.80	1	X
.90	3	XXX
1.00	13	XXXXXXXXXXXXXXX
1.10	20	XXXXXXXXXXXXXXXXXXXXXXX
1.20	17	XXXXXXXXXXXXXXXXXXXXXXX
1.30	23	XXXXXXXXXXXXXXXXXXXXXXX
1.40	13	XXXXXXXXXXXXXXX
1.50	20	XXXXXXXXXXXXXXXXXXXXXXX
1.60	5	XXXXX
1.70	1	X

Total of 117 Jobs

Mean Ratio of Job CPU Times	=	1.252
Total Job CPU Time on 370/168	=	3107.88
Total Job CPU Time on 470V/6	=	2373.07
Ratio of Total Job CPU Times	=	1.310

Figure 8. Distribution of CPU Time Ratios For Modified Model Jobstream - 370/168 vs. 470V/6 - All Jobs in Jobstream Included.

<u>MIDPOINT</u>	<u>COUNT</u>	
.80	1	X
.90	2	XX
1.00	8	XXXXXXXX
1.10	24	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.20	10	XXXXXXXXXX
1.30	5	XXXXX
1.40	4	XXXX
1.50	3	XXX
1.60	1	X
1.70		
1.80	1	X
1.90	2	XX

2.30	1	X

2.50	1	X
2.60	1	X

Total of 64 Unique Jobs

Mean Ratio of Job CPU Times	=	1.258
Total Job CPU Time on 370/168	=	2166.24
Total Job CPU Time on 370/195	=	1384.69
Ratio of Total Job CPU Times	=	1.564

Figure 9. *Distribution of CPU Time Ratios For Modified Model Jobstream - 370/168 vs. 370/195 - Each Unique Job Counted Only Once.*

<u>MIDPOINT</u>	<u>COUNT</u>	
.80	1	X
.90	3	XXX
1.00	15	XXXXXXXXXXXXXXXXXX
1.10	45	XX
1.20	24	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.30	6	XXXXXX
1.40	9	XXXXXXXXXX
1.50	3	XXX
1.60	1	X
1.70		
1.80	1	X
1.90	6	XXXXXX

2.30	1	X

2.50	1	X
2.60	1	X

Total of 117 Jobs

Mean Ratio of Job CPU Times	=	1.234
Total Job CPU Time on 370/168	=	3107.88
Total Job CPU Time on 370/195	=	1995.48
Ratio of Total Job CPU Times	=	1.557

Figure 10. Distribution of CPU Time Ratios For Modified Model Jobstream - 370/168 vs. 370/195 - All Jobs in Jobstream Included.

<u>MIDPOINT</u>	<u>COUNT</u>	
.70	2	XX
.80	17	XXXXXXXXXXXXXXXXXXXX
.90	15	XXXXXXXXXXXXXXXXXXXX
1.00	17	XXXXXXXXXXXXXXXXXXXX
1.10	8	XXXXXXXXXX
1.20	0	
1.30	0	
1.40	0	
1.50	1	X
1.60	1	X
1.70	1	X
1.80	0	
1.90	0	
2.00	0	
2.10	0	
2.20	0	
2.30	1	X
2.40	0	
2.50	0	
2.60	1	X

Total of 64 Unique Jobs

Mean Ratio of Job CPU Times	=	1.006
Total Job CPU Time on 470V/6	=	1636.44
Total Job CPU Time on 370/195	=	1384.69
Ratio of Total Job CPU Times	=	1.182

Figure 11. Distribution of CPU Time Ratios for Modified Model Jobstream - 470 vs. 195 - Each Unique Job Counted Only Once.

<u>MIDPOINT</u>	<u>COUNT</u>	
.70	2	XX
.80	29	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.90	32	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.00	35	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.10	10	XXXXXXXXXX
1.20		
1.30		
1.40		
1.50	1	X
1.60	1	X
1.70	5	XXXXX
1.80	0	
1.90	0	
2.00	0	
2.10	0	
2.20	0	
2.30	1	X
2.40		
2.50	0	
2.60	1	

Total of 117 Jobs

Mean Ratio of Job CPU Times	=	1.003
Total Job CPU Time on 470V/6	=	2373.07
Total Job CPU Time on 370/195	=	1995.48
Ratio of Total Job CPU Times	=	1.189

Figure 12. *Distribution of CPU Time Ratios for Modified Model Jobstream - 470 vs. 195 - All Jobs in Jobstream Included.*

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 MODIFIED MODEL JOBSTREAM

ANDAHL 470V/6

IBM 370/195

470V6 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	145	14.87	9.44	145	11.96	9.80	1.243	0.964
ASM	52	0.27	4.15	52	0.29	4.74	0.920	0.875
EDT	45	0.30	9.40	45	0.37	8.91	0.808	1.055
FTG	17	1.49	1.92	17	1.90	1.81	0.782	1.057
PTH	4	2.41	10.69	4	2.99	9.11	0.808	1.173
PTH (O)	31	4.03	12.18	31	4.82	9.45	0.836	1.290
GO	107	12.42	5.86	107	9.60	6.45	1.293	0.909
IEBUTIL	33	0.22	8.75	33	0.22	11.05	0.978	0.792
IEHUTIL	25	0.22	8.89	25	0.23	6.14	0.939	1.448
LOAD&GO	38	21.76	19.54	38	18.59	19.21	1.170	1.017
PL1	8	2.22	7.85	8	2.85	9.05	0.777	0.867
UTILITY	58	0.22	8.81	58	0.23	8.93	0.960	0.986

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	38	26.17	14.63	38	20.97	15.08	1.081	0.987
ASM	5	0.47	7.53	5	0.52	8.51	0.909	0.876
EDT	21	0.30	9.49	21	0.37	8.77	0.836	1.110
FTG	10	2.16	1.82	10	2.76	1.74	0.779	1.173
PTH	4	2.41	10.69	4	2.99	9.11	0.809	1.334
PTH (O)	23	4.15	11.32	23	4.96	8.76	0.844	1.402
GO	20	12.73	9.42	20	9.53	10.56	1.113	1.076
IEBUTIL	16	0.25	9.39	16	0.26	11.88	0.982	1.217
IEHUTIL	9	0.26	10.76	9	0.27	7.72	0.928	1.447
LOAD&GO	18	41.11	20.42	18	33.67	20.10	1.046	0.889
PL1	3	4.08	9.70	3	5.32	12.82	0.789	0.879
UTILITY	23	0.25	10.26	23	0.26	10.90	0.967	1.329

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

TABLE 6. Summary of Results for Modified Model Jobstream -
 Performance Ratios by Type.
 470V/6 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	145	19.39	4.96	145	11.96	9.80	1.621	0.506
ASH	52	0.32	3.34	52	0.29	4.74	1.113	0.705
EDT	45	0.43	6.86	45	0.37	8.91	1.153	0.770
PTG	17	2.11	1.49	17	1.90	1.81	1.110	0.823
PTH	4	3.41	9.04	4	2.99	9.11	1.143	0.992
PTH (0)	31	5.51	9.13	31	4.82	9.45	1.142	0.966
GO	107	15.72	2.77	107	9.60	6.45	1.637	0.430
IEBUTIL	33	0.25	8.03	33	0.22	11.05	1.128	0.726
IEHUTIL	25	0.25	6.72	25	0.23	6.14	1.068	1.095
LOAD&GO	38	29.72	11.11	38	18.59	19.21	1.598	0.579
PL1	8	3.28	10.54	8	2.85	9.05	1.151	1.165
UTILITY	58	0.25	7.46	58	0.23	8.93	1.101	0.835

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	38	34.86	7.54	38	20.97	15.08	1.388	0.839
ASH	5	0.59	5.47	5	0.52	8.51	1.130	0.671
EDT	21	0.42	6.66	21	0.37	8.77	1.157	0.792
PTG	10	3.09	1.48	10	2.76	1.74	1.086	0.883
PTH	4	3.41	9.04	4	2.99	9.11	1.157	1.021
PTH (0)	23	5.69	8.58	23	4.96	8.76	1.139	0.941
GO	20	16.12	3.94	20	9.53	10.56	1.390	0.957
IEBUTIL	16	0.29	8.63	16	0.26	11.88	1.096	1.052
IEHUTIL	9	0.29	8.29	9	0.27	7.72	1.059	1.069
LOAD&GO	18	55.67	11.55	18	33.67	20.10	1.385	0.707
PL1	3	6.17	16.51	3	5.32	12.82	1.142	1.154
UTILITY	23	0.30	8.92	23	0.26	10.90	1.087	1.067

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

TABLE 7. Summary of Results for Modified Model Jobstream -
Performance Ratios by Type.
370/168-3 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470V6

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	145	19.39	4.96	145	14.87	9.44	1.304	0.525
ASH	52	0.32	3.34	52	0.27	4.15	1.210	0.806
EDT	45	0.43	6.86	45	0.30	9.40	1.426	0.730
PTG	17	2.11	1.49	17	1.49	1.92	1.419	0.779
PTH	4	3.41	9.04	4	2.41	10.69	1.416	0.846
PTH (0)	31	5.51	9.13	31	4.03	12.18	1.366	0.749
GO	107	15.72	2.77	107	12.42	5.86	1.266	0.473
IEBUTIL	33	0.25	8.03	33	0.22	8.75	1.153	0.917
IEHUTIL	25	0.25	6.72	25	0.22	8.89	1.138	0.756
LOAD&GO	38	29.72	11.11	38	21.76	19.54	1.366	0.569
PL1	8	3.28	10.54	8	2.22	7.85	1.482	1.343
UTILITY	58	0.25	7.46	58	0.22	8.81	1.146	0.847

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	39	34.86	7.54	38	26.17	14.63	1.318	0.905
ASH	5	0.59	5.47	5	0.47	7.53	1.247	0.757
EDT	21	0.42	6.66	21	0.30	9.49	1.392	0.729
PTG	10	3.09	1.48	10	2.16	1.82	1.395	0.835
PTH	4	3.41	9.04	4	2.41	10.69	1.431	0.838
PTH (0)	23	5.69	8.58	23	4.15	11.32	1.351	0.736
GO	20	16.12	3.94	20	12.73	9.42	1.292	0.940
IEBUTIL	16	0.29	8.63	16	0.25	9.39	1.137	0.913
IEHUTIL	9	0.29	8.29	9	0.26	10.76	1.149	0.797
LOAD&GO	19	55.67	11.55	18	41.11	20.42	1.357	0.866
PL1	3	6.17	16.51	3	4.08	9.70	1.451	1.441
UTILITY	23	0.30	8.92	23	0.25	10.26	1.140	0.854

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

TABLE 8. Summary of Results for Modified Model Jobstream
Performance Ratios by Type.
370/168-3 vs. 470V/6

D. Applications Problems

One of the groups of jobs used in this benchmark is a subset of the applications problems documented in TM 213. These applications problems are, for the most part, written in FORTRAN. The assembly language routines perform well-defined mathematical, character, or bit manipulation, or system-dependent functions. A single PL/1 program is included. Only minimal JCL changes were made to the subset of jobs used in this benchmark. Those jobs from the applications problems which were not included in this benchmark would have required major JCL changes and/or re-programming to be executable; time constraints precluded this.

For ease in reference and comparison, the jobnames in this subset of applications problems are identical to those described in ANL-8127 and TM-213.

Tables 9, 10, and 11 summarize the performance of the Applications Problems collection on the benchmark machines. Note particularly the differences in relative performance of the single and double precision problems. Average GO step execution times are recorded, with each job counting once in the tabulated totals and means regardless of how often it was included in the problem collection.

Complete results for the Applications Problems are in Appendix C.

E. Current User Production Codes and Special Kernels

The original benchmark application code collection, assembled in 1971, was restricted to those applications then implemented on the IBM 360/75 using models appropriate to the scale of computing power available on that machine. To represent the current Laboratory computing workload more accurately, particularly as it has been influenced by the increase in computing power available on the 370/195, a selection of heavily used, large-scale production codes was added to the benchmark. These codes represent new or extended applications with the 195, and most of them have undergone some tuning to optimize their performance on the current machine.

The user codes selected include representatives from quantum chemistry (BISONINT, OVCBENCH), nuclear reactor design and engineering (DIFIDADJ, DIFIDMOD, DIFIDRL), reactor fuel management (BIGREBUS, REBUSTST), and fast reactor transient and accident analysis (FX2DEMO, NATRAN, SASBENCH). The codes are dominated by double precision floating point arithmetic, with NATRAN being the only single precision representative. Most of the codes make use of loop mode and the overlap of floating point arithmetic on the 370/195. All are coded in FORTRAN, compiled on the H compiler at optimization level 2, with the exception of SASBENCH, which is compiled with the G compiler. Further information about the codes can be found in the appendices of ANL-76-50.

To update the benchmark collection further, a group of program kernels, most of them highly tuned for the 370/195, was extracted from major user production codes or specially written for the benchmark. Use of small kernels rather than entire production codes allowed us to compare performance of code sequences that were easily characterized, whose behavior was well understood on the 195, and which were representative of whole classes of applications programs. Most of the kernels represent time-limiting paths in large codes and thereby reflect the common code tuning efforts which have been undertaken at Argonne.

The kernels selected include tuned paths from the reactor codes SYN3D (DMATMUL, MINVERT) and VIM Monte Carlo Code (MORETEST), the molecular dynamics models of A. Rahman (FSQRT), and the STATOS graphics package (BITSET). As with the user production code collection, the kernels are primarily FORTRAN H (OPT = 2), dominated by double precision floating point arithmetic, although some single precision floating point representatives are included (EMATMUL, FORTLIBE). Two assembly language kernels are included which perform no floating point arithmetic--a bit manipulation program (BITSET) and a binary table search routine (MORETEST). Most of the kernels take advantage of loop mode on the 370/195, and most achieve significant overlap of floating point addition with floating point multiplication or division.

The jobs DMATMUL/EMATMUL and FORTLIBD/FORTLIBE require special mention. DMATMUL/EMATMUL consist of five separate matrix multiplication algorithms, each invoked for square matrices of ten different dimensions. FORTLIBD/FORTLIBE consist of five separate FORTRAN library routines, each invoked for a set of random arguments.

Tables 12, 13, and 14 summarize the performance of the User Code GO steps and tables 15, 16, and 17 summarize the performance of the Special Kernel GO steps on the benchmark machines. Average execution times are recorded, with each job contributing once to the tabulated totals and means. Complete results are in Appendix C.

F. Naval Research Laboratory Benchmark Kernels

Included in the benchmark were six jobs that were taken from the Naval Research Laboratory benchmark collection. These jobs invoke specially written kernels abstracted from major codes essential to the research programs at NRL, and formed the basis of their recent computer evaluation and acquisition. These kernels were included in the ANL benchmark because of the applicability of their numerical methods to the solution of large classes of scientific problems. The availability of timings for these problems on a variety of machines was considered an additional advantage. Specifically these kernels have been run on the fastest computers now available.

The kernels are compiled under FORTRAN H (OPT = 2) and include a finite fast Fourier transform (NRLICH01), a particle push algorithm (NRLICH02), a Runge-Kutta O.D.E. solver (NRLICH04), a two-dimensional mode coupling problem (NRLICH05), a fluid dynamics algorithm (NRLICH06), and a general matrix and vector arithmetic exercises (NRLICH07). Except for the last, all the kernels use single precision floating point, with NRLICH07 using single and double precision equally. NRLICH01, NRLICH06, and NRLICH07 take advantage of loop mode, and floating point overlap is probable in most of the examples. NRLICH02, NRLICH04, and NRLICH05 have a high proportion of fixed point addressing and loop management instructions.

Tables 18, 19, and 20 summarize the performance of the NRL Benchmark Kernel GO steps on the benchmark machines. Complete results are in Appendix C.

G. Summary of Performance Ratios

Table 21 summarizes the CPU performance of the benchmark machines for the major categories of work comprising this study. Data for ASP was obtained by combining the Model and Modified Model Jobstream results. Data for the language translators and service programs were obtained by combining all parts of the benchmark. The tabulated mean CPU time ratios were obtained by averaging the job performance ratios in each grouping, counting each unique job once regardless of how often it was included in the benchmark.

ARGONNE NATIONAL LABORATORY
 470V/6 VS. IBM 370/195
 DOUBLE PRECISION APPLICATIONS PROBLEMS

AMDHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD600									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT
ANLTRIN	1	125.36	9.22	1	95.97	12.27		1.106	0.751
DROPLET	1	488.00	1.94	1	281.29	3.06		1.735	0.634
EIGEN	1	21.48	2.87	1	12.33	3.87		1.742	0.742
LIPZ1A	1	189.42	7.21	1	126.06	10.00		1.185	0.721
NATRII	3	68.02	3.04	3	36.27	1.92		1.875	1.583
NONTP	1	204.29	1.82	1	162.42	2.22		1.258	0.920
MULTC	1	90.23	2.56	1	68.69	18.69		1.314	0.137
PEXCO	1	178.25	3.78	1	133.82	3.76		1.332	0.919
SDIAG	1	31.30	6.41	1	13.32	1.44		2.500	4.451
TOTAL	9	1359.35	34.15	9	930.17	57.23		1.860	0.667
MEAN	9	150.93	4.24	9	103.35	6.36		1.583	1.184

ARGONNE NATIONAL LABORATORY
 470V/6 VS. IBM 370/195
 SINGLE PRECISION APPLICATIONS PROBLEMS

470V/6				IBM 370/195			470 / 195		
STEP = LOAD600									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT
DOT2	1	322.74	41.99	1	372.95	51.08		0.964	0.820
EROS	1	134.63	43.14	1	145.51	89.77		0.929	0.326
KITLPLCK	1	67.29	1.43	1	58.53	1.40		0.992	0.925
LINJA	1	225.98	102.50	1	276.35	91.07		0.919	1.124
WVENTVE	3	45.58	3.40	3	32.14	21.28		0.921	0.160
OWL	1	113.75	3.05	1	123.64	8.99		0.929	0.611
TOTAL	6	949.59	235.46	6	1073.46	259.79		0.879	0.306
MEAN	6	158.24	39.24	6	178.90	43.30		0.905	0.741

TABLE 3. Summary of Results for Applications Problems -
 Single Precision and Double Precision Floating Points.
 470V/6 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
DOUBLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD600								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIN	1	158.86	11.21	1	95.97	12.27	1.651	0.914
DROPLET	1	498.80	1.70	1	281.29	3.06	1.772	0.556
BIORN	1	23.46	1.53	1	12.33	3.87	1.903	0.395
LIPPIA	1	222.32	8.71	1	126.06	10.00	1.768	0.471
MATRIX	1	79.28	1.77	3	36.27	1.92	2.186	0.920
MONTE	1	276.87	1.67	1	162.42	2.22	1.702	0.752
MULTC	1	111.88	2.07	1	68.69	18.69	1.629	0.111
REXCO	1	216.49	3.35	1	133.82	3.76	1.618	0.891
SDIAG	1	33.87	1.51	1	13.32	1.44	2.513	1.049
TOTAL	9	1620.23	29.52	9	930.17	57.23	1.742	0.516
MEAN	9	180.03	3.28	9	103.35	6.36	1.860	0.673

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
SINGLE PRECISION APPLICATIONS PROBLEMS

IBM 370/148 MOD 3				IBM 370/195			168 / 195		
STEP = LOAD600									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DOT2	1	529.19	29.92	1	372.95	51.08	1.419	0.548	
EBOS	1	217.82	69.91	1	145.51	89.77	1.498	0.779	
KTYLPLK	1	116.08	1.69	1	68.53	1.60	1.693	1.054	
LINDA	1	193.32	79.42	1	276.35	91.07	1.423	0.472	
WVSTEV	3	127.56	2.60	3	92.88	21.28	1.373	0.122	
QVL	1	193.85	1.66	1	123.68	8.99	1.564	0.333	
TOTAL	6	1577.98	185.10	6	1079.86	259.79	1.461	0.713	
MEAN	6	262.93	30.85	6	179.98	43.30	1.495	0.628	

TABLE 10. Summary of Results for Applications Problems -
Single Precision and Double Precision Floating Point.
370/168-3 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
SINGLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT
DOT2	1	529.39	29.82	1	322.36	41.89		1.642	0.712
EROS	1	217.42	69.91	1	134.63	83.14		1.615	0.941
KITLPLCK	1	116.04	1.69	1	67.29	1.48		1.724	1.142
LINDA	1	193.32	79.42	1	225.98	102.50		1.741	0.775
NVERTFX	3	127.56	2.60	3	85.58	3.40		1.491	0.765
OWL	1	191.95	1.66	1	113.75	3.05		1.704	0.544
TOTAL	6	1577.58	195.10	6	949.59	235.46		1.661	0.786
MEAN	6	262.93	30.95	6	158.26	39.24		1.653	0.797

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
DOUBLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470	
STEP = LOAD&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIN	1	158.46	11.21	1	125.36	9.22	1.264	1.216
DROPLT	1	498.40	1.70	1	488.00	1.94	1.021	0.876
EIGEN	1	23.46	1.53	1	21.48	2.87	1.092	0.533
LIP21A	1	222.32	4.71	1	149.42	7.21	1.488	0.653
MATRIX	3	79.28	1.77	3	68.02	3.04	1.165	0.581
MONTE	1	276.47	1.67	1	274.29	1.82	1.353	0.914
MULTC	1	111.88	2.07	1	90.23	2.56	1.247	0.909
RYICD	1	216.49	3.35	1	178.25	3.08	1.215	1.088
SDIAG	1	33.47	1.51	1	33.30	6.41	1.005	0.236
TOTAL	9	1620.23	29.52	9	1358.35	38.15	1.143	0.773
MEAN	9	180.03	3.28	9	150.93	4.24	1.205	0.768

TABLE 11. Summary of Results for Applications Problems -
Single Precision and Double Precision Floating Point.
370/168-3 vs. 470V/6

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 SINGLE PRECISION LARGE USER CODES

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD/GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NATFRAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
TOTAL	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
MEAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 DOUBLE PRECISION LARGE USER CODES

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.913	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DHOD	1	512.47	36.72	1	292.34	54.68	1.755	0.672	
DIF1DBL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
FX2DBNO	1	451.98	281.06	1	321.12	290.55	1.414	0.967	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	
TOTAL	9	3217.50	1618.21	9	1895.55	1314.61	1.697	1.231	
MEAN	9	357.50	179.80	9	210.62	146.07	1.657	1.055	

TABLE 12. Summary of Results for Large User Jobs
 470V/6 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
SINGLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

NATRAM	1	148.83	2.18	1	79.69	4.42	1.868	0.493

TOTAL	1	148.83	2.18	1	79.69	4.42	1.958	0.493
MEAN	1	148.83	2.18	1	79.69	4.42	1.868	0.493

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
DOUBLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.090	1.063	
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497	
DIF1DADJ	1	150.81	19.79	1	73.94	16.96	2.040	1.108	
DIF1DMOD	1	573.86	27.49	1	232.34	54.68	1.963	0.503	
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180	
FX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996	
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575	
PXBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043	
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440	
TOTAL	9	3783.38	1104.74	9	1895.55	1314.61	1.996	0.840	
MEAN	9	420.38	122.75	9	210.62	146.07	1.939	0.923	

TABLE 13. Summary of Results for Large User Jobs.
370/168-3 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
SINGLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NATRAN	1	148.83	2.18	1	88.98	2.11	1.673	1.033	

TOTAL	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
MEAN	1	148.83	2.18	1	88.98	2.11	1.673	1.033	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
DOUBLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGRFBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIF1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
QVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	156.50	1	113.64	151.79	1.152	1.097	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	
TOTAL	9	3783.38	1104.74	9	3217.50	1618.21	1.176	0.683	
MEAN	9	420.38	122.75	9	357.50	179.80	1.179	0.928	

TABLE 14. Summary of Results for Large User Jobs.
370/168-3 vs. 470V/6

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
SINGLE PRECISION KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

PMATHMUL	1	139.24	1.46	1	98.47	1.43	1.574	1.921
FORTLIBE	1	71.51	2.66	1	92.75	6.65	0.864	0.400

TOTAL	2	210.75	4.12	2	171.22	8.08	1.231	0.510
MEAN	2	105.37	2.06	2	85.61	4.04	1.219	0.710

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
DOUBLE PRECISION KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

DMATHMUL	1	242.93	1.43	1	87.96	1.47	2.761	0.973
FORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688
PSQRT	1	296.61	1.35	1	92.66	2.08	3.588	0.649
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045

TOTAL	4	736.64	6.74	4	318.49	8.62	2.313	0.782
MEAN	4	184.16	1.69	4	79.62	2.15	2.249	0.939

TABLE 15. Summary of Results for Tuned Kernels.
470V/6 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
SINGLE PRECISION KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD&GO								
-----				*-----*				
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

EMATMUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119
FORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.293

TOTAL	2	315.58	3.48	2	171.22	8.08	1.843	0.431
MEAN	2	157.79	1.74	2	85.61	4.04	1.827	0.701

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
DOUBLE PRECISION KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

DMATMUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061
FORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613
PSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068

TOTAL	4	859.48	7.12	4	318.49	8.62	2.699	0.926
MEAN	4	214.87	1.78	4	79.62	2.15	2.664	0.909

TABLE 16. Summary of Results for Tuned Kernels.
370/168-3 vs. 370/195

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 SINGLE PRECISION KERNELS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = LOAD&GO									
-----				-----			-----		
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT
-----				-----			-----		
ENATMUL	1	203.87	1.60	1	139.24	1.46		1.464	1.096
FORTLIBE	1	111.71	1.88	1	71.51	2.66		1.562	0.707
-----				-----			-----		
TOTAL	2	315.58	3.48	2	210.75	4.12		1.497	0.845
MEAN	2	157.79	1.74	2	105.37	2.06		1.513	0.901
-----				-----			-----		

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 DOUBLE PRECISION KERNELS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

DMATMUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091
FORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.931
FSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370
MINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022

TOTAL	4	859.48	7.12	4	736.64	6.74	1.167	1.056
MEAN	4	214.87	1.73	4	184.16	1.68	1.295	1.094

TABLE 17. Summary of Results for Tuned Kernels.
 370/168-3 vs. 470V/6

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 SINGLE PRECISION NRL KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT

NRLICH01	1	162.38	0.26	1	156.05	0.58		1.041	0.448
NRLICH02	1	129.18	0.41	1	110.98	0.18		1.164	2.278
NRLICH04	1	127.10	0.28	1	109.61	0.30		1.160	0.933
NRLICH05	1	149.26	0.23	1	134.94	0.20		1.106	1.150
NRLICH06	1	153.58	0.21	1	123.62	0.22		1.242	0.955

TOTAL	5	721.50	1.39	5	635.20	1.48		1.136	0.939
MEAN	5	144.30	0.28	5	127.04	0.30		1.143	1.153

TABLE 18. Summary of Results for Naval Research
 Laboratory Benchmark Kernels.
 470V/6 vs. 370/195

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
SINGLE PRECISION NRL KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
NRLICH01	1	247.56	0.21	1	156.05	0.58	1.596	0.362
NRLICH02	1	173.77	0.20	1	110.98	0.18	1.566	1.111
NRLICH04	1	191.53	0.15	1	109.61	0.30	1.747	0.500
NRLICH05	1	254.16	0.14	1	134.94	0.20	1.884	0.700
NRLICH06	1	236.91	0.23	1	123.62	0.22	1.916	1.045
TOTAL	5	1103.93	0.93	5	635.20	1.48	1.734	0.628
MEAN	5	220.79	0.19	5	127.04	0.30	1.740	0.744

**TABLE 19. Summary of Results for Naval Research
Laboratory Benchmark Kernels
370/168-3 vs. 370/195**

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
SINGLE PRECISION NRL KERNELS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470	
STEP = GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
NRLICH01	1	247.56	0.21	1	162.38	0.26	1.525	0.808
NRLICH02	1	173.77	0.20	1	129.18	0.41	1.345	0.488
NRLICH04	1	191.53	0.15	1	127.10	0.28	1.507	0.536
NRLICH05	1	254.16	0.14	1	149.26	0.23	1.703	0.609
NRLICH06	1	236.91	0.23	1	153.58	0.21	1.543	1.095
TOTAL	5	1103.93	0.93	5	721.50	1.39	1.530	0.669
MEAN	5	220.79	0.19	5	144.30	0.28	1.524	0.707

**TABLE 20. Summary of Results for Naval Research
Laboratory Benchmark Kernels.
370/168-3 vs. 470V/6**

	Total Steps	Total Jobs	Unique Jobs	Mean CPU Ratio		
				470/195	168/195	168/470
ASP	2	2	2	.87	1.12	1.29
ASSEMBLER F	106	28	7	.89	1.13	1.27
FORTRAN G	34	34	10	.77	1.09	1.41
FORTRAN H	91	91	53	.81	1.12	1.38
OPT=0	54	54	23	.84	1.14	1.36
OPT=2	37	37	30	.79	1.10	1.39
LINKEDIT	88	74	27	.85	1.16	1.38
PL/I F	17	17	4	.77	1.15	1.50
OS UTILITIES	116	106	23	.96	1.11	1.17
'IEB' UTILITIES	66	66	16	.97	1.12	1.18
'IEH' UTILITIES	50	42	9	.94	1.09	1.17
GO & LOAD&GO STEPS ^{1 2 4}	311	145	75	1.24	1.60	1.34
MODEL JOBSTREAM ¹	121	44	34	1.02	1.33	1.32
MODIFIED JOBSTREAM ¹	145	56	38	1.08	1.39	1.32
APPLICATIONS PROBLEMS ²	20	20	16	1.28	1.68	1.39
LARGE USER CODES	10	10	10	1.60	1.93	1.23
SPECIAL JOB KERNELS	8	8	8	1.62	2.10	1.42
NRL KERNELS	6	6	6	1.35	1.86	1.44
SINGLE PRECISION GO STEPS	16	16	14	1.05	1.66	1.59
APPLICATIONS PROBLEMS	8	8	6	.91	1.50	1.65
LARGE USER CODES	1	1	1	1.12	1.87	1.67
SPECIAL JOB KERNELS	2	2	2	1.22	1.83	1.51
NRL KERNELS	5	5	5	1.14	1.74	1.52
FORTRAN LIBRARY ³	5	1	1	1.00	1.61	1.61
DOUBLE PRECISION GO STEPS ²	24	24	22	1.74	2.04	1.21
APPLICATIONS PROBLEMS ²	11	11	9	1.58	1.86	1.21
LARGE USER CODES	9	9	9	1.66	1.94	1.18
SPECIAL JOB KERNELS	4	4	4	2.25	2.66	1.30
FORTRAN LIBRARY ³	5	1	1	1.71	2.40	1.42

¹ Job BMKJ512A excluded due to GO step timer dependency.

² Job SUMX excluded due to ABEND on AMDAHL.

³ Unweighted average of performance ratios for EXP, LOG, SIN, SQRT, X**Y.

⁴ Jobs common to both jobstreams, counted only once in totals.

TABLE 21. Benchmark Summary Data -
Mean CPU Time Performance Ratios.

IV. EVALUATION OF EXPERIMENT

Figures 13, 14, and 15 show the hardware configuration used in the experiment. In each configuration the 2305 was used for SYS1.SYSJOBQE, the frequently used members of SYS1.LINKLIB, SYS1.FORTLIB, and SYS1.AMDLIB (a library of popular, local sub-routines). A single systems resident disk contained the remainder of OS. Two disks were used as STORAGE/PERMANENTLY RESIDENT for the allocation of temporary and non-temporary datasets. One disk was used as PRIVATE/PERMANENTLY RESIDENT for the input datasets required by some of the jobs. Two disks were used as ASP queue packs.

The I/O device configurations were quite limited for such powerful CPUs. The only real bottleneck, however, was caused by the operating system's tendency to allocate most of the temporary datasets on the same disk. The STORAGE disk with the lowest address was much too busy on both the configurations. As a result, the CPU utilization was low for the two jobstreams, and the elapsed times for the streams were longer than they should have been. Since this problem was also present on our production system (it has since been corrected) the benchmark is believed valid despite the bottleneck.

A log was kept of the activities and problems during the running of the benchmark at IBM and is included in Appendix B. The problems were minor, and to be expected since the IBM hardware engineers had to reconfigure the test machine for the experiment.

The experimental error inherent in timed jobstream runs like these was sampled by repeating the Model Jobstream run under identical conditions. The jobs and their order in the queue, the hardware, software, and scheduling parameters were all identical. No operator interaction was involved. Table 22 summarizes the surprisingly large variations. These runs were both made with the machine set to hardstop on any (recoverable or not) CPU or memory errors. Also Error Statistics by Volume (ESV) was set to give an operator message on any temporary I/O errors, and none were recorded. The variations seem to be due only to the vagaries on I/O interrupt sequences which combined to cause different combinations of jobs to be active late in each run. This indication of experimental error should be kept in mind when interpreting the results of the experiment.

Figure 13. IBM 370/195 Benchmark Hardware Configuration

Figure 14. ANDAEL 470V/6 Benchmark Hardware Configuration

Figure 16. IBM 370/168-3 Benchmark Hardware Configuration

	<u>RUN #1</u>	<u>RUN #2</u>	<u>RUN #1</u> <u>RUN #2</u>
ELAPSED TIME (MIN:SEC)	30:40	29:57	1.02
TOTAL CPU TIME (MIN:SEC)	26:50	27:37	0.97
ASP CPU TIME (MIN:SEC)	2:09.26	2:10.34	0.99
CPU UTILIZATION	87.53%	92.21%	0.95

TABLE 22. Model Jobstream Experimental Error.

V. ADJUNCT EXPERIMENTS

A. MVS vs. MVT

As an adjunct to the main benchmark experiment, the Job Control Language for the Model Jobstream was changed to run under the MVS (Multiple Virtual Systems) operating system Release 3.6 on the identical 168 hardware configuration. The Virtual I/O feature was used for scratch datasets. Job Entry Subsystem 2 (JES2 - similar to HASP) was used to take the place of ASP on the MVT run. The procedure used to run the Model Jobstream under MVT was used to time the MVS run, except that SLACMON was not run with the MVS run. However, an MVS software monitor called MF/1 (Management Facility/1) was used to gather statistics. Table 23 summarizes the results. The total CPU time for the MVS run was less than the MVT run, indicating the system CPU overhead for MVS was less than MVT for this jobstream.

	<u>MVS</u>	<u>MVT</u>	<u>MVS/MVT</u>
ELAPSED TIME (MIN:SEC)	27:04	29:57	0.90
TOTAL CPU TIME (MIN:SEC)	27:04	27:37	0.98

TABLE 23. MVS vs. MVT

B. 168 vs. 168AP

The Model Jobstream was run again on the same 168, but with an additional CPU added to make it a 168AP (Attached Processor). The hardware configuration, the jobs, the JCL, and the operating system were all identical. MF/1 was running. Table 24 shows the results.

	<u>168</u>	<u>168AP</u>	<u>168/168AP</u>
ELAPSED TIME (MIN:SEC)	27:14	16:47	1.62

TABLE 24. 168 vs. 168AP

VI. SUMMARY

168 vs. 470

The IBM 370/168 Model 3 CPU was slower than the AMDAHL 470V/6 CPU for all classes of work included in the benchmark. The 168 compared least favorably on single precision floating point GO steps (almost 60 percent slower than the 470), most favorably on double precision floating point GO steps (only about 20 percent slower than the 470), with many "pure" double precision kernels running nearly identically on the two machines (see for example the EISPACK timing summary in APPENDIX D). The smaller performance disadvantage of the 168 for double precision is attributable to its doubleword data paths (as against single word paths on the 470), its larger cache memory (32K vs. 16K), and the high speed multiply feature. Numerous hardware differences contribute to the observed variations in performance ratios for different classes of work, including differences in CPU cycle times, differences in instruction cycle counts, differences in cache and main memory storage width and access times, the non-store through feature of the 470 cache, different instruction pipeline depths, and the doubleword orientation of the 168 floating point unit. Though the range of measured performance ratios appears reasonable, it is difficult to account for in detail as there is no timing document available from IBM for the 168.

168 vs. 195

The 168 was also slower than the IBM 370/195 for all classes of work. It was only 10 to 15 percent slower than the 195 for compiles, utilities, and LINKEDIT steps. However, it was 60 percent slower for the GO steps. The 168 compared least favorably for the GO steps with substantial floating point calculations. The 195 has a more sophisticated architecture with segmented and faster floating point execution units.

470 vs. 195

The AMDAHL 470V/6 compares favorably with the 195 for certain classes of work. It was 10 to 20 percent faster at running ASP, compilers, and the Linkage Editor. The higher CPU utilization and shorter run time for the Model Jobstream on the AMDAHL machine are partially attributed to its ability to run the operating system faster than the 195. The 195 was faster, on average, at running GO steps, which appears to be due to the 195's high performance floating point hardware. Programs using little or no floating point or only single precision ran faster, or only marginally slower, on AMDAHL. For double precision, however, applications codes ran about 75 percent faster and tuned kernels up to 400 percent faster on the 195. The large performance difference for double precision floating point is due to the single word orientated architecture in the 470's floating point

hardware, while the 195 floating point hardware produces results just as fast for double precision as for single precision.

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APPENDIX A

DESCRIPTIONS OF
ADDITIONAL 370/168 KERNELS

**Kernels Included in the 370/168 and 370/195
Benchmarks but Omitted from the 470V/6**

A small number of kernels were included in the 370/168 and 370/195 benchmarks, but not the 470V/6 study. These have been excluded from the rest of this report to permit comparison of the three machines on a common basis. The extra kernels are included here for completeness.

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 KERNELS RUN ON 195 AND 168 ONLY

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = KERNELS								
-----				*-----*				
KERNELS	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

ARMAX-1	1	22.55	0.00	1	21.50	0.00	1.049	
ARMAX-2	1	45.89	0.00	1	14.69	0.00	3.124	
DOTP-D	1	865.00	0.00	1	240.00	0.00	3.604	
DOTP-X	1	1655.00	0.00	1	545.00	0.00	3.037	
INVERT	1	226.00	0.00	1	62.27	0.00	3.629	
INVER2	1	280.13	0.00	1	56.29	0.00	4.977	
RUNGE-1	1	2.08	0.00	1	0.67	0.00	3.095	
RUNGE-2	1	1.92	0.00	1	0.55	0.00	3.466	
RUNGE-3	1	1.36	0.00	1	0.55	0.00	2.491	
RUNGE-4	1	1.28	0.00	1	0.39	0.00	3.249	
SORINV	1	277.72	0.00	1	78.55	0.00	3.536	

TOTAL	11	3378.93	0.00	11	1020.46	0.00	3.311	
MEAN	11	307.18		11	92.77		3.205	

A. ARMAX

The two FORTRAN H kernels, ARMAX-1 and ARMAX-2, represent alternate optimized approaches to finding the maximum magnitude of an array of floating point double precision numbers. ARMAX-1 accomplishes the task with explicit comparisons and branches, and performs about the same on both machines. ARMAX-2 uses only floating point arithmetic to find the largest magnitude, and exhibits the substantial performance advantage of the 370/195 high performance floating point unit.

B. DOTP

The two assembler language kernels, DOTP-D and DOTP-X, perform simple scalar products of two floating point double precision vectors using double and extended precision arithmetic respectively. The expected superiority of the 195 was observed, with some surprise that the performance ratio for extended precision was less than that for double precision.

ADDR1 ADDR2 STMT SOURCE STATEMENT

	1	DOTD	CSECT	
00000	2		USING	*,15
0000C	3		STM	14,6,12(13)
00000	4		LM	1,4,0(1)
00000	5		L	5,0(4)
00039	6		S	5,=F'1'
00003	7		SLL	5,3
0003C	8		L	4,=F'8'
	9		SR	6,6
	10		SDR	4,4
00000	11	LOOP	LD	0,0(6,1)
00000	12		MD	0,0(6,2)
	13		ADR	4,0
0001C	14		BXLE	6,4,LCOP
	15	*		
00000	16		STD	4,0(0,3)
0000C	17		LM	14,6,12(13)
	18		BR	14
	19		END	
	20			=F'1'
	21			=F'8'

N
 N - 1
 (N - 1) * 8
 INCREMENT FOR BXLE.
 CLEAR INDEX REGISTER.
 INITIALIZE DOT PRODUCT TO ZERO.
 V1
 V1 * V2
 SUM + V1 * V2

:

ADDR1 ADDR2 STMT SOURCE STATEMENT

	1	DOTX	CSECT	
00000	2		USING	*,15
0000C	3		STM	14,6,12(13)
00000	4		LM	1,4,0(1)
00000	5		L	5,0(4)
0003H	6		S	5,=F'1'
00003	7		SLL	5,3
0003C	8		L	4,=F'8'
	9		SR	6,6
	10		SXR	4,4
00000	11	LOOP	LD	0,0(6,1)
00000	12		MXD	0,0(6,2)
	13		AXR	4,0
0001C	14		BXLE	6,4,LOOP
	15	*		
	16		LRDR	4,4
0000C	17		STD	4,0(0,3)
0000C	18		LM	14,6,12(13)
	19		BR	14
	20		END	
	21			=F'1'
	22			=F'8'

N
 N - 1
 (N - 1) * 8
 INCREMENT FOR BXLE.
 CLEAR INDEX REGISTER.
 INITIALIZE DOT PRODUCT TO ZERO.
 V1
 V1 * V2
 SUM + V1 * V2
 ROUND

C. INVERT

The three assembler language kernels, INVERT, INVER2, and SORINV, each solve a set of tridiagonal linear equations in double precision floating point. All three contain two "in stack" recursive loops. INVER2 represents an attempt to increase the overlap of floating point operations on the 195 by instruction scheduling. SORINV includes successive over-relaxation code in addition to the linear equation solution. These routines account for a majority of CPU time in the DIFF1D, DIFF2D, DIFF3D, and FX2 nuclear reactor codes at Argonne. Relative machine performance is consistent with similar floating point double precision work in the benchmark. Note that the tuning performed in INVER2 for the 370/195 has resulted in significant detuning on the 370/168.

LOC	OBJECT CODE	ADDR1	ADDR2	STMT	SOURCE STATEMENT
000000				1	INVERT CSECT
		00000		2	USING *,15
000000	9019 D00C	0000C		3	STM 1,9,12(13)
000004	5880 F068	00068		4	L 8,=F'8'
000008	9817 1000	00000		5	LM 1,7,0(1)
00000C	5897 0000	00000		6	L 9,0(7)
000010	8990 0003	00003		7	SLL 9,3
000014	5890 F06C	0006C		8	S 9,=F'16'
000018	1877			9	SR 7,7
00001A	6801 0000	00000		10	LD 0,0(1)
00001E	6C04 0000	00000		11	MD 0,0(4)
000022	6005 0000	00000		12	STD 0,0(5)
000026	0700			13	CNOP 0,6
000028	6C07 3008	00008		14	LOOP10 MD 0,8(7,3)
00002C	6A07 4008	00008		15	AD 0,8(7,4)
000030	6C07 1008	00C08		16	MD 0,8(7,1)
000034	6007 5008	00008		17	STD 0,8(7,5)
000038	8778 F028	00028		18	BXLE 7,8,LOOP10
00003C	6007 6000	00000		19	STD 0,0(7,6)
000040	1879			20	LR 7,9
000042	1188			21	LNR 8,8
000044	1898			22	LR 9,8
000046	0700			23	CNOP 0,8
000048	6C07 1000	00000		24	LOOP20 MD 0,0(7,1)
00004C	6C07 2000	00000		25	MD 0,0(7,2)
000050	6A07 5000	00000		26	AD 0,0(7,5)
000054	6C07 60C0	00000		27	STD 0,0(7,6)
000058	8678 F048	00048		28	BXH 7,8,LOOP20
00005C	9819 D00C	0000C		29	LM 1,9,12(13)
000060	07FE			30	BR 14
				31	END
000068	00000008			32	=F'8'
00006C	00000010			33	=F'16'

LDC	OBJECT CODE	ADDR1	ADDR2	STMT	SOURCE STATEMENT
000000				1	INVER2 CSECT
		00000		2	USING *,15
000000	9019 000C		0000C	3	STM 1,9,12(13)
000004	9817 1000		00000	4	LM 1,7,0(1)
000008	6801 0000		00000	5	LD 0,0(1)
00000C	6C04 0000		00000	6	MD 0,0(4)
000010	6005 0000		00000	7	STD 0,0(5)
000014	5880 F0D8		000D8	8	L 8,=F'16'
000018	5897 0000		00000	9	L 9,0(7)
00001C	8990 0003		00003	10	SLI 9,3
000020	1898			11	SR 9,8
000022	9200 F0D0	000D0		12	MVI FLAG,X'00'
000026	9101 7003	00003		13	TM 3(7),X'01'
00002A	5870 F0DC		000DC	14	L 7,=F'0'
00002E	4710 F050		00050	15	BD LOOP10
000032	9201 F0D0	000D0		16	MVI FLAG,X'01'
000036	5870 F0E0		000E0	17	L 7,=F'8'
00003A	6C03 0008		00008	18	MD 0,8(3)
00003E	6A04 0008		00008	19	AD 0,8(4)
000042	6C01 0008		00008	20	MD 0,8(1)
000046	6005 0008		00008	21	STD 0,8(5)
00004A	070007000700			22	CNOP 0,8
000050	6C07 3008		00008	23	LOOP10 MD 0,8(7,3)
000054	6A07 4008		00008	24	AD 0,8(7,4)
000058	6C07 1008		00008	25	MD 0,8(7,1)
00005C	6007 5008		00008	26	STD 0,8(7,5)
000060	6C07 3010		00010	27	MD 0, 3)
000064	6A07 4010		00010	28	AD 0,16(7,4)
000068	6C07 1010		00010	29	MD 0,16(7,1)
00006C	6C07 5010		00010	30	STD 0,16(7,5)
000070	8778 F050		00050	31	BXLE 7,8,LOOP10
000074	6007 6000		00000	32	STD 0,0(7,6)
000078	1878			33	SR 7,8
00007A	1188			34	LNR 8,8
00007C	9500 F0D0	000D0		35	CLI FLAG,X'00'
000080	4780 F098		00098	36	BE START20
000084	5870 F0E0		000E0	37	S 7,=F'8'
000088	6C09 1000		00000	38	MD 0,0(9,1)
00008C	6C09 2000		00000	39	MD 0,0(9,2)
000090	6A09 5000		00000	40	AD 0,0(9,5)
000094	6009 6000		00000	41	STD 0,0(9,6)
000098	1898			42	START20 LR 9,8
00009A	070007000700			43	CNOP 0,8
0000A0				44	LOOP20 DS 0H
0000A0	6827 1008		00008	45	LD 2,8(7,1)
0000A4	6C27 2008		00008	46	MD 2,8(7,2)
0000A8	6847 1000		00000	47	LD 4,0(7,1)
0000AC	2C02			48	MDR 0,2
0000AE	6C47 2000		00000	49	MD 4,0(7,2)
0000B2	6A07 5008		00008	50	AD 0,8(7,5)
0000B6	6007 6008		00008	51	STD 0,8(7,6)
0000BA	2C04			52	MDR 0,4
0000BC	6A07 5000		00000	53	AD 0,0(7,5)
0000C0	6007 6000		00000	54	STD 0,0(7,6)
0000C4	8678 F0A0		000A0	55	BXW 7,8,LOOP20

LDC OBJECT CODE ADDR1 ADDR2 STMT SOURCE STATEMENT

LDC	OBJECT CODE	ADDR1	ADDR2	STMT	SOURCE STATEMENT
0000C8	9819 000C		0000C	56	LM 1,9,12(13)
0000CC	07FE			57	BR 14
0000D0				58	OS 0D
0000D0	00			59	FLAG DC XL1'00'
				60	END
0000D8	00000010			61	#F'16'
0000DC	00000000			62	#F'0'
0000E0	00000008			63	#F'8'

ADDR2 STMT SOURCE STATEMENT

	1	SORINV	CSECT	
00000	2		USING	*,15
00000	3		STM	1,9,12(13)
00010	4		L	9,28(1)
00000	5		L	9,0(9)
				JMAX
00000	6		LM	1,7,0(1)
00000	7		LD	0,0(1)
				R(1)
00000	8		LD	6,0(7)
00003	9		SLL	9,3
				JMAX*8
00088	10		L	8,=F*8'
				8
00000	11		MD	0,0(4)
				F(1)*R(1)
	12		SR	1,8
	13		SR	2,8
	14		SR	3,8
	15		SR	6,8
	16		LR	7,8
00000	17		STD	0,0(5)
				OMEGA(1)
	18		SR	4,8
	19		SR	5,8
	20		SR	9,8
				(JMAX-1)*8
00008	21	LOOP10	MD	0,8(7,3)
				OMEGA*D
00008	22		AD	0,8(7,4)
				F+OMEGA*D
00008	23		MD	0,8(7,1)
				R*(F+OMEGA*D)
00008	24		STD	0,8(7,5)
00038	25		BXLE	7,8,LOOP10
	26		LNR	8,8
	27		LR	7,9
	28		LDR	4,0
				X(NINTJ)
00008	29		SD	0,8(9,6)
				PSI(NEW)-PSI(OLD)
	30		MDR	0,6
				PSI(NEW)-PSI(OLD)*OMEGA
00008	31		AD	0,8(9,6)
				PSI(NEW)-PSI(OLD)*OMEGA+PSI(OLD)
00008	32		STD	0,8(9,6)
				EXTRAPOLATED FLUX
	33		SR	9,9
00000	34	LOOP20	MD	4,0(7,1)
				X*R
00000	35		MD	4,0(7,2)
				X*R*8
00000	36		AD	4,0(7,5)
				OMEGA+X*R*8
	37		LDR	0,4
00000	38		SD	0,0(7,6)
				PSI(NEW)-PSI(OLD)
	39		MDR	0,6
				PSI(NEW)-PSI(OLD)*OMEGA
00000	40		AD	0,0(7,6)
				PSI(NEW)-PSI(OLD)*OMEGA+PSI(OLD)
00000	41		STD	0,0(7,6)
				EXTRAPOLATED FLUX
00062	42		BXH	7,8,LOOP20
00000	43		LM	1,9,12(13)
	44		BR	14
	45		END	
	46			=F*8'

D. RUNGE

The four FORTRAN H kernels, RUNGE-1 through RUNGE-4, represents four successive stages in tuning a double precision Runge-Kutta integrator on the 370/195. Note that the sequence represents successful tuning on both machines, although a variety of relative performances (2.5-3.5) is observed across the collection.

```

      SUBROUTINE SUB1
C THIS FORTRAN CODE OF RUNGE-KUTTA 4TH ORDER AS WOULD BE TRANSLATED
C TO USE CRAY SCALAR REGISTERS FOR A GAUSSIAN Y=EXP(-.5*X*X)
C REVISED VERSION NOV 5 1975 FOR COMPUTERS WITH SEPARATE ADDER AND MULTIPLIER
C THIS IS DECK 1 WITH TIME=4.25 SECS ON /165
      IMPLICIT REAL*8 (A-H,O-Z)
      REAL*8 K
      SUM=0.0
      X=0.0
      Y=1.
      H=1.0D0/32768.D0
      H5=1.0D0/65536.D0
      DO 100 I=1,163840
      K=X*H
      X=X+H5
      K=K*Y
      SUM=K
      K=K*.5D0
      T=H*X
      K=Y-K
      K=K*T
      SUM=SUM+K
      SUM=SUM+K
      K=K*.5D0
      T=H*X
      K=Y-K
      K=K*T
      SUM=SUM+K
      SUM=SUM+K
      X=X+H5
      T=H*X
      K=Y-K
      K=K*T
      SUM=SUM+K
      SUM=SUM*.1666666666666666D0
      Y=Y-SUM
100  CONTINUE
      Z=Y*.39894228040143267D0
      ZTEST =Z
C      PRINT 200,          ZTEST
200  FORMAT(1H ,5D22.15)
      RETURN
      END

```



```

      SUBROUTINE SUB2
C THIS FORTRAN CODE OF RUNGE-KUTTA 4TH ORDER AS WOULD BE TRANSLATED
C TO USE CRAY SCALAR REGISTERS FOR A GAUSSIAN Y=EXP(-.5*X*X)
C REVISED VERSION NOV 5 1975 FOR COMPUTERS WITH SEPARATE ADDER AND MULTIPLIER
C THIS IS DECK 1 WITH TIME=4.25 SECS ON /165
C**MODIFIED TO RUN ON 370/195.
      IMPLICIT REAL*8 (A-H,O-Z)
      REAL*8 K
      DATA C1/-.5D0/, C2/-.25D0/, C3/-.1666666666666666D0/
      X=0.0
      Y=1.
      H=1.0D0/32768.D0
      H5=1.0D0/65536.D0
      DO 100 I=1,163840
      K=X*H
      X=X+H5
      K=K*Y
      SUM=K
      K = K * C1
      T = X * H
      K = K + Y
      X=X+H5
      K=K*T
      K = K + K
      SUM = SUM + K
      K = K * C2
      K = K + Y
      K=K*I
      SUM = SUM + K
      T = X * H
      SUM = SUM + K
      K = K - Y
      K=K*I
      SUM = SUM - K
      SUM = SUM * C3
      Y = SUM + Y
100  CCONTINUE
      Z=Y*.39894228040143267D0
      ZTEST =Z
C    PRINT 200,      ZTEST
200  FORMAT(1H,5D22.15)
      RETURN
      END

```

```

      SUBROUTINE SUB3
C THIS FORTRAN CODE OF RUNGE-KUTTA 4TH ORDER AS WOULD BE TRANSLATED
C TO USE CRAY SCALAR REGISTERS FOR A GAUSSIAN Y=EXP(-.5*X*X)
C REVISED VERSION NOV 5 1975 FOR COMPUTERS WITH SEPARATE ADDER AND MULTIPLIER
C THIS IS DECK 2 WITH TIME=2.71 SECS ON /165
      IMPLICIT REAL*8 (A-H,O-Z)
      REAL*8 K
      H=1.0D0/32768.D0
      H2=H*H
      H2H=H2/2.0D0
      X1=0.0
      X2=H2H
      SUM=0.0
      Y=1.
      T=0.0D0
      DO 100 I=1,163840
      SUM=Y*X1
      K=Y-SUM
      K=X2*K
      SUM=SUM+K
      K=K*.5D0
      K=Y-K
      K=X2*K
      X1=X1+H2H
      SUM=SUM+K
      K=Y-K
      K=X1*K
      X2=X2+H2
      SUM=SUM+K
      SUM=SUM*.333333333333333D0
      Y=Y-SUM
100  CONTINUE
      Z=Y*.39894228040143267D0
      ZTEST =Z
C PRINT 200, ZTEST
200  FORMAT(1H,5D22.15)
      RETURN
      END

```

```

      SUBROUTINE SUB4
C THIS FORTRAN CODE OF RUNGE-KUTTA 4TH ORDER AS WOULD BE TRANSLATED
C TO USE CRAY SCALAR REGISTERS FOR A GAUSSIAN Y=EXP(-.5*X*X)
C REVISED VERSION NOV 5 1975 FOR COMPUTERS WITH SEPARATE ADDER AND MULTIPLIER
C THIS IS DECK 2 WITH TIME=2.71 SECS ON /165
C**THIS VERSION REVISED FOR EXECUTION ON 360/195 UNDER FORTRAN H OPT=2.
      IMPLICIT REAL*8 (A-H,O-Z)
      REAL*8 K
      DATA C3/-.3333333333333333D0/
      H=1.0D0/32768.D0
      H2=H*H
      H2H=H2/2.0D0
      X2=H2H
      X1=0.0
      SUM=0.0
      Y=1.
      DO 100 I=1,163840
      SUM = SUM * X1
      X1=X1+H2H
      K = SUM - Y
      K=X2*K
      SUM = SUM - K
      K=K*.5D0
      K = K + Y
      K = K * X2
      X2=X2+H2
      SUM=SUM+K
      K = K - Y
      K = K * X1
      SUM = SUM - K
      SUM = SUM * C3
      SUM = SUM + Y
      Y = SUM
100  CONTINUE
      Z=Y*.39894228040143267D0
      ZTEST =Z
C      PRINT 200,          ZTEST
200  FORMAT (1H ,5D22.15)
      RETURN
      END

```

APPENDIX B

IBM 168 BENCHMARK LOG

February 9, 1976

8:00 Coffee and introduction to center by Clay Railey.

8:40 Art Hayworth and John Scholl restoring RES195.

9:00 Tour facility.

9:05 RES195 restored.

9:15 Machine is a MOD I. Changing micro code disk to make it a MOD III.
Modify ASP deck to match configuration.

9:20 IPL
IEA104A M DRM195

9:25 Drum was used by TSS. Have to DASDI it.

9:40 Still trying to DASDI drum.

9:45 Drum initialized.

9:46 IPL - WAIT 005 - Turned off 400.

9:48 IPL M DRM195 again.

10:00 Starting LOCAL system to look at catalog on RES195.

10:08 Catalog listing. IEHLIST failed on LOCAL system.

10:15 Run CLIP against DRM195 to verify VOLID. VOLID=DRM195 O.K.

10:25 Recataloged SYS1.LINKLIB to RES195.

10:27 IPL - WAIT - Turn off drum.
M DRM195 - Turn drum back on.
WAIT.

10:40 Recatalog apparently failed.

10:45 Trying to list catalog with SVS IEHLIST.

10:50 Catalog printing. Coffee.

11:00 Recatalog SYS1.LINKLIB.

11:10 IPL successful.

11:15 806 ABEND starting RDRSA PROC.
"Abend in open during interpreter initialization."

OIC is a 3505 here. RDR PROC says 2540.
Missing OPEN executors for 3505.

11:30 IBM looking for a 2540 for our use.
2540 switched in at OOC.

11:35 D.R.S. looking for device dependent OPEN modules need-
ed to support 3505 to copy into SVCLIB.

11:42 806 ABEND starting WTR to 3211.
IMAGELIB missing for 3211.

12:00 Running SVS to copy IMAGELIB and OPEN executors for
3211 and 3505 onto RES195.
Used SVS to restore DLIB01.

1:10 IPL
RDRSA ABEND 806
Writer O.K. Something still missing for 3505.
RDRSA has no SYSABEND DD card.

1:25 Have a running system but need to use 2540 card reader.
Need to copy some more modules over to support 3505.
Use RDR PROC to get SYSABEND dump.

1:38 3505 modules copied successfully.

1:40 3505 card reader working properly.
Read in MAKEDRUM.

1:44 MAKEDRUM ended O.K.

1:50 CLIPing packs.

2:15 Restoring PACK14.
Formatting ASP Q-packs.

2:35 I/O to take to make JOBSTREAM.

2:38 Read in ASP initialization deck.

2:41 ASP ABEND U0101 OC5.
Abend in INITGEN.

2:46 Pulled console card for 3066 from ASP deck.
Reread ASP initialization deck.
ASP ABEND U0101.

2:50 Pulled device cards for 3505 and 3525.
Read ASP initialization deck.
ASP ABEND U0101.

2:55 Printing ASP dump.
Calling D.E.E. for help with ASP.

3:00 Reading dump and catching up on lunch.

3:15 Add DEVICE card for 3211 and supply GN train parameter
for PRI PRINTER card.
Read in ASP initialization deck.

3:18 ASP is up.

3:20 3505 card reader jam.

3:25 BENTAPE1 ran but placed in FORMS hold by ASP.
8 RETURN.

3:32 Changed STANDARDS card to TRAIN=GN.
Read in ASP initialization deck.

3:34 ASP is up.
BENTAPE1 job still in FORMS hold.
When job is released from FORMS hold, ASP puts it right
back in.

3:45 Listing ASP STEPLIB to see if translate table included
for GN train.
Both GN and GN11 found.
No G11 entry found.

3:50 8 RETURN.

3:53 Change STANDARDS to TRAIN=ANY.
Read in ASP initialization deck.

3:55 Running BENTAPE1 again to create MODEL JOBSTREAM
(STREAM1) from PDS.

3:58 ASP couldn't build EXPRESS fence.
Read in ASP initialization deck.
PERMANENT ERROR 1 on 3505 reader.

4:00 ASP initialization deck read in.

4:02 Read in BENTAPE1 to build MODEL JOBSTREAM (STREAM1)
from PDS.

4:05 Ready to GO. Restart ASP so we will have accurate
ASP CPU time for STREAM1.

4:11 MODEL JOBSTREAM (STREAM1) read into ASP queue.

4:17 Start SLACMON.
Vary SY1 online.
STREAM1 started.

4:47:40 STREAM1 ended.

CPU utilization = 87.53%, (SLACMON)
ASP stopped to get ASP-CPU/WAIT.

4:50 Run job BENTAPE2 to create MODIFIED MODEL JOBSTREAM
(STREAM2).
Changed DISP to OLD for ASP.STATFILE in ASP restart
deck.

4:55 Restart ASP.
Read in STREAM2.

5:14 SLACMON started.
VARY SY1 online.
Start STREAM2.

6:11 STREAM2 ended.
SLACMON ended.
CPU utilization = 97.66%.
8 RETURN for ASP - CPU/WAIT.

6:15 Print SLACMON output for STREAM2.

6:25 Restart ASP to run applications problems.

6:45 Printer not started.
V SY1 OFFLINE.
Need to restart to get output.
Pull COPIES=0 from SYSOUT card.

7:00 Active jobs finished on MAIN.
RESTART ASP.
COLDSTART card removed from deck.

7:40 V SY1 OFFLINE.
V PR1 OFFLINE.

7:45 8 RETURN

Call it a day.

February 10, 1976

8:30 IBM looking for stand alone DUMP/RESTORE so we can restore the drum.

8:35 CLIP drum. (TSS left invalid VOLID).

8:46 IPL and restart ASP.

8:48 Running jobs.

9:00 CPU is set to a MOD 1.
Active jobs cancelled.
ANLVRTX1,ANLMTRX3,ANLSDIAG.

9:20 Re-IPL with MOD 3.
Restart ASP.

9:21 Running jobs.
Job NINIX (MINIBNCH) 322.
Job ANLVRTX3 322.
Run EISPACK full 10 repetitions.

13:10 OS/MVT waiting for work.
Pull PRELIB from DIF1DMOD.
MAXARRAY no object cards.
ITIME, DUMMY missing from XHOLESKI.

14:08 Someone moved our packs - it appears to have been a scheduling conflict (we started the day with 2/350 bank - @ 1400 hrs. we had to switch packs to 2/370 bank).
Still another delay because packs were mounted on our 2/370 bank - had to dismount packs.

14:30 Got machine and I/O back @ 1430 hours.
Re-IPL'ed and restarted ASP.

14:31 Cooling alarm sounded on 168; has not burned up yet so still running system.

14:32 ASP up - ready to run MODEL JOBSTREAM second time.

15:08 JOBSTREAM done - began to run last of A. Hinds jobs.

15:45 All finished with our jobs - turned machine over to IBM for MVS Benchmark run.

16:55 MVS up with JES2 on 168MP-A - 2 spools, 1 on SPOOL1 and the other on SCROO1. 4DO DRUM and seven packs including RES195 for data. 10 INITS, 5 are class BC, 3 are CB, 1 BG, and 1 NB. C is for compute bound, N is for utilities, G is extra.

17:07 STREAM1 started on MVS.

17:11 413 ABEND - (trouble positioning tape) because tapes
 on wrong channel.
 Permanent I/O error on VIO dataset.

17:22 Shutdown MVS to correct problems.

17:41 Loading queue to start STREAM31 on MVS again.

17:42:35 STREAM1 started on MVS. Two spools, etc. like above
 at 16:55.

18:09:52 STREAM1 ended successfully on MVS.

February 11, 1976

14:00 Configuring Uniprocessor 168 with 2305 and moving
 packs. The local production system had to be moved
 to the MP to accommodate us.

14:47 DADS1.DUMP/RESTORE for 2305 to run MVS.

14:56 IPL to bring up MVS.

15:15 MVS without MF/1, with SMI - STREAM1 JOBSTREAM started.

15:45 Above STREAM ended; reloaded queue and run MVS with
 MF/1, and with SMI (STREAM1).

15:55 STREAM started (w/MF1 and SMI).

16:20 STREAM ended; run no good - 1 job left in Q.

16:30 Reload queue with JOBSTREAM and try again.

16:40 Started STREAM again w/MF1 and SMI.

16:45 SMI malfunction - had to abort run.

16:55 Same STREAM tried again.

17:18 STREAM run successfully. Time could possibly be
 shorter because LINKPACK AREA was already loaded
 right by aborted run with no intervening IPL.

17:25 Running jobs to fix up SAS, etc. to run with MODEL
 JOBSTREAM under MVS.

19:38 MODEL JOBSTREAM and SASBENCH, OVCBENCH, and BISONINT
 run successfully under MVS with MF/1.

19:40 Restore drum and move packs to run MVT.

20:00 No one knew how to load alternate nucleus for MVT.

20:20 Got alternate nucleus loaded and found console address
 was in error - 00F instead of 01F.

20:25 Moved RES195 to local production system to ZAP console
 address.

20:35 Nucleus zapped, move RES195 to 'UN1.

20:40 Still didn't work. We decided to do the last run
 (which was to verify SLACMON overhead) on the A side
 of the MP tomorrow.

February 12, 1976

15:30 MVS run on MP using 4 megs and both CPU's.
16:00 Run successful.
16:15 MVT on 168A', MODEL JOBSTREAM, SMI, no SLACMON.
16:47 Run successful.
16:50 Running MAXARRAY under MVT.

APPENDIX C

DETAILED RESULTS FOR ALL
BENCHMARK JOB GROUPS

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3

AMDAHL 470V/6

168 / 470V6

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BMKJS01A	4	2.52	33.36	4	1.82	38.82	1.388	0.859
BMKJS02A	3	3.70	28.08	3	2.51	32.92	1.475	0.853
BMKJS03A	1	11.79	18.90	1	8.57	19.95	1.376	0.947
BMKJS03B	1	6.90	7.90	1	5.09	6.85	1.356	1.153
BMKJS04A	2	106.30	12.91	2	87.68	21.12	1.212	0.612
BMKJS05A	1	77.74	10.36	1	68.88	23.02	1.129	0.450
BMKJS06A	1	5.48	11.46	1	3.98	15.31	1.377	0.749
BMKJS06B	1	4.84	11.31	1	3.66	19.10	1.322	0.592
BMKJS07A	3	1.19	9.46	3	0.88	13.77	1.356	0.687
BMKJS07B	1	1.26	13.76	1	1.06	19.85	1.189	0.693
BMKJS08A	1	1.75	6.56	1	1.29	8.92	1.357	0.735
BMKJS08B	1	1.72	6.56	1	1.24	20.27	1.387	0.324
BMKJS09A	1	18.46	230.97	1	14.43	214.56	1.279	1.076
BMKJS09B	1	12.92	134.92	1	10.24	151.98	1.262	0.888
BMKJS10A	2	1.06	7.22	2	0.75	8.05	1.413	0.898
BMKJS10B	2	0.97	5.98	2	0.71	7.70	1.373	0.777
BMKJS11A	1	18.18	10.66	1	11.01	16.74	1.651	0.637
BMKJS11B	1	14.64	10.14	1	9.27	9.87	1.579	1.027
BMKJS12A	1	32.80	69.02*	1	23.65	68.90*	1.387	1.002
BMKJS13A	1	5.01	30.37	1	3.85	31.81	1.301	0.955
BMKJS13B	1	4.19	18.63	1	3.14	26.94	1.334	0.692
BMKJS14A	1	208.04	34.69	1	164.91	64.07	1.262	0.541
BMKJS15A	1	19.14	16.60	1	13.20	23.37	1.450	0.710
BMKJS15B	1	8.89	29.74	1	6.54	30.63	1.359	0.971
BMKJS16A	1	19.06	24.58	1	12.45	28.09	1.531	0.875
BMKJS17A	1	36.92	36.74	1	26.26	58.23	1.406	0.631
BMKJS18A	1	110.00	13.55	1	101.61	17.53	1.083	0.773
BMKJS19A	1	191.86	49.61	1	128.41	76.25	1.494	0.651
BMKJS19B	1	133.71	47.25	1	89.77	54.55	1.489	0.866
BMKJS20A	1	5.66	9.99	1	4.07	16.20	1.391	0.617
BMKJS21A	3	3.37	40.55	3	2.80	58.83	1.205	0.689
BMKJS21B	7	0.24	3.32	7	0.20	4.43	1.196	0.750
BMKJS22A	1	41.68	109.24	1	24.75	87.56	1.684	1.248
BMKJS23A	1	1.34	4.57	1	1.09	5.59	1.229	0.818
BMKJS23B	1	1.46	6.78	1	1.22	9.91	1.197	0.684
BMKJS24A	1	183.98	80.38	1	123.36	187.04	1.491	0.430
BMKJS24B	1	6.48	12.58	1	4.90	23.55	1.322	0.534
COMPMOVP	1	0.57	12.55	1	0.43	20.63	1.326	0.608
COPY1	1	2.02	81.55	1	1.30	118.99	1.554	0.685
COPY2	1	0.09	1.83	1	0.10	2.37	0.900	0.772
GENER1	5	0.31	14.96	5	0.23	19.44	1.353	0.770
GENER2	7	0.15	3.11	7	0.11	3.87	1.364	0.804
GENUPDTR	3	0.54	3.74	3	0.45	5.58	1.201	0.670
LIST1	3	0.27	4.67	3	0.24	5.43	1.127	0.859
LIST2	3	0.22	5.71	3	0.20	5.61	1.082	1.018
LIST3	2	0.61	22.49	2	0.59	21.58	1.042	1.042

LIST4	3	0.15	4.90	3	0.11	6.68	1.333	0.733
LIST5	2	0.39	18.98	2	0.31	26.31	1.254	0.721
MOVE1	3	0.33	5.47	3	0.32	13.28	1.042	0.412
PTPCH1	1	0.17	1.98	1	0.20	1.52	0.850	1.303
PTPCH2	2	0.14	2.53	2	0.14	3.46	1.000	0.730
UPDAT1	3	0.20	2.79	3	0.18	2.88	1.130	0.970
UPDAT2	1	0.23	9.83	1	0.20	5.40	1.150	1.820
UPDTE1	1	0.15	2.06	1	0.08	4.31	1.875	0.478
UPDTE2	2	0.14	2.57	2	0.09	3.12	1.474	0.824
UPDTE3	1	0.05	0.46	1	0.04	0.21	1.250	2.190
UPDTE4	1	0.36	1.96	1	0.35	3.00	1.029	0.653
UPDTE5	1	0.13	2.11	1	0.09	6.30	1.444	0.335
UPDTE6	2	0.17	1.53	2	0.18	1.96	0.944	0.781
UTILITY1	1	0.76	9.93	1	0.58	16.43	1.310	0.604
TOTAL	105	1454.29	1909.89	105	1089.82	2447.93	1.334	0.780
MEAN	60	21.89	23.77	60	16.26	30.34	1.305	0.803

ARGONNE NATIONAL LABORATORY
TRM 370/168 MOD 3 VS. AMDAHL 470V/6
MODEL JOBSTREAM

TRM 370/168 MOD 3				AMDAHL 470V/6			168 / 470V6	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	12	0.09	1.67	12	0.07	1.18	1.253	1.419
BMKJS02A	9	0.14	2.85	9	0.11	2.34	1.306	1.219
BMKJS03A	4	2.33	1.02	4	1.71	0.79	1.366	1.280
BMKJS03B	2	2.47	2.36	2	1.87	2.49	1.321	0.950
BMKJS04A	6	34.72	0.66	6	28.73	1.69	1.208	0.390
BMKJS05A	3	24.64	0.67	3	22.09	2.22	1.115	0.304
BMKJS06A	3	0.45	0.69	3	0.35	0.75	1.264	0.924
BMKJS06B	3	1.17	3.01	3	0.93	5.31	1.259	0.567
BMKJS07A	12	0.07	1.26	12	0.06	1.34	1.243	0.937
BMKJS07B	3	0.21	2.54	3	0.17	4.23	1.192	0.600
BMKJS08A	2	0.62	2.49	2	0.45	1.80	1.374	1.382
BMKJS08B	2	0.60	2.62	2	0.45	8.97	1.344	0.292
BMKJS09A	3	5.77	75.27	3	4.52	69.23	1.275	1.087
BMKJS09B	2	5.98	66.20	2	4.76	73.65	1.256	0.899
BMKJS10A	6	0.06	1.09	6	0.06	1.18	1.086	0.926
BMKJS10B	4	0.16	2.24	4	0.12	3.07	1.286	0.728
BMKJS11A	3	4.80	0.74	3	2.75	1.05	1.748	0.708
BMKJS11B	3	4.21	2.06	3	2.60	2.51	1.623	0.823
BMKJS12A	2	1.72	1.27*	2	1.12	1.34*		
BMKJS13A	3	0.63	1.77	3	0.48	1.65	1.312	1.073
BMKJS13B	2	0.71	2.58	2	0.54	2.80	1.303	0.923
BMKJS14A	2	95.98	2.19	2	76.76	2.48	1.250	0.883
BMKJS15A	3	0.69	1.65	3	0.54	0.93	1.272	1.768
BMKJS15B	1	0.02	0.07	1	0.02	0.10	1.000	0.700
BMKJS16A	4	2.28	1.59	4	1.41	1.71	1.622	0.929
BMKJS17A	2	4.26	1.07	2	3.04	1.00	1.401	1.070
BMKJS18A	3	35.65	1.77	3	33.14	2.07	1.076	0.855
BMKJS19A	3	60.79	2.70	3	40.46	1.92	1.503	1.409
BMKJS19B	2	63.02	8.66	2	42.16	4.56	1.495	1.900
BMKJS20A	3	0.04	0.27	3	0.04	0.41	1.182	0.661
BMKJS22A	2	12.96	42.67	2	7.46	30.70	1.738	1.390
BMKJS23A	2	0.09	1.48	2	0.09	1.84	1.000	0.809
BMKJS23B	3	0.12	1.64	3	0.10	1.99	1.276	0.824
BMKJS24A	2	90.86	37.84	2	60.85	90.10	1.493	0.420
BMKJS24B	2	2.12	4.46	2	1.63	6.01	1.300	0.743
TOTAL	121	1207.92	724.42	121	912.91	826.52	1.323	0.876
MEAN	34	13.49	8.29	34	10.02	9.83	1.316	0.935

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6		
STEP = ASM									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BMKJS13A	2	0.82	8.38	2	0.65	9.15	1.252	0.916	
BMKJS13B	2	0.82	6.09	2	0.62	9.54	1.323	0.639	
BMKJS19A	2	0.83	8.44	2	0.64	13.12	1.287	0.643	
BMKJS21A	39	0.26	3.12	39	0.22	4.53	1.205	0.689	
BMKJS21B	7	0.24	3.32	7	0.20	4.43	1.196	0.750	

TOTAL	52	16.71	190.74	52	13.62	271.14	1.227	0.703	
MEAN	5	0.59	5.87	5	0.47	8.15	1.252	0.728	

STEP = EDT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS01A	9	0.51	10.54	8	0.34	13.74	1.489	0.767	
BMKJS02A	3	0.84	11.63	3	0.51	16.58	1.658	0.702	
BMKJS03A	2	0.27	6.01	2	0.17	7.07	1.543	0.850	
BMKJS04A	4	0.27	4.75	4	0.18	7.22	1.543	0.657	
BMKJS05A	1	0.26	2.95	1	0.16	5.22	1.625	0.565	
BMKJS06A	1	0.30	7.48	1	0.23	11.51	1.304	0.650	
BMKJS07A	3	0.24	3.11	3	0.18	6.49	1.352	0.479	
BMKJS09A	1	0.23	3.97	1	0.17	5.48	1.353	0.724	
BMKJS10A	2	0.18	2.94	2	0.12	3.20	1.609	0.917	
BMKJS11A	1	0.21	6.85	1	0.18	10.77	1.167	0.636	
BMKJS12A	1	0.75	16.55	1	0.55	11.97	1.364	1.383	
BMKJS13A	1	0.31	6.12	1	0.25	5.13	1.240	1.193	
BMKJS14A	1	0.48	8.24	1	0.40	15.58	1.200	0.529	
BMKJS15A	1	0.51	8.05	1	0.42	16.05	1.214	0.502	
BMKJS15B	1	0.64	16.92	1	0.49	11.80	1.306	1.434	
BMKJS16A	1	0.35	5.45	1	0.22	4.98	1.591	1.094	
BMKJS17A	1	0.69	12.55	1	0.55	15.20	1.255	0.826	
BMKJS18A	1	0.18	3.55	1	0.17	6.42	1.059	0.553	
BMKJS19A	1	0.70	6.08	1	0.41	11.50	1.707	0.529	
BMKJS19B	1	0.78	7.77	1	0.50	15.29	1.560	0.508	
BMKJS20A	1	0.40	3.48	1	0.29	6.72	1.379	0.518	
TOTAL	37	16.08	281.42	37	11.05	382.16	1.455	0.736	
MEAN	21	0.43	7.38	21	0.31	9.90	1.406	0.763	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6		
STEP = FTG									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BMKJS02A	3	0.39	1.90	3	0.30	2.10	1.300	0.902	
BMKJS03A	1	1.92	2.81	1	1.39	2.63	1.381	1.068	
BMKJS03B	1	1.96	3.17	1	1.35	1.87	1.452	1.695	
BMKJS04A	2	1.61	1.43	2	1.14	1.59	1.410	0.903	
BMKJS06A	1	3.84	1.91	1	2.69	1.56	1.428	1.224	
BMKJS07A	3	1.66	1.32	3	0.47	1.92	1.414	0.689	
BMKJS10A	2	0.68	1.01	2	0.46	1.31	1.489	0.772	
BMKJS10B	2	0.66	1.51	2	0.46	1.55	1.419	0.971	
BMKJS11A	1	1.57	1.58	1	2.59	2.82	1.378	0.560	
BMKJS15A	1	16.57	3.60	1	11.16	4.52	1.485	0.796	

TOTAL	17	36.93	30.65	17	25.62	34.39	1.441	0.891	
MEAN	10	3.19	2.02	10	2.20	2.19	1.416	0.958	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = PTH (0)								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BHKJS05A	1	3.56	5.39	1	2.45	11.15	1.453	0.483
BHKJS06B	1	1.34	2.28	1	0.88	3.17	1.523	0.719
BHKJS07B	1	0.64	6.15	1	0.54	7.17	1.185	0.858
BHKJS08A	1	0.50	1.57	1	0.38	5.31	1.316	0.296
BHKJS08B	1	0.51	1.32	1	0.34	2.32	1.500	0.569
BHKJS09A	1	0.93	1.19	1	0.69	1.40	1.348	0.850
BHKJS09B	1	0.96	2.52	1	0.72	4.68	1.333	0.538
BHKJS11B	1	2.00	3.95	1	1.48	2.35	1.351	1.681
BHKJS12A	1	32.05	52.47	1	23.10	56.93	1.387	0.922
BHKJS13A	1	1.17	2.17	1	0.85	3.43	1.376	0.633
BHKJS13B	1	1.13	1.27	1	0.81	2.26	1.395	0.562
BHKJS14A	1	15.60	22.07	1	10.98	43.53	1.421	0.507
BHKJS15B	1	8.23	12.75	1	6.03	18.73	1.365	0.681
BHKJS16A	1	9.58	12.76	1	6.60	16.25	1.452	0.785
BHKJS17A	1	27.71	22.04	1	19.63	41.02	1.412	0.537
BHKJS18A	1	2.87	4.68	1	2.01	4.89	1.428	0.957
BHKJS19A	1	7.12	18.55	1	5.34	32.76	1.333	0.566
BHKJS19B	1	6.89	22.15	1	4.95	30.14	1.392	0.735
BHKJS20A	1	5.13	5.69	1	3.67	8.24	1.398	0.691
BHKJS23A	1	1.15	1.60	1	0.90	1.92	1.278	0.833
BHKJS23B	1	1.09	1.86	1	0.93	3.94	1.172	0.472
BHKJS24A	1	2.26	4.70	1	1.66	6.83	1.361	0.688
BHKJS24B	1	2.23	3.66	1	1.63	11.54	1.368	0.317
TOTAL	23	134.65	212.79	23	96.57	319.96	1.394	0.665
MEAN	23	5.85	9.25	23	4.20	13.91	1.372	0.690

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

TRM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	12	0.09	1.67	12	0.07	1.18	1.253	1.419
BMKJS02A	9	0.14	2.85	9	0.11	2.34	1.306	1.219
BMKJS03A	4	2.33	1.02	4	1.71	0.79	1.366	1.280
BMKJS04A	6	34.72	0.66	6	28.73	1.69	1.208	0.390
BMKJS05A	3	24.64	0.67	3	22.09	2.22	1.115	0.304
BMKJS06A	3	0.45	0.69	3	0.35	0.75	1.264	0.924
BMKJS07A	12	0.07	1.26	12	0.06	1.34	1.243	0.937
BMKJS09A	3	5.77	75.27	3	4.52	69.23	1.275	1.087
BMKJS10A	6	0.06	1.09	6	0.06	1.18	1.086	0.926
BMKJS11A	3	4.80	0.74	3	2.75	1.05	1.748	0.708
BMKJS12A	2	1.72	1.27*	2	1.12	1.34*		
BMKJS13A	3	0.63	1.77	3	0.48	1.65	1.312	1.073
BMKJS14A	2	95.98	2.19	2	76.76	2.48	1.250	0.883
BMKJS15A	3	0.69	1.65	3	0.54	0.93	1.272	1.768
BMKJS15B	1	0.02	0.07	1	0.02	0.10	1.000	0.700
BMKJS16A	4	2.28	1.59	4	1.41	1.71	1.622	0.929
BMKJS17A	2	4.26	1.07	2	3.04	1.00	1.401	1.070
BMKJS18A	3	35.65	1.77	3	33.14	2.07	1.076	0.855
BMKJS19A	3	60.79	2.70	3	40.46	1.92	1.503	1.409
BMKJS19B	2	63.02	8.66	2	42.16	4.56	1.495	1.900
BMKJS20A	3	0.04	0.27	3	0.04	0.41	1.182	0.661
TOTAL	87	957.29	362.27	87	744.80	335.39	1.285	1.080
MEAN	20	16.82	5.38	20	12.92	4.93	1.299	1.022

STEP = IEBCOMPR								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
COMPMOVE	1	0.09	1.47	1	0.07	2.25	1.286	0.653
TOTAL	1	0.09	1.47	1	0.07	2.25	1.286	0.653
MEAN	1	0.09	1.47	1	0.07	2.25	1.286	0.653

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDALH 470V/6			168 / 470V6		
STEP = IEBCOPY									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COPY1	1	2.02	81.55	1	1.30	118.99	1.554	0.685	
COPY2	1	0.09	1.83	1	0.10	2.37	0.900	0.772	
TOTAL	2	2.11	83.38	2	1.40	121.36	1.507	0.687	
MEAN	2	1.05	41.69	2	0.70	60.68	1.227	0.729	

STEP = IERGENER									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENPP1	5	0.31	14.96	5	0.23	19.44	1.353	0.770	
GENER2	7	0.15	3.11	7	0.11	3.87	1.364	0.804	
TOTAL	12	2.62	96.60	12	1.93	124.31	1.358	0.777	
MEAN	2	0.23	9.04	2	0.17	11.66	1.359	0.797	

STEP = IEBPTPCH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
PTPCH1	1	0.17	1.98	1	0.20	1.52	0.850	1.303	
PTPCH2	2	0.14	2.53	2	0.14	3.46	1.000	0.730	
TOTAL	3	0.46	7.04	3	0.49	8.45	0.939	0.833	
MEAN	2	0.16	2.25	2	0.17	2.49	0.925	1.016	

STEP = IEBUPDAT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
UPDAT1	3	0.20	2.79	3	0.18	2.88	1.130	0.970	
UPDAT2	1	0.23	9.83	1	0.20	5.40	1.150	1.920	
TOTAL	4	0.84	18.20	4	0.74	14.03	1.135	1.297	
MEAN	2	0.22	6.31	2	0.19	4.14	1.140	1.195	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = IEBUPDTE								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
GENUPDTE	3	0.45	2.78	3	0.38	4.57	1.204	0.608
UPDTE1	1	0.15	2.06	1	0.08	4.31	1.875	0.478
UPDTE2	2	0.14	2.57	2	0.09	3.12	1.474	0.824
UPDTE3	1	0.05	0.46	1	0.04	0.21	1.250	2.190
UPDTE4	1	0.36	1.96	1	0.35	3.00	1.029	0.653
UPDTE5	1	0.13	2.11	1	0.09	6.30	1.444	0.335
UPDTE6	2	0.17	1.53	2	0.18	1.96	0.944	0.781
TOTAL	11	2.67	23.13	11	2.24	37.70	1.192	0.614
MEAN	7	0.21	1.92	7	0.17	3.35	1.317	0.838

STEP = IEBUTIL									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPNOVP	1	0.09	1.47	1	0.07	2.25	1.286	0.653	
COPY1	1	2.02	81.55	1	1.30	118.99	1.554	0.685	
COPY2	1	0.09	1.83	1	0.10	2.37	0.900	0.772	
GENER1	5	0.31	14.96	5	0.23	19.44	1.353	0.770	
GENER2	7	0.15	3.11	7	0.11	3.87	1.364	0.804	
GENUPDTP	3	0.45	2.78	3	0.38	4.57	1.204	0.608	
PTPCH1	1	0.17	1.98	1	0.20	1.52	0.850	1.303	
PTPCH2	2	0.14	2.53	2	0.14	3.46	1.000	0.730	
UPDAT1	3	0.20	2.79	3	0.18	2.88	1.130	0.970	
UPDAT2	1	0.23	9.83	1	0.20	5.40	1.150	1.820	
UPDTE1	1	0.15	2.06	1	0.08	4.31	1.875	0.478	
UPDTE2	2	0.14	2.57	2	0.09	3.12	1.474	0.824	
UPDTE3	1	0.05	0.46	1	0.04	0.21	1.250	2.190	
UPDTE4	1	0.36	1.96	1	0.35	3.00	1.029	0.653	
UPDTE5	1	0.13	2.11	1	0.09	6.30	1.444	0.335	
UPDTE6	2	0.17	1.53	2	0.18	1.96	0.944	0.781	
TOTAL	33	8.79	229.82	33	6.87	308.10	1.279	0.746	
MEAN	16	0.30	8.35	16	0.23	11.48	1.238	0.899	

"IEBUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6		
STEP = IEHLIST									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

LIST1	3	0.27	4.67	3	0.24	5.43	1.127	0.859	
LIST2	3	0.22	5.71	3	0.20	5.61	1.082	1.019	
LIST3	2	0.61	22.49	2	0.59	21.58	1.042	1.042	
LIST4	3	0.15	4.90	3	0.11	6.68	1.333	0.733	
LIST5	2	0.39	18.98	2	0.31	26.31	1.254	0.721	

TOTAL	13	3.92	128.75	13	3.46	148.93	1.133	0.864	
MEAN	5	0.33	11.35	5	0.29	13.12	1.168	0.875	

STEP = IPHMOVE									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.48	11.08	1	0.36	18.38	1.333	0.603	
MOVE1	3	0.33	5.47	3	0.32	13.28	1.042	0.412	
UTILITY1	1	0.44	6.71	1	0.31	11.49	1.419	0.584	
TOTAL	5	1.91	34.20	5	1.62	69.70	1.179	0.491	
MEAN	3	0.42	7.75	3	0.33	14.38	1.265	0.533	

STEP = IPHPRGM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENUPDT*	3	0.08	0.96	3	0.07	1.01	1.190	0.954	
UTILITY1	4	0.08	0.80	4	0.07	1.23	1.195	0.652	
TOTAL	7	0.57	6.11	7	0.48	7.97	1.189	0.767	
MEAN	2	0.08	0.88	2	0.07	1.12	1.189	0.803	

ARGONNE NATIONAL LABORATORY
TBM 370/168 MOD 3 VS. AMDAHL 470V/6
MODEL JOBSTREAM

TBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470V6	
STEP = IEHUTIL								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
COMPMOVE	1	0.48	11.08	1	0.36	18.38	1.333	0.603
GENUPDTE	3	0.08	0.96	3	0.07	1.01	1.190	0.954
LIST1	3	0.27	4.67	3	0.24	5.43	1.127	0.859
LIST2	3	0.22	5.71	3	0.20	5.61	1.092	1.018
LIST3	2	0.61	22.49	2	0.59	21.58	1.042	1.042
LIST4	3	0.15	4.90	3	0.11	6.68	1.333	0.733
LIST5	2	0.39	18.98	2	0.31	26.31	1.254	0.721
MOVE1	3	0.33	5.47	3	0.32	13.28	1.042	0.412
UTILITY1	5	0.15	1.99	5	0.12	3.29	1.310	0.604
TOTAL	25	6.40	169.06	25	5.56	226.60	1.151	0.746
MEAN	9	0.30	8.47	9	0.26	11.28	1.191	0.772

"IEHUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

STEP = LOADGO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS03B	2	2.47	2.36	2	1.87	2.49	1.321	0.950	
BMKJS06B	3	1.17	3.01	3	0.93	5.31	1.259	0.567	
BMKJS07B	3	0.21	2.54	3	0.17	4.23	1.192	0.600	
BMKJS08A	2	0.62	2.49	2	0.45	1.80	1.374	1.382	
BMKJS08B	2	0.60	2.62	2	0.45	8.97	1.344	0.292	
BMKJS09B	2	5.98	66.20	2	4.76	73.65	1.256	0.899	
BMKJS10B	4	0.16	2.24	4	0.12	3.07	1.286	0.728	
BMKJS11B	3	4.21	2.06	3	2.60	2.51	1.623	0.823	
BMKJS13B	2	0.71	2.58	2	0.54	2.80	1.303	0.923	
BMKJS22A	2	12.96	42.67	2	7.46	30.70	1.738	1.390	
BMKJS23A	2	0.09	1.48	2	0.09	1.84	1.000	0.809	
BMKJS23B	3	0.12	1.64	3	0.10	1.99	1.276	0.824	
BMKJS24A	2	90.86	37.84	2	60.85	90.10	1.493	0.820	
BMKJS24B	2	2.12	4.46	2	1.63	6.01	1.300	0.743	
TOTAL	34	250.63	362.15	34	168.11	491.13	1.491	0.737	
MEAN	14	8.74	12.44	14	5.86	16.82	1.340	0.811	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6		
STEP = PL1									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BMKJS01A	4	1.24	7.27	4	0.92	7.80	1.345	0.931	
BMKJS02A	3	2.04	6.01	3	1.37	7.23	1.485	0.831	
BMKJS22A	1	15.75	23.89	1	9.83	26.15	1.602	0.914	

TOTAL	8	26.82	71.00	8	17.63	79.07	1.521	0.898	
MEAN	3	6.34	12.39	3	4.04	13.73	1.478	0.892	

STEP = UTILITY									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVR	2	0.28	6.27	2	0.21	10.31	1.326	0.608	
COPY1	1	2.02	41.55	1	1.30	118.99	1.554	0.685	
COPY2	1	0.09	1.83	1	0.10	2.37	0.900	0.772	
GFNER1	5	0.31	14.96	5	0.23	19.44	1.353	0.770	
GFNER2	7	0.15	3.11	7	0.11	3.87	1.364	0.804	
GFNUPDTE	6	0.27	1.87	6	0.22	2.79	1.201	0.670	
LIST1	3	0.27	4.67	3	0.24	5.43	1.127	0.859	
LIST2	3	0.22	5.71	3	0.20	5.61	1.082	1.018	
LIST3	2	0.61	22.49	2	0.59	21.58	1.042	1.042	
LIST4	3	0.15	4.90	3	0.11	6.68	1.333	0.733	
LIST5	2	0.39	18.98	2	0.31	26.31	1.254	0.721	
MOVE1	3	0.33	5.47	3	0.32	13.28	1.042	0.412	
PTPCN1	1	0.17	1.98	1	0.20	1.52	0.850	1.303	
PTPCN2	2	0.14	2.53	2	0.14	3.46	1.000	0.730	
UPDAT1	3	0.20	2.79	3	0.18	2.88	1.130	0.970	
UPDAT2	1	0.23	9.83	1	0.20	5.40	1.150	1.820	
UPDTP1	1	0.15	2.06	1	0.08	4.31	1.875	0.478	
UPDTP2	2	0.14	2.57	2	0.09	3.12	1.474	0.824	
UPDTE3	1	0.05	0.46	1	0.04	0.21	1.250	2.190	
UPDTP4	1	0.36	1.96	1	0.35	3.00	1.029	0.653	
UPDTE5	1	0.13	2.11	1	0.09	6.30	1.444	0.335	
UPDTE6	2	0.17	1.53	2	0.18	1.96	0.944	0.781	
UTILITY1	5	0.15	1.99	5	0.12	3.29	1.310	0.604	
TOTAL	54	15.19	398.88	58	12.43	534.70	1.222	0.746	
MEAN	23	0.30	8.77	23	0.24	11.83	1.219	0.860	

"UTILITY" COMBINES ALL IBM UTILITIES ("IES" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODEL JOBSTREAM

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470V6

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	121	9.98	5.99	121	7.54	6.83	1.323	0.876
ASM	52	0.32	3.67	52	0.26	5.21	1.227	0.703
PDT	37	0.43	7.61	37	0.30	10.33	1.455	0.736
FTG	17	2.17	1.80	17	1.51	2.02	1.441	0.891
PTH (0)	23	5.85	9.25	23	4.20	13.91	1.394	0.665
GO	87	11.00	4.16	87	8.56	3.86	1.285	1.080
IPBUTIL	33	0.27	6.96	33	0.21	9.34	1.279	0.746
IEHUTIL	25	0.26	6.76	25	0.22	9.06	1.151	0.746
LOAD&GO	34	7.37	10.65	34	4.94	14.44	1.491	0.737
PL1	9	3.35	8.87	8	2.20	9.88	1.521	0.898
UTILITY	58	0.26	6.88	58	0.21	9.22	1.222	0.746

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	34	13.49	8.29	34	10.02	9.83	1.316	0.935
ASM	5	0.59	5.87	5	0.47	8.15	1.252	0.729
PDT	21	0.43	7.38	21	0.31	9.90	1.406	0.763
FTG	10	3.19	2.02	10	2.20	2.19	1.416	0.958
PTH (0)	23	5.85	9.25	23	4.20	13.91	1.372	0.690
GO	20	16.82	5.38	20	12.92	4.93	1.299	1.022
IPBUTIL	16	0.30	8.35	16	0.23	11.48	1.238	0.899
IEHUTIL	9	0.30	8.47	9	0.26	11.28	1.191	0.772
LOAD&GO	14	8.74	12.44	14	5.86	16.82	1.340	0.811
PL1	3	6.34	12.39	3	4.04	13.73	1.478	0.892
UTILITY	23	0.30	8.77	23	0.24	11.83	1.219	0.860

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IPBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3

IBM 370/195

168 / 195

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BMKJS01A	4	2.52	33.36	4	2.16	33.79	1.168	0.987
BMKJS02A	3	3.70	28.08	3	3.16	28.19	1.169	0.996
BMKJS03A	1	11.79	18.90	1	8.29	18.91	1.422	0.999
BMKJS03B	1	6.90	7.90	1	4.99	9.45	1.383	0.836
BMKJS04A	2	106.30	12.91	2	89.66	21.22	1.186	0.608
BMKJS05A	1	77.74	10.36	1	39.41	11.59	1.973	0.894
BMKJS06A	1	5.48	11.46	1	4.76	11.59	1.151	0.989
BMKJS06B	1	4.84	11.31	1	3.80	18.27	1.274	0.619
BMKJS07A	3	1.19	9.46	3	1.07	9.66	1.119	0.979
BMKJS07B	1	1.26	13.76	1	1.18	15.25	1.068	0.902
BMKJS08A	1	1.75	6.56	1	1.53	8.09	1.144	0.811
BMKJS08B	1	1.72	6.56	1	1.57	7.88	1.096	0.832
BMKJS09A	1	18.46	230.97	1	13.10	520.09	1.409	0.444
BMKJS09B	1	12.92	134.92	1	10.59	452.48	1.220	0.298
BMKJS10A	2	1.06	7.22	2	0.95	7.28	1.110	0.992
BMKJS10B	2	0.97	5.98	2	0.90	9.01	1.083	0.664
BMKJS11A	1	18.18	10.66	1	11.78	11.59	1.543	0.920
BMKJS11B	1	14.64	10.14	1	9.21	15.73	1.590	0.645
BMKJS12A	1	32.80	69.02*	1	27.92	74.55*	1.175	0.926
BMKJS13A	1	5.01	30.37	1	4.24	56.85	1.182	0.534
BMKJS13B	1	4.19	18.63	1	3.67	36.35	1.142	0.513
BMKJS14A	1	208.04	34.69	1	106.83	35.20	1.947	0.986
BMKJS15A	1	19.14	16.60	1	16.65	24.98	1.150	0.665
BMKJS15B	1	8.89	29.74	1	7.62	38.95	1.167	0.764
BMKJS16A	1	19.06	24.58	1	14.24	22.50	1.338	1.092
BMKJS17A	1	36.92	36.74	1	31.21	35.29	1.193	1.041
BMKJS18A	1	110.00	13.55	1	42.95	11.04	2.561	1.227
BMKJS19A	1	191.96	49.61	1	130.91	69.89	1.466	0.710
BMKJS19B	1	133.71	47.25	1	88.77	41.08	1.506	1.150
BMKJS20A	1	5.66	9.99	1	5.06	13.56	1.119	0.737
BMKJS21A	3	3.37	40.55	3	3.10	65.25	1.099	0.621
BMKJS21B	7	0.24	3.32	7	0.22	5.69	1.093	0.584
BMKJS22A	1	41.68	109.24	1	32.39	107.27	1.287	1.014
BMKJS23A	1	1.34	4.57	1	1.27	7.49	1.055	0.610
BMKJS23B	1	1.46	6.78	1	1.39	10.30	1.050	0.658
BMKJS24A	1	183.98	80.38	1	146.90	149.85	1.252	0.536
BMKJS24B	1	6.48	12.58	1	5.63	19.40	1.151	0.648
COMPMOV	1	0.57	12.55	1	0.52	13.46	1.096	0.932
COPY1	1	2.02	81.55	1	1.34	119.00	1.507	0.685
COPY2	1	0.09	1.83	1	0.10	2.80	0.900	0.654
GENPR1	5	0.31	14.96	5	0.23	26.68	1.389	0.561
GENPR2	7	0.15	3.11	7	0.12	8.10	1.207	0.384
GENPRDTP	3	0.54	3.74	3	0.46	4.68	1.167	0.800
LIST1	3	0.27	4.67	3	0.22	4.07	1.212	1.147
LIST2	1	0.22	5.71	3	0.20	5.55	1.119	1.028
LIST3	2	0.61	22.49	2	0.53	19.67	1.150	1.143

LIST4	3	0.15	4.90	3	0.14	4.73	1.048	1.035
LIST5	2	0.39	18.98	2	0.36	19.81	1.082	0.958
NOVP1	3	0.33	5.47	3	0.33	4.52	1.000	1.209
PTPCH1	1	0.17	1.98	1	0.18	1.39	0.944	1.424
PTPCH2	2	0.14	2.53	2	0.13	2.10	1.115	1.202
UPDAT1	3	0.20	2.79	3	0.19	2.59	1.070	1.079
UPDAT2	1	0.23	9.83	1	0.19	9.09	1.211	1.081
UPDTE1	1	0.15	2.06	1	0.11	2.76	1.364	0.746
UPDTE2	2	0.14	2.57	2	0.13	3.18	1.120	0.809
UPDTE3	1	0.05	0.46	1	0.04	0.99	1.250	0.465
UPDTE4	1	0.36	1.96	1	0.34	1.30	1.059	1.508
UPDTE5	1	0.13	2.11	1	0.13	2.25	1.000	0.938
UPDTE6	2	0.17	1.53	2	0.18	1.93	0.971	0.795
UTILITY1	1	0.76	9.93	1	0.68	11.27	1.118	0.881
TOTAL	105	1454.29	1909.89	105	1005.91	2941.06	1.446	0.649
MEAN	60	21.89	23.77	60	14.77	38.46	1.235	0.848

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JORSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BKKJS01A	12	0.09	1.67	12	0.08	1.18	1.112	1.420
BKKJS02A	9	0.14	2.85	9	0.12	1.92	1.164	1.480
BKKJS03A	4	2.33	1.02	4	1.51	0.78	1.547	1.309
BKKJS03P	2	2.47	2.36	2	1.59	3.03	1.553	0.779
BKKJS04A	6	34.72	0.66	6	29.24	1.69	1.187	0.392
BKKJS05A	3	24.64	0.67	3	12.03	0.89	2.049	0.757
BKKJS06A	3	0.45	0.69	3	0.37	0.83	1.207	0.831
BKKJS06B	3	1.17	3.01	3	0.91	5.19	1.282	0.580
BKKJS07A	12	0.07	1.26	12	0.07	0.94	1.048	1.336
BKKJS07B	3	0.21	2.54	3	0.18	3.42	1.148	0.742
BKKJS08A	2	0.62	2.49	2	0.55	3.18	1.136	0.783
BKKJS08B	2	0.60	2.62	2	0.56	2.42	1.071	1.083
BKKJS09A	3	5.77	75.27	3	4.02	171.14	1.414	0.440
BKKJS09B	2	5.98	66.20	2	4.88	224.91	1.225	0.294
BKKJS10A	6	0.76	1.09	6	0.06	1.02	1.086	1.067
BKKJS10B	4	0.16	2.24	4	0.14	3.45	1.105	0.648
BKKJS11A	3	4.80	0.74	3	2.75	0.75	1.745	0.987
BKKJS11B	3	4.21	2.06	3	2.49	3.66	1.694	0.563
BKKJS12A	2	1.72	1.27*	2	0.15	1.06*		
BKKJS13A	3	0.63	1.77	3	0.54	0.74	1.174	2.181
BKKJS13B	2	0.71	2.58	2	0.65	3.56	1.092	0.725
BKKJS14A	2	95.98	2.19	2	46.48	1.53	2.065	1.427
BKKJS15A	3	0.69	1.65	3	0.58	1.73	1.191	0.952
BKKJS15B	1	0.02	0.07	1	0.03	0.10	0.667	0.700
BKKJS16A	4	2.29	1.59	4	1.49	0.89	1.527	1.779
BKKJS17A	2	4.26	1.07	2	3.55	1.32	1.198	0.814
BKKJS18A	3	35.65	1.77	3	13.46	0.63	2.649	2.815
BKKJS19A	3	60.79	2.70	3	40.89	1.77	1.487	1.525
BKKJS19B	2	63.02	8.66	2	41.10	2.51	1.533	3.452
BKKJS20A	3	0.04	0.27	3	0.05	0.42	0.929	0.651
BKKJS22A	2	12.96	42.67	2	9.59	35.02	1.351	1.214
BKKJS23A	2	0.09	1.48	2	0.11	2.09	0.864	0.712
BKKJS23B	3	0.12	1.64	3	0.11	2.55	1.121	0.642
BKKJS24A	2	90.86	37.84	2	72.47	72.54	1.254	0.522
BKKJS24B	2	2.12	4.46	2	1.86	7.34	1.142	0.608
TOTAL	121	1207.92	724.42	121	793.22	1379.74	1.523	0.525
MPAN	34	13.49	8.29	34	8.66	16.62	1.125	1.071

"ALL GO" COMBINES ALL GO, LOADGO, AND EDTGO STEPS.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP	ASH							
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS13A	2	0.82	8.38	2	0.70	23.00	1.163	0.364
BMKJS13B	2	0.82	6.09	2	0.71	13.74	1.155	0.443
BMKJS19A	2	0.83	8.44	2	0.75	14.95	1.107	0.564
BMKJS21A	39	0.26	3.12	39	0.24	5.02	1.089	0.621
BMKJS21B	7	0.24	3.32	7	0.22	5.69	1.093	0.584
TOTAL	52	16.71	190.74	52	15.13	339.00	1.104	0.563
MEAN	5	0.59	5.87	5	0.52	12.48	1.121	0.516

STEP = EDT								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	8	0.51	10.54	8	0.41	11.29	1.220	0.934
BMKJS02A	3	0.84	11.63	3	0.67	14.99	1.260	0.776
BMKJS03A	2	0.27	6.01	2	0.21	6.85	1.286	0.879
BMKJS04A	4	0.27	4.75	4	0.22	6.80	1.200	0.699
BMKJS05A	1	0.26	2.95	1	0.20	3.16	1.300	0.934
BMKJS06A	1	0.30	7.48	1	0.27	6.91	1.111	1.082
BMKJS07A	3	0.24	3.11	3	0.19	4.37	1.281	0.712
BMKJS09A	1	0.23	3.97	1	0.20	3.73	1.150	1.064
BMKJS10A	2	0.18	2.94	2	0.15	2.97	1.194	0.988
BMKJS11A	1	0.21	6.85	1	0.22	7.23	0.955	0.947
BMKJS12A	1	0.75	16.55	1	0.58	12.63	1.293	1.310
BMKJS13A	1	0.31	6.12	1	0.24	6.65	1.292	0.920
BMKJS14A	1	0.48	8.24	1	0.43	9.56	1.116	0.862
BMKJS15A	1	0.51	8.05	1	0.49	12.65	1.041	0.636
BMKJS15B	1	0.64	16.92	1	0.52	23.30	1.231	0.726
BMKJS16A	1	0.35	5.45	1	0.25	6.92	1.400	0.788
BMKJS17A	1	0.69	12.55	1	0.49	11.06	1.408	1.135
BMKJS18A	1	0.18	3.55	1	0.19	4.02	0.947	0.883
BMKJS19A	1	0.70	6.08	1	0.55	12.11	1.273	0.502
BMKJS19B	1	0.78	7.77	1	0.64	16.52	1.219	0.470
BMKJS20A	1	0.40	3.48	1	0.37	5.46	1.081	0.637
TOTAL	37	16.09	281.42	37	13.16	337.13	1.222	0.835
MEAN	21	0.43	7.39	21	0.36	9.01	1.203	0.852

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = PTG								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BHKJS02A	1	0.19	1.90	3	0.37	2.12	1.054	0.896
BHKJS03A	1	1.92	2.81	1	1.84	2.11	1.043	1.132
BHKJS03B	1	1.96	3.17	1	1.81	3.38	1.083	0.938
BHKJS04A	2	1.61	1.43	2	1.49	2.55	1.080	0.564
BHKJS06A	1	3.84	1.91	1	3.38	2.19	1.136	0.872
BHKJS07A	1	0.66	1.32	3	0.60	1.53	1.100	0.865
BHKJS10A	2	0.68	1.01	2	0.63	1.24	1.096	0.819
BHKJS10B	2	0.66	1.51	2	0.61	2.10	1.073	0.719
BHKJS11A	1	1.57	1.58	1	3.31	2.10	1.079	0.752
BHKJS15A	1	16.57	3.60	1	14.43	7.13	1.148	0.505
TOTAL	17	36.93	30.65	17	33.15	39.62	1.114	0.774
MEAN	10	3.19	2.02	10	2.85	2.64	1.089	0.826

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = PTH (0)								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS05A	1	3.56	5.39	1	3.13	5.76	1.137	0.936
BMKJS06B	1	1.34	2.28	1	1.07	2.70	1.252	0.944
BMKJS07B	1	0.64	6.15	1	0.64	4.99	1.000	1.232
BMKJS08A	1	0.50	1.57	1	0.43	1.72	1.163	0.913
BMKJS08B	1	0.51	1.32	1	0.44	3.04	1.159	0.434
BMKJS09A	1	0.93	1.19	1	0.84	2.95	1.107	0.403
BMKJS09B	1	0.96	2.52	1	0.83	2.66	1.157	0.947
BMKJS11B	1	2.00	3.95	1	1.75	4.74	1.143	0.833
BMKJS12A	1	32.05	52.47	1	27.34	61.92	1.172	0.847
BMKJS13A	1	1.17	2.17	1	0.98	1.96	1.194	1.107
BMKJS13B	1	1.13	1.27	1	0.95	1.73	1.189	0.734
BMKJS14A	1	15.60	22.07	1	13.43	22.57	1.162	0.978
BMKJS15B	1	8.23	12.75	1	7.07	15.55	1.164	0.820
BMKJS16A	1	9.58	12.76	1	8.01	12.00	1.196	1.063
BMKJS17A	1	27.71	22.04	1	23.61	21.59	1.174	1.021
BMKJS18A	1	2.87	4.68	1	2.38	5.13	1.206	0.912
BMKJS19A	1	7.12	18.55	1	6.18	22.56	1.152	0.822
BMKJS19B	1	6.89	22.15	1	5.93	19.54	1.162	1.134
BMKJS20A	1	5.13	5.69	1	4.55	6.84	1.127	0.832
BMKJS23A	1	1.15	1.60	1	1.05	3.32	1.095	0.482
BMKJS23B	1	1.09	1.86	1	1.06	2.64	1.028	0.705
BMKJS24A	1	2.26	4.70	1	1.96	4.77	1.153	0.985
BMKJS24B	1	2.23	3.66	1	1.91	4.73	1.168	0.774
TOTAL	23	134.65	212.79	23	115.54	235.41	1.165	0.904
MPAN	23	5.85	9.25	23	5.02	10.24	1.150	0.859

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS01A	12	0.09	1.67	12	0.08	1.18	1.112	1.420	
BMKJS02A	9	0.14	2.85	9	0.12	1.92	1.164	1.480	
BMKJS03A	4	2.33	1.02	4	1.51	0.78	1.547	1.309	
BMKJS04A	6	34.72	0.66	6	29.24	1.69	1.187	0.392	
BMKJS05A	3	24.64	0.67	3	12.03	0.89	2.049	0.757	
BMKJS06A	3	0.45	0.69	3	0.37	0.83	1.207	0.831	
BMKJS07A	12	0.07	1.26	12	0.07	0.94	1.048	1.336	
BMKJS09A	3	5.77	75.27	3	4.02	171.14	1.434	0.440	
BMKJS10A	6	0.06	1.09	6	0.06	1.02	1.086	1.067	
BMKJS11A	3	4.80	0.74	3	2.75	0.75	1.745	0.987	
BMKJS12A	2	1.72	1.27*	2	0.15	1.06*			
BMKJS13A	3	0.63	1.77	3	0.54	0.74	1.174	2.381	
BMKJS14A	2	95.98	2.19	2	46.48	1.53	2.065	1.427	
BMKJS15A	3	0.69	1.65	3	0.58	1.73	1.191	0.952	
BMKJS15B	1	0.02	0.07	1	0.03	0.10	0.667	0.700	
BMKJS16A	4	2.28	1.59	4	1.49	0.89	1.527	1.779	
BMKJS17A	2	4.26	1.07	2	3.55	1.32	1.198	0.814	
BMKJS18A	3	35.65	1.77	3	13.46	0.63	2.649	2.815	
BMKJS19A	3	60.79	2.70	3	40.89	1.77	1.487	1.525	
BMKJS19B	2	63.02	8.66	2	41.10	2.51	1.533	3.452	
BMKJS20A	3	0.04	0.27	3	0.05	0.42	0.929	0.651	
TOTAL	87	957.29	362.27	87	597.05	613.24	1.603	0.591	
NRAN	20	16.82	5.38	20	9.92	9.64	1.400	1.326	

STEP = IRRCONDD

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
CONPHOVE	1	0.09	1.47	1	0.08	1.41	1.125	1.043	
TOTAL	1	0.09	1.47	1	0.08	1.41	1.125	1.043	
NRAN	1	0.09	1.47	1	0.08	1.41	1.125	1.043	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = IERCOPY									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COPY1	1	2.02	81.55	1	1.34	119.00	1.507	0.685	
COPY2	1	0.09	1.83	1	0.10	2.80	0.900	0.654	

TOTAL	2	2.11	83.38	2	1.44	121.80	1.465	0.685	
MEAN	2	1.05	41.69	2	0.72	60.90	1.204	0.669	

STEP = IERGENER									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENER1	5	0.31	14.96	5	0.23	26.68	1.389	0.561	
GENER2	7	0.15	3.11	7	0.12	8.10	1.207	0.384	
TOTAL	12	2.62	96.60	12	2.00	190.13	1.310	0.509	
MEAN	2	0.23	9.04	2	0.18	17.39	1.299	0.472	

STEP = IERPTCH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
PTPCH1	1	0.17	1.98	1	0.18	1.39	0.944	1.424	
PTPCH2	2	0.14	2.53	2	0.13	2.10	1.115	1.202	
TOTAL	3	0.46	7.04	3	0.44	5.60	1.045	1.257	
MEAN	2	0.16	2.25	2	0.15	1.75	1.030	1.313	

STEP = IPBUPDAT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
UPDAT1	3	0.20	2.79	3	0.19	2.59	1.070	1.079	
UPDAT2	1	0.23	9.83	1	0.19	9.09	1.211	1.081	
TOTAL	4	0.84	18.20	4	0.76	16.85	1.105	1.090	
MEAN	2	0.22	6.31	2	0.19	5.84	1.140	1.080	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = IEBUPDTE								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

GENUPDTE	3	0.45	2.78	3	0.39	3.52	1.162	0.791
PPDTE1	1	0.15	2.06	1	0.11	2.76	1.364	0.746
UPDTE2	2	0.14	2.57	2	0.13	3.18	1.120	0.809
PPDTE3	1	0.05	0.46	1	0.04	0.99	1.250	0.465
UPDTE4	1	0.36	1.96	1	0.34	1.30	1.059	1.508
UPDTE5	1	0.13	2.11	1	0.13	2.25	1.000	0.938
UPDTE6	2	0.17	1.53	2	0.18	1.93	0.971	0.795

TOTAL	11	2.67	23.13	11	2.39	28.05	1.117	0.825
MEAN	7	0.21	1.92	7	0.19	2.27	1.132	0.864

STEP = IEBUTIL									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.09	1.47	1	0.08	1.41	1.125	1.043	
COPY1	1	2.02	81.55	1	1.34	119.00	1.507	0.685	
COPY2	1	0.09	1.83	1	0.10	2.80	0.900	0.654	
GENER1	5	0.31	14.96	5	0.23	26.68	1.389	0.561	
GP PR2	7	0.15	3.11	7	0.12	8.10	1.207	0.384	
GENUPDTE	3	0.45	2.78	3	0.39	3.52	1.162	0.791	
PPDCH1	1	0.17	1.98	1	0.18	1.39	0.944	1.424	
PTDCH2	2	0.14	2.53	2	0.13	2.10	1.115	1.202	
PPDAT1	3	0.20	2.79	3	0.19	2.59	1.070	1.079	
UPDAT2	1	0.23	9.83	1	0.19	9.09	1.211	1.081	
PPDTE1	1	0.15	2.06	1	0.11	2.76	1.364	0.746	
PPDTE2	2	0.14	2.57	2	0.13	3.18	1.120	0.809	
PPDTE3	1	0.05	0.46	1	0.04	0.99	1.250	0.465	
PPDTE4	1	0.36	1.96	1	0.34	1.30	1.059	1.509	
PPDTE5	1	0.13	2.11	1	0.13	2.25	1.000	0.939	
UPDTE6	2	0.17	1.53	2	0.18	1.93	0.971	0.795	
TOTAL	33	8.79	229.82	33	7.11	363.84	1.236	0.632	
MEAN	16	0.30	8.35	16	0.24	11.82	1.150	0.885	

"IEBUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

ARGONNE NATIONAL LABORATORY
TRM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

TRM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = IEHLIST								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

LIST1	3	0.27	4.67	3	0.22	4.07	1.212	1.147
LIST2	3	0.22	5.71	3	0.20	5.55	1.119	1.028
LIST3	2	0.61	22.49	2	0.53	19.67	1.150	1.143
LIST4	3	0.15	4.90	3	0.14	4.73	1.048	1.035
LIST5	2	0.39	18.98	2	0.36	19.81	1.082	0.958

TOTAL	13	3.92	128.75	13	3.47	122.03	1.130	1.055
MEAN	5	0.33	11.35	5	0.29	10.77	1.122	1.062

STEP = IEHMOVE									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.48	11.08	1	0.44	12.05	1.091	0.920	
MOVE1	3	0.33	5.47	3	0.33	4.52	1.000	1.209	
UTILITY1	1	0.44	6.71	1	0.37	7.57	1.189	0.986	
TOTAL	5	1.91	34.20	5	1.80	33.19	1.061	1.030	
MEAN	3	0.42	7.75	3	0.38	8.05	1.093	1.005	

STEP = IEHPRGM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENUPDTE	3	0.08	0.96	3	0.07	1.16	1.190	0.828	
UTILITY1	4	0.09	0.80	4	0.08	0.92	1.032	0.970	
TOTAL	7	0.57	6.11	7	0.52	7.19	1.096	0.850	
MEAN	2	0.08	0.88	2	0.07	1.04	1.111	0.849	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = IEHUTIL									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COMPMOVP	1	0.48	11.08	1	0.44	12.05	1.091	0.920	
GENUPDTE	3	0.08	0.96	3	0.07	1.16	1.190	0.828	
LIST1	3	0.27	4.67	3	0.22	4.07	1.212	1.147	
LIST2	3	0.22	5.71	3	0.20	5.55	1.119	1.028	
LIST3	2	0.61	22.49	2	0.53	19.67	1.150	1.143	
LIST4	3	0.15	4.90	3	0.14	4.73	1.048	1.035	
LIST5	2	0.39	18.98	2	0.36	19.81	1.082	0.958	
MOVE1	3	0.33	5.47	3	0.33	4.52	1.000	1.209	
UTILITY1	5	0.15	1.99	5	0.14	2.25	1.118	0.881	

TOTAL	25	6.40	169.06	25	5.79	162.41	1.105	1.041	
MEAN	9	0.30	8.47	9	0.27	8.20	1.112	1.017	

"IEHUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

STEP = LOADSGO

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS03B	2	2.47	2.36	2	1.59	3.03	1.553	0.779	
BMKJS06B	3	1.17	3.01	3	0.91	5.19	1.282	0.580	
BMKJS07B	3	0.71	2.54	3	0.18	3.42	1.148	0.742	
BMKJS08A	2	0.62	2.49	2	0.55	3.18	1.136	0.783	
BMKJS08B	2	0.60	2.62	2	0.56	2.42	1.071	1.083	
BMKJS09B	2	5.98	66.20	2	4.88	224.91	1.225	0.294	
BMKJS10B	4	0.16	2.24	4	0.14	3.45	1.105	0.648	
BMKJS11B	3	4.21	2.06	3	2.49	3.66	1.694	0.563	
BMKJS13B	2	0.71	2.58	2	0.65	3.56	1.092	0.725	
BMKJS22A	2	12.96	42.67	2	9.59	35.02	1.351	1.219	
BMKJS23A	2	0.09	1.48	2	0.11	2.09	0.864	0.712	
BMKJS23B	3	0.12	1.64	3	0.11	2.55	1.121	0.642	
BMKJS24A	2	90.86	37.84	2	72.47	72.54	1.258	0.522	
BMKJS24B	2	2.12	4.46	2	1.86	7.34	1.142	0.608	
TOTAL	34	250.63	362.15	34	196.17	766.50	1.278	0.472	
MEAN	14	8.78	12.44	14	6.86	26.60	1.217	0.707	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = PL1								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	4	1.24	7.27	4	1.08	7.69	1.141	0.945
BMKJS02A	3	2.04	6.01	3	1.76	5.31	1.159	1.131
BMKJS22A	1	15.75	23.89	1	13.20	37.22	1.193	0.642
TOTAL	8	26.82	71.00	8	22.82	83.92	1.175	0.846
MEAN	3	6.34	12.39	3	5.35	16.74	1.164	0.906

STEP = UTILITY								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
CCMPMOV	2	0.28	6.27	2	0.26	6.73	1.096	0.932
COPY1	1	2.02	81.55	1	1.34	119.00	1.507	0.685
COPY2	1	0.09	1.83	1	0.10	2.80	0.900	0.654
GFNR01	5	0.31	14.96	5	0.23	26.68	1.389	0.561
GFNR02	7	0.15	3.11	7	0.12	8.10	1.207	0.384
GFNRUPDR	6	0.27	1.87	6	0.23	2.34	1.167	0.800
LIST1	3	0.27	4.67	3	0.22	4.07	1.212	1.147
LIST2	3	0.22	5.71	3	0.20	5.55	1.119	1.028
LIST3	2	0.61	22.49	2	0.53	19.67	1.150	1.143
LIST4	3	0.15	4.90	3	0.14	4.73	1.048	1.035
LIST5	2	0.39	18.98	2	0.36	19.81	1.082	0.958
MOV01	3	0.33	5.47	3	0.33	4.52	1.000	1.209
PTPCH1	1	0.17	1.98	1	0.18	1.39	0.944	1.424
PTPCH2	2	0.14	2.53	2	0.13	2.10	1.115	1.202
UPDAT1	3	0.20	2.79	3	0.19	2.59	1.070	1.079
UPDAT2	1	0.23	9.83	1	0.19	9.09	1.211	1.091
UPDTR1	1	0.15	2.06	1	0.11	2.76	1.364	0.746
UPDTR2	2	0.14	2.57	2	0.13	3.18	1.120	0.809
UPDTR3	1	0.05	0.46	1	0.04	0.99	1.250	0.465
UPDTR4	1	0.36	1.96	1	0.34	1.30	1.059	1.508
UPDTR5	1	0.13	2.11	1	0.13	2.25	1.000	0.938
UPDTR6	2	0.17	1.53	2	0.18	1.93	0.971	0.795
UTILITY1	5	0.15	1.99	5	0.14	2.25	1.118	0.881
TOTAL	54	15.19	398.88	58	12.90	526.25	1.178	0.758
MEAN	23	0.30	8.77	23	0.25	11.04	1.135	0.933

"UTILITY" COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODEL JOBSTREAM

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	121	9.98	5.99	121	6.56	11.40	1.523	0.525
ASM	52	0.32	3.67	52	0.29	6.52	1.104	0.563
EDT	37	0.43	7.61	37	0.36	9.11	1.222	0.835
PTG	17	2.17	1.80	17	1.95	2.33	1.114	0.774
PTH (O)	23	5.85	9.25	23	5.02	10.24	1.165	0.904
GO	87	11.00	4.16	87	6.86	7.05	1.603	0.591
IFBUTIL	33	0.27	6.96	33	0.22	11.03	1.236	0.632
IPHUTIL	25	0.26	6.76	25	0.23	6.50	1.105	1.041
LOADGO	34	7.37	10.65	34	5.77	22.54	1.278	0.472
PL1	8	3.35	8.87	8	2.85	10.49	1.175	0.846
UTILITY	58	0.26	6.88	58	0.22	9.07	1.178	0.758

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	34	13.49	8.29	34	8.66	16.62	1.325	1.071
ASM	5	0.59	5.87	5	0.52	12.48	1.121	0.516
EDT	21	0.43	7.38	21	0.36	9.01	1.203	0.852
PTG	10	3.19	2.02	10	2.85	2.64	1.089	0.826
PTH (O)	23	5.85	9.25	23	5.02	10.24	1.150	0.859
GO	20	16.82	5.38	20	9.92	9.64	1.400	1.326
IFBUTIL	16	0.30	8.35	16	0.24	11.82	1.150	0.885
IPHUTIL	9	0.30	8.47	9	0.27	8.20	1.112	1.017
LOADGO	14	8.74	12.44	14	6.86	26.60	1.217	0.707
PL1	3	6.34	12.39	3	5.35	16.74	1.164	0.906
UTILITY	23	0.30	8.77	23	0.25	11.04	1.135	0.933

"ALL GO " COMBINES ALL GO, LOADGO, AND EDTGO STEPS.

"IFBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IPHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6

IBM 370/195

470V6 / 195

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BMKJS01A	4	1.82	38.82	4	2.16	33.79	0.841	1.149
BMKJS02A	3	2.51	32.92	3	3.16	28.19	0.792	1.168
BMKJS03A	1	8.57	19.95	1	8.29	18.91	1.034	1.755
BMKJS03B	1	5.09	6.85	1	4.99	9.45	1.020	0.725
BMKJS04A	2	87.68	21.12	2	89.66	21.22	0.978	0.995
BMKJS05A	1	68.88	23.02	1	39.41	11.59	1.748	1.986
BMKJS06A	1	3.98	15.11	1	4.76	11.59	0.836	1.321
BMKJS06B	1	3.66	19.10	1	3.80	18.27	0.963	1.045
BMKJS07A	3	0.88	13.77	3	1.07	9.66	0.825	1.426
BMKJS07B	1	1.06	19.85	1	1.18	15.25	0.898	1.302
BMKJS08A	1	1.29	8.92	1	1.53	8.09	0.843	1.103
BMKJS08B	1	1.24	20.27	1	1.57	7.88	0.790	2.572
BMKJS09A	1	14.43	214.56	1	13.10	520.09	1.102	0.413
BMKJS09B	1	10.24	151.98	1	10.59	452.48	0.967	0.336
BMKJS10A	2	0.75	8.05	2	0.95	7.28	0.785	1.106
BMKJS10B	2	0.71	7.70	2	0.90	9.01	0.789	0.855
BMKJS11A	1	11.01	16.74	1	11.78	11.59	0.935	1.444
BMKJS11B	1	9.27	9.87	1	9.21	15.73	1.007	0.627
BMKJS12A	1	23.65	68.90*	1	27.92	74.55*	0.847	0.924
BMKJS13A	1	3.85	31.81	1	4.24	56.85	0.908	0.560
BMKJS13B	1	3.14	26.94	1	3.67	36.35	0.856	0.741
BMKJS14A	1	154.91	64.07	1	106.83	35.20	1.544	1.820
BMKJS15A	1	13.20	23.37	1	16.65	24.98	0.793	0.936
BMKJS15B	1	6.54	30.63	1	7.62	38.95	0.858	0.786
BMKJS16A	1	12.45	28.09	1	14.24	22.50	0.874	1.248
BMKJS17A	1	26.26	58.23	1	31.21	35.29	0.841	1.653
BMKJS18A	1	121.61	17.53	1	42.95	11.04	2.355	1.583
BMKJS19A	1	128.41	76.25	1	130.91	69.89	0.431	1.791
BMKJS19B	1	89.77	54.55	1	88.77	41.08	1.311	1.320
BMKJS20A	1	4.07	16.20	1	5.06	13.56	0.904	1.195
BMKJS21A	3	2.80	58.83	3	3.10	65.25	0.904	0.902
BMKJS21B	7	0.20	4.43	7	0.22	5.69	0.914	0.779
BMKJS22A	1	24.75	87.56	1	32.39	107.27	0.764	0.816
BMKJS23A	1	1.09	5.59	1	1.27	7.49	0.858	0.746
BMKJS23B	1	1.22	9.91	1	1.39	10.30	0.878	0.962
BMKJS24A	1	123.36	187.04	1	146.90	149.85	0.840	1.248
BMKJS24B	1	4.90	23.55	1	5.63	19.40	0.870	1.214
COMPMOVP	1	0.43	20.63	1	0.52	13.46	0.827	1.533
COPY1	1	1.30	118.99	1	1.34	119.00	0.970	1.000
COPY2	1	0.10	2.37	1	0.10	2.80	1.000	0.886
GENPR1	5	0.23	19.44	5	0.23	26.68	1.027	0.729
GENPR2	7	0.11	3.87	7	0.12	8.10	0.895	0.478
GENUPDTP	3	0.45	5.58	3	0.46	4.68	0.971	1.193
LIST1	3	0.24	5.43	3	0.22	4.07	1.076	1.334
LIST2	3	0.20	5.61	3	0.20	5.55	1.034	1.010
LIST3	2	0.59	21.58	2	0.53	19.67	1.103	1.097

[illegible]

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195	
STPP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	12	0.07	1.18	12	0.08	1.18	0.888	1.031
BMKJS02A	9	0.11	2.34	9	0.12	1.92	0.891	1.214
BMKJS03A	4	1.71	0.79	4	1.51	0.78	1.133	1.023
BMKJS03B	2	1.87	2.49	2	1.59	3.03	1.176	0.820
BMKJS04A	6	28.73	1.69	6	29.24	1.69	0.983	1.003
BMKJS05A	3	22.09	2.22	3	12.03	0.89	1.837	2.491
BMKJS06A	3	0.35	0.75	3	0.37	0.83	0.955	0.900
BMKJS06B	3	0.93	5.31	3	0.91	5.19	1.018	1.023
BMKJS07A	12	0.06	1.34	12	0.07	0.94	0.843	1.426
BMKJS07B	3	0.17	4.23	3	0.18	3.42	0.963	1.236
BMKJS08A	2	0.45	1.80	2	0.55	3.18	0.827	0.567
BMKJS08B	2	0.45	8.97	2	0.56	2.42	0.796	3.709
BMKJS09A	3	4.52	69.23	3	4.02	171.14	1.125	0.405
BMKJS09B	2	4.76	73.65	2	4.88	224.91	0.975	0.327
BMKJS10A	6	0.06	1.18	6	0.06	1.02	1.000	1.151
BMKJS10B	4	0.12	3.07	4	0.14	3.45	0.860	0.889
BMKJS11A	3	2.75	1.05	3	2.75	0.75	0.999	1.394
BMKJS11B	3	2.60	2.51	3	2.49	3.66	1.044	0.684
BMKJS12A	2	1.12	1.34*	2	0.15	1.06*		
BMKJS13A	3	0.48	1.65	3	0.54	0.74	0.894	2.220
BMKJS13B	2	0.54	2.80	2	0.65	3.56	0.838	0.785
BMKJS14A	2	76.76	2.48	2	46.48	1.53	1.651	1.616
BMKJS15A	3	0.54	0.93	3	0.58	1.73	0.936	0.538
BMKJS15B	1	0.02	0.10	1	0.03	0.10	0.667	1.000
BMKJS16A	4	1.41	1.71	4	1.49	0.89	0.941	1.916
BMKJS17A	2	3.04	1.00	2	3.55	1.32	0.855	0.761
BMKJS18A	3	33.14	2.07	3	13.46	0.63	2.462	3.291
BMKJS19A	3	40.46	1.92	3	40.89	1.77	0.989	1.083
BMKJS19B	2	42.16	4.56	2	41.10	2.51	1.026	1.817
BMKJS20A	3	0.08	0.41	3	0.05	0.42	0.786	0.984
BMKJS22A	2	7.46	30.70	2	9.59	35.02	0.777	0.877
BMKJS23A	2	0.09	1.84	2	0.11	2.09	0.864	0.880
BMKJS23B	3	0.10	1.99	3	0.11	2.55	0.879	0.779
BMKJS24A	2	60.85	90.10	2	72.47	72.54	0.940	1.242
BMKJS24B	2	1.63	6.01	2	1.86	7.34	0.879	0.819
TOTAL	121	912.91	826.52	121	793.22	1379.74	1.151	0.599
MEAN	34	10.02	9.83	34	8.66	16.62	1.018	1.231

*ALL GO * COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

ARGONNE NATIONAL LABORATORY
ANDAH 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

ANDAH 470V/6				IBM 370/195			470V6 / 195		
STEP = ASM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BKJS13A	2	0.65	9.15	2	0.70	23.00	0.929	0.398	
BKJS13B	2	0.62	9.54	2	0.71	13.74	0.873	0.694	
BKJS19A	2	0.64	13.12	2	0.75	14.95	0.860	0.877	
BKJS21A	39	0.22	4.53	39	0.24	5.02	0.904	0.902	
BKJS21B	7	0.20	4.43	7	0.22	5.69	0.914	0.779	
TOTAL	52	13.62	271.14	52	15.13	339.00	0.910	0.800	
MEAN	5	0.47	8.15	5	0.52	12.48	0.896	0.710	

STEP = EDT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BKJS01A	8	0.34	13.74	8	0.41	11.29	0.819	1.217	
BKJS02A	3	0.51	16.58	3	0.67	14.99	0.760	1.106	
BKJS03A	2	0.17	7.07	2	0.21	6.85	0.833	1.033	
BKJS04A	4	0.18	7.22	4	0.22	6.80	0.778	1.061	
BKJS05A	1	0.16	5.22	1	0.20	3.16	0.800	1.652	
BKJS06A	1	0.23	11.51	1	0.27	6.91	0.852	1.666	
BKJS07A	1	0.18	6.49	3	0.19	4.37	0.947	1.485	
BKJS09A	1	0.17	5.48	1	0.20	3.73	0.850	1.469	
BKJS10A	2	0.12	3.20	2	0.15	2.97	0.742	1.077	
BKJS11A	1	0.18	10.77	1	0.22	7.23	0.819	1.490	
BKJS12A	1	0.55	11.97	1	0.58	12.63	0.948	0.949	
BKJS13A	1	0.25	5.13	1	0.24	6.65	1.042	0.771	
BKJS14A	1	0.40	15.58	1	0.43	9.56	0.930	1.630	
BKJS15A	1	0.42	16.05	1	0.49	12.65	0.857	1.263	
BKJS15B	1	0.49	11.80	1	0.52	23.30	0.942	0.506	
BKJS16A	1	0.22	4.98	1	0.25	6.92	0.880	0.720	
BKJS17A	1	0.55	15.20	1	0.49	11.06	1.122	1.374	
BKJS18A	1	0.17	6.42	1	0.19	4.02	0.895	1.597	
BKJS19A	1	0.41	11.50	1	0.55	12.11	0.745	0.950	
BKJS19B	1	0.50	15.29	1	0.64	16.52	0.781	0.926	
BKJS20A	1	0.29	6.72	1	0.37	5.46	0.784	1.231	
TOTAL	37	11.05	382.16	37	13.16	337.13	0.940	1.134	
MEAN	21	0.31	9.90	21	0.36	9.01	0.863	1.199	

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 MODEL JOBSTREAM

AMDahl 470V/6				IBM 370/195			470V6 / 195		
STEP = PTG									
JORNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS02A	3	0.30	2.10	3	0.37	2.12	0.811	0.994	
BMKJS03A	1	1.39	2.63	1	1.84	2.11	0.755	1.246	
BMKJS03B	1	1.35	1.87	1	1.81	3.38	0.746	0.553	
BMKJS04A	2	1.14	1.59	2	1.49	2.55	0.766	0.625	
BMKJS06A	1	2.69	1.56	1	3.38	2.19	0.796	0.712	
BMKJS07A	3	0.47	1.92	3	0.60	1.53	0.778	1.255	
BMKJS10A	2	0.46	1.31	2	0.63	1.24	0.736	1.060	
BMKJS10B	2	0.46	1.55	2	0.61	2.10	0.756	0.740	
BMKJS11A	1	2.59	2.82	1	3.31	2.10	0.782	1.343	
BMKJS15A	1	11.16	4.52	1	14.43	7.13	0.773	0.634	
TOTAL	17	25.62	34.39	17	33.15	39.62	0.773	0.869	
MEAN	10	2.20	2.19	10	2.85	2.64	0.770	0.916	

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195	
STEP = PTH (0)								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS05A	1	2.45	11.15	1	3.13	5.76	0.783	1.936
BMKJS06B	1	0.88	3.17	1	1.07	2.70	0.822	1.174
BMKJS07B	1	0.54	7.17	1	0.64	4.99	0.844	1.437
BMKJS08A	1	0.38	5.31	1	0.43	1.72	0.884	3.087
BMKJS08B	1	0.34	2.32	1	0.44	3.04	0.773	0.763
BMKJS09A	1	0.69	1.40	1	0.84	2.95	0.821	0.475
BMKJS09B	1	0.72	4.68	1	0.83	2.66	0.867	1.759
BMKJS11B	1	1.48	2.35	1	1.75	4.74	0.846	0.496
BMKJS12A	1	23.10	56.93	1	27.34	61.92	0.845	0.919
BMKJS13A	1	0.85	3.43	1	0.98	1.96	0.867	1.750
BMKJS13B	1	0.81	2.26	1	0.95	1.73	0.953	1.306
BMKJS14A	1	10.98	43.53	1	13.43	22.57	0.914	1.929
BMKJS15B	1	6.03	18.73	1	7.07	15.55	0.853	1.205
BMKJS16A	1	6.60	16.25	1	8.01	12.00	0.824	1.354
BMKJS17A	1	19.63	41.02	1	23.61	21.59	0.931	1.900
BMKJS18A	1	2.01	4.89	1	2.38	5.11	0.945	0.953
BMKJS19A	1	5.34	32.76	1	6.18	22.56	0.864	1.452
BMKJS19B	1	4.95	30.14	1	5.93	19.54	0.815	1.542
BMKJS20A	1	3.67	8.24	1	4.55	6.84	0.807	1.205
BMKJS21A	1	0.90	1.92	1	1.05	3.32	0.857	0.579
BMKJS23B	1	0.93	3.94	1	1.06	2.64	0.977	1.492
BMKJS24A	1	1.66	6.83	1	1.96	4.77	0.847	1.432
BMKJS24B	1	1.63	11.54	1	1.91	4.73	0.953	2.440
TOTAL	23	96.57	319.36	23	115.54	235.41	0.836	1.359
MPAN	23	4.20	13.91	23	5.02	10.24	0.840	1.417

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195	
STPP = 60								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	12	0.07	1.18	12	0.08	1.18	0.988	1.001
BMKJS02A	9	0.11	2.34	9	0.12	1.92	0.891	1.214
BMKJS03A	4	1.71	0.79	4	1.51	0.78	1.133	1.021
BMKJS04A	6	28.73	1.69	6	29.24	1.69	0.983	1.003
BMKJS05A	3	22.09	2.22	3	12.03	0.89	1.837	2.491
BMKJS06A	3	0.35	0.75	3	0.37	0.83	0.955	0.900
BMKJS07A	12	0.06	1.34	12	0.07	0.94	0.843	1.426
BMKJS09A	3	4.52	69.23	3	4.02	171.14	1.125	0.405
BMKJS10A	6	0.06	1.18	6	0.06	1.02	1.000	1.151
BMKJS11A	3	2.75	1.05	3	2.75	0.75	0.999	1.394
BMKJS12A	2	1.12	1.34*	2	0.15	1.06*		
BMKJS13A	3	0.48	1.65	3	0.54	0.74	0.894	2.220
BMKJS14A	2	76.76	2.48	2	46.48	1.53	1.651	1.616
BMKJS15A	3	0.54	0.93	3	0.58	1.73	0.936	0.538
BMKJS15R	1	0.02	0.10	1	0.03	0.10	0.667	1.000
BMKJS16A	4	1.41	1.71	4	1.49	0.89	0.941	1.916
BMKJS17A	2	3.04	1.00	2	3.55	1.32	0.855	0.761
BMKJS18A	3	13.14	2.07	3	13.46	0.63	2.462	3.291
BMKJS19A	3	40.46	1.92	3	40.89	1.77	0.989	1.083
BMKJS19B	2	42.16	4.56	2	41.10	2.51	1.026	1.817
BMKJS20A	3	0.04	0.41	3	0.05	0.42	0.786	0.984
TOTAL	97	744.80	335.39	87	597.05	613.24	1.247	0.547
MEAN	20	12.92	4.93	20	9.92	9.64	1.001	1.362

STEP = IZPCOMPR

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPROVE	1	0.07	2.25	1	0.08	1.41	0.875	1.596	
TOTAL	1	0.07	2.25	1	0.08	1.41	0.875	1.596	
MEAN	1	0.07	2.25	1	0.08	1.41	0.875	1.596	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 MODEL JOBSTREAM

ANDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IEBCOPY									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COPY1	1	1.30	118.99	1	1.34	119.00	0.970	1.000	
COPY2	1	0.10	2.37	1	0.10	2.80	1.000	0.846	

TOTAL	2	1.40	121.36	2	1.44	121.80	0.972	0.996	
MEAN	2	0.70	60.68	2	0.72	60.90	0.985	0.923	

STEP = IERGENER									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENER1	5	0.23	19.44	5	0.23	26.68	1.027	0.729	
GENER2	7	0.11	3.87	7	0.12	8.10	0.885	0.478	
TOTAL	12	1.93	124.31	12	2.00	190.13	0.965	0.654	
MEAN	2	0.17	11.66	2	0.18	17.39	0.956	0.603	

STEP = IEBPTPCH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
PTPCH1	1	0.20	1.52	1	0.18	1.39	1.111	1.094	
PTPCH2	2	0.14	3.46	2	0.13	2.10	1.115	1.646	
TOTAL	3	0.49	8.45	3	0.44	5.60	1.114	1.509	
MEAN	2	0.17	2.49	2	0.15	1.75	1.113	1.170	

STEP = IEBUGDAT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
UPDAT1	3	0.18	2.88	3	0.19	2.59	0.947	1.112	
UPDAT2	1	0.20	5.40	1	0.19	9.09	1.053	0.594	
TOTAL	4	0.74	14.03	4	0.76	16.85	0.974	0.833	
MEAN	2	0.19	4.14	2	0.19	5.88	1.000	0.953	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IEBUPDTE									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

GENUPDTE	3	0.38	4.57	3	0.39	3.52	0.966	1.300	
UPDTE1	1	0.08	4.31	1	0.11	2.76	0.727	1.562	
UPDTE2	2	0.09	3.12	2	0.13	3.18	0.760	0.983	
UPDTE3	1	0.04	0.21	1	0.04	0.99	1.000	0.212	
UPDTE4	1	0.35	3.00	1	0.34	1.30	1.029	2.308	
UPDTE5	1	0.09	6.30	1	0.13	2.25	0.692	2.800	
UPDTE6	2	0.18	1.96	2	0.18	1.93	1.029	1.018	

TOTAL	11	2.24	37.70	11	2.39	28.05	0.937	1.344	
MEAN	7	0.17	3.35	7	0.19	2.27	0.886	1.455	

STEP = IEBUTIL									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.07	2.25	1	0.08	1.41	0.875	1.596	
COPY1	1	1.30	118.99	1	1.34	119.00	0.970	1.000	
COPY2	1	0.10	2.37	1	0.10	2.80	1.000	0.846	
GENPR1	5	0.23	19.44	5	0.23	26.68	1.027	0.729	
GENPR2	7	0.11	3.87	7	0.12	8.10	0.885	0.478	
GENUPDTE	3	0.38	4.57	3	0.39	3.52	0.966	1.300	
PTPCH1	1	0.20	1.52	1	0.18	1.39	1.111	1.094	
PTPCH2	2	0.14	3.46	2	0.13	2.10	1.115	1.646	
UPDAT1	3	0.18	2.88	3	0.19	2.59	0.947	1.112	
UPDAT2	1	0.20	5.40	1	0.19	9.09	1.053	0.594	
UPDTE1	1	0.08	4.31	1	0.11	2.76	0.727	1.562	
UPDTE2	2	0.09	3.12	2	0.13	3.18	0.760	0.983	
UPDTE3	1	0.04	0.21	1	0.04	0.99	1.000	0.212	
UPDTE4	1	0.35	3.00	1	0.34	1.30	1.029	2.308	
UPDTE5	1	0.09	6.30	1	0.13	2.25	0.692	2.800	
UPDTE6	2	0.18	1.96	2	0.18	1.93	1.029	1.018	
TOTAL	33	6.87	308.10	33	7.11	363.84	0.966	0.847	
MEAN	16	0.23	11.48	16	0.24	11.82	0.949	1.205	

"IEBUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IEHLIST									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

LIST1	3	0.24	5.43	3	0.22	4.07	1.076	1.334	
LIST2	3	0.20	5.61	3	0.20	5.55	1.034	1.010	
LIST3	2	0.59	21.58	2	0.53	19.67	1.103	1.097	
LIST4	3	0.11	6.68	3	0.14	4.73	0.786	1.412	
LIST5	2	0.31	26.31	2	0.36	19.81	0.863	1.328	

TOTAL	13	3.46	148.93	13	3.47	122.03	0.997	1.220	
MEAN	5	0.29	13.12	5	0.29	10.77	0.972	1.236	

STEP = IEHMOVE									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMHMOVE	1	0.36	18.38	1	0.44	12.05	0.818	1.525	
MOVE1	3	0.32	13.28	3	0.33	4.52	0.960	2.935	
UTILITY1	1	0.31	11.49	1	0.37	7.57	0.838	1.519	
TOTAL	5	1.62	69.70	5	1.80	33.19	0.900	2.100	
MEAN	3	0.33	14.38	3	0.38	8.05	0.872	1.993	

STEP = IEHPRGM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENUPDTE	3	0.07	1.01	3	0.07	1.16	1.000	0.868	
UTILITY1	4	0.07	1.23	4	0.08	0.92	0.971	1.335	
TOTAL	7	0.48	7.97	7	0.52	7.19	0.923	1.108	
MEAN	2	0.07	1.12	2	0.07	1.04	0.935	1.102	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IEHUTIL									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COMPMOVP	1	0.36	18.38	1	0.44	12.05	0.818	1.525	
GENUPDTP	3	0.07	1.01	3	0.07	1.16	1.000	0.863	
LIST1	3	0.24	5.43	3	0.22	4.07	1.076	1.334	
LIST2	3	0.20	5.61	3	0.20	5.55	1.034	1.010	
LIST3	2	0.59	21.58	2	0.53	19.67	1.103	1.097	
LIST4	3	0.11	6.68	3	0.14	4.73	0.786	1.412	
LIST5	2	0.31	26.31	2	0.36	19.81	0.863	1.328	
MOVE1	3	0.32	13.28	3	0.33	4.52	0.960	2.935	
UTILITY1	5	0.12	3.29	5	0.14	2.25	0.853	1.458	

TOTAL	25	5.56	226.60	25	5.79	162.41	0.960	1.395	
MEAN	9	0.26	11.28	9	0.27	8.20	0.944	1.441	

"IEHUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

STEP = LOADSGO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS03B	2	1.87	2.49	2	1.59	3.03	1.176	0.820	
BMKJS06B	3	0.93	5.31	3	0.91	5.19	1.018	1.023	
BMKJS07B	3	0.17	4.23	3	0.18	3.42	0.963	1.236	
BMKJS08A	2	0.45	1.80	2	0.55	3.18	0.827	0.567	
BMKJS09B	2	0.45	8.97	2	0.56	2.42	0.796	3.709	
BMKJS09B	2	4.76	73.65	2	4.88	224.91	0.975	0.327	
BMKJS10B	4	0.12	3.07	4	0.14	3.45	0.860	0.889	
BMKJS11B	3	2.60	2.51	3	2.49	3.66	1.044	0.684	
BMKJS13B	2	0.54	2.80	2	0.65	3.56	0.838	0.785	
BMKJS22A	2	7.46	30.70	2	9.59	35.02	0.777	0.877	
BMKJS23A	2	0.09	1.84	2	0.11	2.09	0.864	0.880	
BMKJS23B	3	0.10	1.99	3	0.11	2.55	0.879	0.779	
BMKJS24A	2	60.85	90.10	2	72.47	72.54	0.840	1.242	
BMKJS24B	2	1.63	6.71	2	1.86	7.34	0.879	0.819	
TOTAL	34	168.11	491.13	34	196.17	766.50	0.857	0.641	
MEAN	14	5.86	16.82	14	6.86	26.60	0.910	1.046	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = PL1									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BMKJS01A	4	0.92	7.80	4	1.08	7.69	0.848	1.015	
BMKJS02A	3	1.37	7.23	3	1.76	5.31	0.780	1.361	
BMKJS22A	1	9.83	26.15	1	13.20	37.22	0.745	0.703	

TOTAL	8	17.63	79.07	8	22.82	83.92	0.773	0.942	
MEAN	3	4.04	13.73	3	5.35	16.74	0.791	1.026	

STEP = UTILITY									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	2	0.21	10.31	2	0.26	6.73	0.827	1.533	
COPY1	1	1.30	118.99	1	1.34	119.00	0.970	1.000	
COPY2	1	0.10	2.37	1	0.10	2.80	1.000	0.846	
GENPR1	5	0.23	19.44	5	0.23	26.68	1.027	0.729	
GENER2	7	0.11	3.87	7	0.12	8.10	0.885	0.478	
GENUPDT	6	0.22	2.79	6	0.23	2.34	0.971	1.193	
LIST1	3	0.24	5.43	3	0.22	4.07	1.076	1.334	
LIST2	3	0.20	5.61	3	0.20	5.55	1.034	1.010	
LIST3	2	0.59	21.58	2	0.53	19.67	1.103	1.097	
LIST4	3	0.11	6.68	3	0.14	4.73	0.786	1.412	
LIST5	2	0.31	26.31	2	0.36	19.81	0.863	1.328	
MOVPR1	3	0.32	13.28	3	0.33	4.52	0.960	2.935	
PTPCH1	1	0.20	1.52	1	0.18	1.39	1.111	1.094	
PTPCH2	2	0.14	3.46	2	0.13	2.10	1.115	1.646	
UPDAT1	3	0.18	2.88	3	0.19	2.59	0.947	1.112	
UPDAT2	1	0.20	5.40	1	0.19	9.09	1.053	0.594	
UPDTE1	1	0.08	4.31	1	0.11	2.76	0.727	1.562	
UPDTE2	2	0.09	3.12	2	0.13	3.18	0.760	0.983	
UPDTE3	1	0.04	0.21	1	0.04	0.99	1.000	0.212	
UPDTE4	1	0.35	3.00	1	0.34	1.30	1.029	2.308	
UPDTE5	1	0.09	6.30	1	0.13	2.25	0.692	2.800	
UPDTE6	2	0.18	1.96	2	0.18	1.93	1.029	1.014	
UTILITY1	5	0.12	3.29	5	0.14	2.25	0.853	1.458	
TOTAL	58	12.43	534.70	58	12.90	526.25	0.964	1.016	
MEAN	23	0.24	11.83	23	0.25	11.04	0.949	1.290	

"UTILITY" COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODEL JOBSTREAM

AMDAHL 470V/6

IBM 370/195

470V6 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	121	7.54	6.83	121	6.56	11.40	1.151	0.599
ASM	52	0.26	5.21	52	0.29	6.52	0.900	0.800
EDT	37	0.30	10.33	37	0.36	9.11	0.840	1.174
PTG	17	1.51	2.02	17	1.95	2.33	0.773	0.868
PTH (0)	23	4.20	13.91	23	5.02	10.24	0.836	1.359
GO	87	8.56	3.86	87	6.86	7.05	1.247	0.547
IEBUTIL	33	0.21	9.34	33	0.22	11.03	0.966	0.847
IFHUTIL	25	0.22	9.06	25	0.23	6.50	0.960	1.395
LOAD&GO	34	4.94	14.44	34	5.77	22.54	0.857	0.641
PL1	8	2.20	9.88	8	2.85	10.49	0.773	0.942
UTILITY	58	0.21	9.22	58	0.22	9.07	0.964	1.016

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	34	10.02	9.83	34	8.66	16.62	1.018	1.231
ASM	5	0.47	8.15	5	0.52	12.48	0.896	0.730
EDT	21	0.31	9.90	21	0.36	9.01	0.863	1.199
PTG	10	2.20	2.19	10	2.85	2.64	0.770	0.916
PTH (0)	23	4.20	13.91	23	5.02	10.24	0.840	1.417
GO	20	12.92	4.93	20	9.92	9.64	1.093	1.362
IEBUTIL	16	0.23	11.48	16	0.24	11.82	0.949	1.205
IFHUTIL	9	0.26	11.28	9	0.27	8.20	0.944	1.441
LOAD&GO	14	5.86	16.82	14	6.86	26.60	0.910	1.046
PL1	3	4.04	13.73	3	5.35	16.74	0.791	1.026
UTILITY	23	0.24	11.83	23	0.25	11.04	0.949	1.290

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IFHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470V6

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BMKTSMP1	1	281.07	5.01	1	174.77	7.64	1.608	0.656
BMKJS01A	4	2.42	34.37	4	1.80	36.69	1.341	0.937
BMKJS02A	3	3.72	28.35	3	2.50	31.46	1.489	0.901
BMKJS03A	1	11.49	9.73	1	8.63	15.85	1.331	0.614
BMKJS03B	1	6.81	4.45	1	5.22	5.28	1.305	0.843
BMKJS04A	2	101.15	11.06	2	98.34	20.48	1.029	0.540
BMKJS05A	5	74.73	8.87	5	67.25	12.44	1.111	0.713
BMKJS06A	1	5.49	10.67	1	3.92	16.69	1.401	0.639
BMKJS06B	1	4.77	9.61	1	3.69	17.34	1.293	0.554
BMKJS07A	3	1.20	8.44	3	0.84	11.53	1.423	0.733
BMKJS07B	1	1.34	12.80	1	1.04	16.45	1.288	0.778
BMKJS08A	1	1.69	4.35	1	1.26	9.23	1.341	0.471
BMKJS08B	1	1.73	7.00	1	1.30	7.74	1.331	0.904
BMKJS09A	1	18.67	192.75	1	14.25	520.20	1.310	0.371
BMKJS09B	1	12.93	231.67	1	9.98	466.03	1.296	0.497
BMKJS10A	2	1.04	7.05	2	0.80	7.80	1.306	0.904
BMKJS10B	2	1.01	6.49	2	0.74	7.05	1.372	0.921
BMKJS11A	1	18.21	11.02	1	10.65	11.66	1.710	0.945
BMKJS11B	1	14.50	8.43	1	9.28	6.64	1.563	1.270
BMKJS12A	1	31.70	63.04*	1	23.35	67.08*	1.358	0.940
BMKJS13A	1	4.76	16.42	1	3.70	35.40	1.286	0.464
BMKJS13B	1	4.18	25.84	1	3.15	27.04	1.327	0.956
BMKJS14A	1	196.08	24.04	1	157.82	36.47	1.242	0.659
BMKJS15A	1	17.98	8.87	1	12.71	13.73	1.415	0.646
BMKJS15B	1	9.05	25.83	1	6.53	47.84	1.386	0.540
BMKJS16A	1	18.92	18.19	1	12.12	23.78	1.561	0.765
BMKJS17A	1	36.34	42.27	1	25.96	53.37	1.400	0.792
BMKJS18A	1	104.00	7.13	1	97.53	7.19	1.066	0.992
BMKJS19A	1	189.59	47.23	1	128.70	58.18	1.473	0.812
BMKJS19B	5	126.89	28.05	5	85.69	37.35	1.481	0.751
BMKJS20A	1	5.53	10.24	1	4.01	13.23	1.379	0.774
BMKJS21A	3	3.40	37.40	3	2.88	43.54	1.179	0.859
BMKJS21B	7	0.24	2.53	7	0.21	3.29	1.153	0.769
BMKJS22A	1	40.95	91.55	1	25.45	56.96	1.609	1.607
BMKJS23A	1	1.39	4.55	1	1.09	5.45	1.275	0.835
BMKJS23B	1	1.39	6.57	1	1.15	11.67	1.209	0.563
BMKJS24A	1	182.34	71.15	1	124.29	159.39	1.467	0.446
BMKJS24B	1	6.23	10.10	1	4.91	13.47	1.269	0.757
CONPMOVE	1	0.52	11.33	1	0.48	16.54	1.083	0.685
COPY1	1	1.95	80.65	1	1.45	86.34	1.345	0.934
COPY2	1	0.15	2.41	1	0.11	2.53	1.364	0.953
D*ATMUL	1	249.18	12.35	1	252.57	13.02	0.987	0.943
EMATMUL	1	208.88	11.96	1	145.18	11.51	1.439	1.039
GENER1	5	0.25	22.78	5	0.23	19.65	1.085	1.160
GENPR2	7	0.15	3.18	7	0.10	6.19	1.451	0.514
GENIPDTP	3	0.46	3.89	3	0.45	5.80	1.007	0.671

LIST1	3	0.24	4.04	3	0.22	5.86	1.091	0.688
LIST2	3	0.19	6.14	3	0.20	5.96	0.951	1.031
LIST3	2	0.69	19.83	2	0.52	20.91	1.337	0.948
LIST4	3	0.16	5.56	3	0.14	5.19	1.093	1.071
LIST5	2	0.36	21.30	2	0.31	24.94	1.177	0.854
MOVE1	3	0.34	4.69	3	0.35	13.81	0.981	0.340
NATRAK	1	155.39	14.17	1	94.43	19.62	1.646	0.722
PTPCH1	1	0.17	2.69	1	0.18	3.10	0.944	0.868
PTPCH2	2	0.11	2.89	2	0.12	2.28	0.920	1.267
UPDAT1	3	0.21	2.00	3	0.18	2.86	1.164	0.699
UPDAT2	1	0.22	5.75	1	0.26	4.21	0.846	1.366
UPDTR1	1	0.09	2.88	1	0.13	2.84	0.692	1.014
UPDTR2	2	0.15	2.59	2	0.10	3.18	1.476	0.815
UPDTR3	1	0.06	0.72	1	0.04	0.46	1.500	1.565
UPDTR4	1	0.35	2.02	1	0.34	3.34	1.029	0.605
UPDTR5	1	0.13	1.80	1	0.10	5.26	1.300	0.342
UPDTR6	2	0.19	1.24	2	0.18	1.91	1.114	0.649
UTILITY1	1	0.69	11.76	1	0.54	19.82	1.278	0.593
TOTAL	117	3107.88	2063.47	117	2373.07	3034.99	1.310	0.680
MEAN	64	33.85	22.09	64	25.57	35.15	1.276	0.804

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJSMP1	1	279.85	1.81	1	173.93	1.72	1.609	1.052
BMKJS01A	12	0.09	1.39	12	0.07	1.10	1.329	1.264
BMKJS02A	9	0.14	2.71	9	0.10	1.94	1.413	1.391
BMKJS03A	4	2.27	0.32	4	1.72	0.36	1.321	0.897
BMKJS03B	2	2.43	1.81	2	1.91	2.03	1.275	0.894
BMKJS04A	6	33.04	0.58	6	32.30	1.67	1.023	0.347
BMKJS05A	15	23.69	0.71	15	21.55	0.97	1.099	0.734
BMKJS06A	3	0.45	0.51	3	0.33	1.65	1.388	0.312
BMKJS06B	3	1.17	2.61	3	0.93	4.75	1.254	0.550
BMKJS07A	12	0.07	0.96	12	0.05	1.26	1.303	0.759
BMKJS07B	3	0.20	2.15	3	0.17	2.20	1.200	0.974
BMKJS08A	2	0.60	1.66	2	0.44	2.89	1.375	0.574
BMKJS08B	2	0.62	2.83	2	0.47	2.93	1.319	0.966
BMKJS09A	3	5.83	62.07	3	4.46	170.60	1.308	0.364
BMKJS09B	2	5.96	114.42	2	4.63	231.69	1.287	0.494
BMKJS10A	6	0.06	0.98	6	0.06	0.69	1.086	1.408
BMKJS10B	4	0.16	2.61	4	0.13	2.57	1.275	1.016
BMKJS11A	3	4.76	0.59	3	2.65	0.57	1.795	1.023
BMKJS11B	3	4.18	2.21	3	2.62	1.60	1.595	1.378
BMKJS12A	2	0.46	0.75*	2	1.18	0.93*		
BMKJS13A	3	0.60	0.44	3	0.45	0.45	1.316	0.978
BMKJS13B	2	0.71	2.77	2	0.54	1.84	1.324	1.504
BMKJS14A	2	90.54	0.61	2	73.40	0.65	1.234	0.931
BMKJS15A	3	0.65	0.64	3	0.53	0.83	1.241	0.768
BMKJS15B	1	0.01	0.14	1	0.02	0.13	0.500	1.077
BMKJS16A	4	2.29	0.68	4	1.37	0.88	1.672	0.768
BMKJS17A	2	4.27	1.90	2	2.99	1.09	1.430	1.735
BMKJS18A	3	33.70	0.32	3	31.81	0.30	1.059	1.078
BMKJS19A	3	60.10	1.22	3	40.54	1.22	1.483	1.000
BMKJS19B	10	59.81	1.68	10	40.15	1.59	1.490	1.055
BMKJS20A	3	0.05	0.31	3	0.05	0.34	1.143	0.921
BMKJS22A	2	12.86	27.85	2	7.76	20.67	1.658	1.347
BMKJS23A	2	0.11	1.42	2	0.09	1.56	1.158	0.911
BMKJS23B	3	0.10	1.67	3	0.08	2.70	1.292	0.621
BMKJS24A	2	90.06	33.81	2	61.29	76.55	1.469	0.442
BMKJS24B	2	2.02	2.73	2	1.60	4.52	1.259	0.603
DMATHUL	1	247.30	2.02	1	251.26	2.69	0.984	0.751
EMATHUL	1	207.03	1.46	1	143.89	1.90	1.439	0.768
NATRAH	1	146.68	2.05	1	88.22	2.73	1.663	0.751
TOTAL	145	2410.96	719.18	145	2155.56	1369.52	1.304	0.525
MEAN	39	34.86	7.54	38	26.17	14.63	1.318	0.905

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = ASM								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS13A	2	0.80	4.84	2	0.63	11.11	1.260	0.436
BMKJS13B	2	0.82	9.26	2	0.61	10.95	1.344	0.846
BMKJS19A	2	0.85	7.83	2	0.65	8.93	1.298	0.877
BMKJS21A	39	0.26	2.88	39	0.22	3.35	1.179	0.859
BMKJS21B	7	0.24	2.53	7	0.21	3.29	1.153	0.769
TOTAL	52	16.79	173.80	52	13.88	215.65	1.210	0.806
MEAN	5	0.59	5.47	5	0.47	7.53	1.247	0.757

STEP = EDT								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	8	0.48	11.36	8	0.35	13.33	1.373	0.852
BMKJS02A	3	0.79	12.10	3	0.49	16.40	1.619	0.738
BMKJS03A	2	0.26	3.73	2	0.19	6.72	1.432	0.555
BMKJS04A	4	0.24	4.04	4	0.18	6.92	1.333	0.588
BMKJS05A	5	0.22	2.57	5	0.14	3.80	1.514	0.676
BMKJS06A	1	0.27	6.83	1	0.21	8.66	1.286	0.789
BMKJS07A	3	0.26	3.21	3	0.15	4.55	1.756	0.705
BMKJS09A	1	0.23	4.92	1	0.19	6.16	1.211	0.799
BMKJS10A	2	0.19	2.78	2	0.14	3.63	1.393	0.766
BMKJS11A	1	0.25	6.57	1	0.17	8.38	1.471	0.784
BMKJS12A	1	0.73	12.01	1	0.57	25.66	1.281	0.468
BMKJS13A	1	0.26	4.42	1	0.22	7.13	1.182	0.620
BMKJS14A	1	0.53	5.84	1	0.42	7.12	1.262	0.820
BMKJS15A	1	0.47	6.16	1	0.36	9.94	1.306	0.620
BMKJS15B	1	0.66	13.22	1	0.48	18.62	1.375	0.710
BMKJS16A	1	0.39	4.06	1	0.21	6.49	1.810	0.626
BMKJS17A	1	0.61	14.08	1	0.48	17.84	1.271	0.789
BMKJS18A	1	0.21	2.63	1	0.19	2.28	1.105	1.154
BMKJS19A	1	0.60	8.22	1	0.44	9.69	1.364	0.848
BMKJS19B	5	0.72	7.46	5	0.48	10.58	1.492	0.705
BMKJS20A	1	0.42	3.74	1	0.30	5.38	1.400	0.695
TOTAL	45	19.17	308.81	45	13.44	423.11	1.426	0.730
MEAN	21	0.42	6.66	21	0.30	9.49	1.392	0.729

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470V6	
STEP = FTG								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS02A	3	0.40	1.95	3	0.30	2.48	1.309	0.788
BMKJS03A	1	1.87	0.97	1	1.38	0.96	1.355	1.010
BMKJS03B	1	1.94	0.82	1	1.40	1.22	1.386	0.672
BMKJS04A	2	1.54	1.25	2	1.08	1.63	1.424	0.767
BMKJS06A	1	3.86	2.30	1	2.73	3.09	1.414	0.744
BMKJS07A	3	0.65	1.41	3	0.47	1.94	1.373	0.728
BMKJS10A	2	0.66	1.34	2	0.49	2.08	1.361	0.643
BMKJS10B	2	0.69	1.26	2	0.48	1.90	1.423	0.666
BMKJS11A	1	3.69	2.69	1	2.53	1.56	1.458	1.724
BMKJS15A	1	15.55	0.79	1	10.77	1.29	1.444	0.612
TOTAL	17	35.84	25.37	17	25.25	32.60	1.419	0.778
MEAN	10	3.09	1.48	10	2.16	1.82	1.395	0.835

STEP = PTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJSMP1	1	1.22	3.20	1	0.84	5.92	1.452	0.541	
DMATHUL	1	1.88	10.33	1	1.31	10.33	1.435	1.000	
EMATHUL	1	1.85	10.50	1	1.29	9.61	1.434	1.093	
NATRAH	1	8.71	12.12	1	6.21	16.89	1.403	0.718	
TOTAL	4	13.66	36.15	4	9.65	42.75	1.416	0.846	
MEAN	4	3.41	9.04	4	2.41	10.69	1.411	0.839	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = PTH (0)								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS05A	5	3.43	4.16	5	2.45	5.72	1.400	0.728
BMKJS06B	1	1.27	1.77	1	0.90	3.09	1.411	0.573
BMKJS07B	1	0.74	6.36	1	0.54	9.84	1.370	0.646
BMKJS08A	1	0.48	1.03	1	0.38	3.45	1.263	0.299
BMKJS08B	1	0.49	1.34	1	0.36	1.88	1.361	0.713
BMKJS09A	1	0.95	1.63	1	0.69	2.23	1.377	0.731
BMKJS09B	1	1.00	2.83	1	0.71	2.65	1.408	1.068
BMKJS11B	1	1.96	1.80	1	1.42	1.83	1.380	0.984
BMKJS12A	1	30.97	51.03	1	22.78	41.42	1.360	1.232
BMKJS13A	1	1.11	0.99	1	0.85	4.69	1.306	0.211
BMKJS13B	1	1.11	1.76	1	0.85	1.44	1.306	1.222
BMKJS14A	1	14.47	16.98	1	10.60	28.04	1.365	0.606
BMKJS15B	1	8.38	12.47	1	6.03	29.09	1.390	0.429
BMKJS16A	1	9.38	11.41	1	6.43	13.75	1.459	0.830
BMKJS17A	1	27.18	24.39	1	19.50	33.34	1.394	0.732
BMKJS18A	1	2.70	3.53	1	1.92	4.01	1.406	0.880
BMKJS19A	1	6.99	19.70	1	5.34	26.98	1.309	0.730
BMKJS19B	5	6.55	17.22	5	4.92	23.58	1.332	0.730
BMKJS20A	1	4.95	5.57	1	3.57	6.84	1.387	0.814
BMKJS23A	1	1.17	1.70	1	0.90	2.32	1.300	0.733
BMKJS23B	1	1.08	1.55	1	0.91	3.58	1.187	0.433
BMKJS24A	1	2.22	3.53	1	1.70	6.28	1.306	0.562
BMKJS24B	1	2.19	4.64	1	1.70	4.42	1.288	1.050
TOTAL	31	170.71	282.93	31	124.93	377.64	1.366	0.749
MEAN	23	5.69	8.58	23	4.15	11.32	1.351	0.736

ARGONNE NATIONAL LABORATORY
IRM 170/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IRM 170/168 MOD 3				ANDAHL 470V/6			168 / 470V6	
STEP = GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BKKJS01A	12	0.09	1.39	12	0.07	1.10	1.329	1.264
BKKJS02A	9	0.14	2.71	9	0.10	1.94	1.413	1.391
BKKJS03A	4	2.27	0.32	4	1.72	0.36	1.321	0.897
BKKJS04A	6	13.04	0.58	6	32.30	1.67	1.023	0.347
BKKJS05A	15	23.69	0.71	15	21.55	0.97	1.099	0.734
BKKJS06A	3	0.45	0.51	3	0.33	1.65	1.388	0.312
BKKJS07A	12	0.07	0.96	12	0.05	1.26	1.303	0.759
BKKJS09A	3	5.83	62.07	3	4.46	170.60	1.308	0.364
BKKJS10A	6	0.06	0.98	6	0.06	0.69	1.096	1.408
BKKJS11A	3	4.76	0.59	3	2.65	0.57	1.795	1.023
BKKJS12A	2	0.46	0.75*	2	1.18	0.93*		
BKKJS13A	3	0.60	0.44	3	0.45	0.45	1.316	0.978
BKKJS14A	2	90.54	0.61	2	73.40	0.65	1.234	0.931
BKKJS15A	3	0.65	0.64	3	0.53	0.83	1.241	0.768
BKKJS15B	1	0.01	0.14	1	0.02	0.13	0.500	1.077
BKKJS16A	4	2.29	0.68	4	1.37	0.88	1.672	0.768
BKKJS17A	2	4.27	1.90	2	2.99	1.09	1.437	1.735
BKKJS18A	3	13.70	0.32	3	31.81	0.30	1.059	1.078
BKKJS19A	3	60.10	1.22	3	40.54	1.22	1.483	1.000
BKKJS19B	10	59.81	1.68	10	40.15	1.59	1.490	1.055
BKKJS20A	3	0.05	0.31	3	0.05	0.34	1.143	0.921
TOTAL	107	1691.72	296.82	107	1328.87	627.02	1.266	0.473
MPAN	20	16.12	3.94	20	12.73	9.42	1.282	0.940

STEP = IERCOMPR

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
COMPMOVE	1	0.09	1.59	1	0.09	1.26	1.000	1.262
TOTAL	1	0.09	1.59	1	0.09	1.26	1.000	1.262
MPAN	1	0.09	1.59	1	0.09	1.26	1.000	1.262

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470V6	
STEP = IERCOPY								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
COPY1	1	1.95	80.65	1	1.45	86.34	1.345	0.934
COPY2	1	0.15	2.41	1	0.11	2.53	1.364	0.953
TOTAL	2	2.10	83.06	2	1.56	88.87	1.346	0.935
MEAN	2	1.05	41.53	2	0.78	44.43	1.354	0.943

STEP = IERGENER									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENR1	5	0.25	22.78	5	0.23	19.65	1.085	1.160	
GENR2	7	0.15	3.18	7	0.10	6.19	1.451	0.514	
TOTAL	12	2.30	136.19	12	1.88	141.58	1.223	0.962	
MEAN	2	0.20	12.98	2	0.17	12.92	1.268	0.837	

STEP = IERPTPCH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
PTPCH1	1	0.17	2.69	1	0.18	3.10	0.944	0.868	
PTPCH2	2	0.11	2.89	2	0.12	2.28	0.920	1.267	
TOTAL	3	0.40	8.48	3	0.43	7.67	0.930	1.106	
MEAN	2	0.14	2.79	2	0.15	2.69	0.932	1.067	

STEP = IERUPDAT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
UPDAT1	3	0.21	2.00	3	0.18	2.86	1.164	0.699	
UPDAT2	1	0.22	5.75	1	0.26	4.21	0.846	1.366	
TOTAL	4	0.46	11.75	4	0.81	12.79	1.062	0.919	
MEAN	2	0.22	3.87	2	0.22	3.53	1.005	1.033	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6		
STEP = IFBUPDTE									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GFNUPDTE	3	0.38	2.91	3	0.39	4.84	0.958	0.602	
UPDTE1	1	0.09	2.89	1	0.13	2.84	0.692	1.014	
UPDTE2	2	0.15	2.59	2	0.10	3.18	1.476	0.815	
UPDTE3	1	0.06	0.72	1	0.04	0.46	1.500	1.565	
UPDTE4	1	0.35	2.02	1	0.34	3.34	1.029	0.605	
UPDTE5	1	0.13	1.80	1	0.10	5.26	1.300	0.342	
UPDTE6	2	0.19	1.24	2	0.18	1.91	1.114	0.649	
TOTAL	11	2.46	23.83	11	2.35	36.60	1.047	0.651	
MEAN	7	0.19	2.02	7	0.18	3.12	1.153	0.799	

STEP = IFBUTIL									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVR	1	0.09	1.59	1	0.09	1.26	1.000	1.262	
COPY1	1	1.95	80.65	1	1.45	86.34	1.345	0.934	
COPY2	1	0.15	2.41	1	0.11	2.53	1.364	0.953	
GENER1	5	0.25	22.78	5	0.23	19.65	1.095	1.160	
GENER2	7	0.15	3.18	7	0.10	6.19	1.451	0.514	
GFNUPDTP	3	0.38	2.91	3	0.39	4.84	0.958	0.602	
PTPCH1	1	0.17	2.69	1	0.18	3.10	0.944	0.869	
PTPCH2	2	0.11	2.89	2	0.12	2.28	0.920	1.267	
UPDAT1	3	0.21	2.00	3	0.18	2.86	1.154	0.699	
UPDAT2	1	0.22	5.75	1	0.26	4.21	0.846	1.366	
UPDTE1	1	0.09	2.88	1	0.13	2.84	0.692	1.014	
UPDTE2	2	0.15	2.59	2	0.10	3.18	1.476	0.815	
UPDTE3	1	0.06	0.72	1	0.04	0.46	1.500	1.565	
UPDTE4	1	0.35	2.02	1	0.34	3.34	1.029	0.605	
UPDTE5	1	0.13	1.80	1	0.10	5.26	1.300	0.342	
UPDTE6	2	0.19	1.24	2	0.18	1.91	1.114	0.649	
TOTAL	33	4.21	264.90	33	7.12	288.77	1.153	0.917	
MEAN	16	0.29	8.63	16	0.25	9.39	1.137	0.911	

"IFBUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470V6	
STEP = IEHLIST								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
LIST1	3	0.24	4.04	3	0.22	5.86	1.091	0.689
LIST2	3	0.19	6.14	3	0.20	5.96	0.951	1.031
LIST3	2	0.69	19.83	2	0.52	20.91	1.337	0.948
LIST4	3	0.16	5.56	3	0.14	5.19	1.093	1.071
LIST5	2	0.36	21.30	2	0.31	24.94	1.177	0.854
TOTAL	13	3.89	129.50	13	3.36	142.75	1.158	0.907
MEAN	5	0.33	11.38	5	0.28	12.57	1.130	0.919

STEP = IEHMOVE									
*****				*****				*****	
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COMPMOVE	1	0.43	9.74	1	0.39	15.28	1.103	0.637	
MOVFP1	3	0.34	4.69	3	0.35	13.81	0.981	0.340	
UTILITY1	1	0.42	8.03	1	0.29	13.57	1.448	0.592	

TOTAL	5	1.87	31.84	5	1.72	70.27	1.087	0.453	
MEAN	3	0.40	7.49	3	0.34	14.22	1.177	0.523	

STEP = IEHPRGM									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

GPNUPDTE	3	0.08	0.97	3	0.06	0.96	1.333	1.014	
UTILITY1	4	0.07	0.93	4	0.06	1.56	1.080	0.597	

TOTAL	7	0.51	6.65	7	0.43	9.13	1.186	0.728	
MEAN	2	0.07	0.95	2	0.06	1.26	1.207	0.805	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470V6		
STEP = IPHUTIL									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COMPMOVE	1	0.43	9.74	1	0.39	15.28	1.103	0.637	
GENUPDTE	3	0.08	0.97	3	0.06	0.96	1.333	1.014	
LIST1	3	0.24	4.04	3	0.22	5.86	1.091	0.688	
LIST2	3	0.19	6.14	3	0.20	5.96	0.951	1.031	
LIST3	2	0.69	19.83	2	0.52	20.91	1.337	0.948	
LIST4	3	0.16	5.56	3	0.14	5.19	1.093	1.071	
LIST5	2	0.36	21.30	2	0.31	24.94	1.177	0.854	
MOVE1	3	0.34	4.69	3	0.35	13.81	0.981	0.340	
UTILITY1	5	0.14	2.35	5	0.11	3.96	1.278	0.593	

TOTAL	25	6.27	167.99	25	5.51	222.15	1.138	0.756	
MEAN	9	0.29	8.29	9	0.26	10.76	1.149	0.797	

"IPHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

STEP = LOAD&GO

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJSMP1	1	279.85	1.81	1	173.93	1.72	1.609	1.052	
BMKJS03B	2	2.43	1.81	2	1.91	2.03	1.275	0.894	
BMKJS06B	3	1.17	2.61	3	0.93	4.75	1.254	0.550	
BMKJS07B	3	0.20	2.15	3	0.17	2.20	1.200	0.974	
BMKJS08A	2	0.60	1.66	2	0.44	2.89	1.375	0.574	
BMKJS08B	2	0.62	2.83	2	0.47	2.93	1.319	0.966	
BMKJS09B	2	5.96	114.42	2	4.63	231.69	1.287	0.494	
BMKJS10B	4	0.16	2.61	4	0.13	2.57	1.275	1.016	
BMKJS11B	3	4.18	2.21	3	2.62	1.60	1.595	1.378	
BMKJS13B	2	0.71	2.77	2	0.54	1.84	1.324	1.504	
BMKJS22A	2	12.86	27.85	2	7.76	20.67	1.658	1.347	
BMKJS23A	2	0.11	1.42	2	0.09	1.56	1.158	0.911	
BMKJS23B	3	0.10	1.67	3	0.08	2.70	1.292	0.621	
BMKJS24A	2	90.06	33.81	2	61.29	76.55	1.469	0.442	
BMKJS24B	2	2.02	2.73	2	1.60	4.52	1.259	0.603	
DMATHUL	1	247.30	2.02	1	251.26	2.69	0.984	0.751	
EMATHUL	1	207.03	1.46	1	143.89	1.90	1.439	0.763	
NATRAH	1	146.68	2.05	1	88.22	2.73	1.663	0.751	
TOTAL	39	1129.25	422.36	38	826.70	742.50	1.366	0.569	
MEAN	18	55.67	11.55	18	41.11	20.42	1.357	0.866	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470V6	
STEP = PL1								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

BMKJSC1A	4	1.19	7.49	4	0.90	6.74	1.319	1.112
BMKJS02A	3	2.10	6.18	3	1.40	6.75	1.500	0.916
BMKJS22A	1	15.22	35.85	1	9.93	15.62	1.533	2.295

TOTAL	8	26.27	84.35	8	17.73	62.81	1.482	1.343
MEAN	3	6.17	16.51	3	4.08	9.70	1.451	1.441

STEP = UTILITY									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

CCMPMOV	2	0.26	5.66	2	0.24	8.27	1.083	0.685	
COPY1	1	1.95	80.65	1	1.45	86.34	1.345	0.934	
COPY2	1	0.15	2.41	1	0.11	2.53	1.364	0.953	
GFNER1	5	0.25	22.78	5	0.23	19.65	1.085	1.160	
GFNER2	7	0.15	3.18	7	0.10	6.19	1.451	0.514	
GENUPDTP	6	0.23	1.94	6	0.23	2.90	1.007	0.671	
LIST1	3	0.24	4.04	3	0.22	5.86	1.091	0.688	
LIST2	3	0.19	6.14	3	0.20	5.96	0.951	1.031	
LIST3	2	0.69	19.83	2	0.52	20.91	1.337	0.948	
LIST4	3	0.16	5.56	3	0.14	5.19	1.093	1.071	
LIST5	2	0.36	21.30	2	0.31	24.94	1.177	0.854	
MOV21	3	0.34	4.69	3	0.35	13.81	0.981	0.340	
PTPCH1	1	0.17	2.69	1	0.18	3.10	0.944	0.868	
PTPCH2	2	0.11	2.89	2	0.12	2.28	0.920	1.267	
UPDAT1	3	0.21	2.00	3	0.18	2.86	1.164	0.699	
UPDAT2	1	0.22	5.75	1	0.26	4.21	0.846	1.366	
UPDTE1	1	0.09	2.88	1	0.13	2.84	0.692	1.014	
UPDTE2	2	0.15	2.59	2	0.10	3.18	1.476	0.815	
UPDTE3	1	0.06	0.72	1	0.04	0.46	1.500	1.565	
UPDTE4	1	0.35	2.02	1	0.34	3.34	1.029	0.605	
UPDTE5	1	0.13	1.80	1	0.10	5.26	1.300	0.342	
UPDTE6	2	0.19	1.24	2	0.18	1.91	1.114	0.649	
UTILITY1	5	0.14	2.35	5	0.11	3.96	1.278	0.593	

TOTAL	58	14.48	432.89	58	12.63	510.92	1.146	0.847	
MEAN	23	0.30	8.92	23	0.25	10.26	1.140	0.854	

"UTILITY" COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3

AMDAHL 470V/6

168 / 470V6

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	145	19.39	4.96	145	14.87	9.44	1.304	0.525
ASM	52	0.32	3.34	52	0.27	4.15	1.210	0.806
PDT	45	0.43	6.86	45	0.30	9.40	1.426	0.730
PTG	17	2.11	1.49	17	1.49	1.92	1.419	0.778
PTH	4	3.41	9.04	4	2.41	10.69	1.416	0.846
PTH (0)	31	5.51	9.13	31	4.03	12.18	1.366	0.749
GO	107	15.72	2.77	107	12.42	5.86	1.266	0.473
IEBUTIL	33	0.25	8.03	33	0.22	8.75	1.153	0.917
IEHUTIL	25	0.25	6.72	25	0.22	8.89	1.138	0.756
LOAD&GO	38	29.72	11.11	38	21.76	19.54	1.366	0.569
PL1	8	3.28	10.54	8	2.22	7.85	1.492	1.343
UTILITY	58	0.25	7.46	58	0.22	8.81	1.146	0.847

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	38	34.86	7.54	38	26.17	14.63	1.318	0.905
ASM	5	0.59	5.47	5	0.47	7.53	1.247	0.757
EDT	21	0.42	6.66	21	0.30	9.49	1.392	0.729
PTG	10	3.09	1.48	10	2.16	1.82	1.395	0.835
PTH	4	3.41	9.04	4	2.41	10.69	1.411	0.838
PTH (0)	23	5.69	8.58	23	4.15	11.32	1.351	0.736
GO	20	16.12	3.94	20	12.73	9.42	1.292	0.940
IEBUTIL	16	0.29	8.63	16	0.25	9.39	1.137	0.913
IEHUTIL	9	0.29	8.29	9	0.26	10.76	1.149	0.797
LOAD&GO	18	55.67	11.55	18	41.11	20.42	1.357	0.866
PL1	3	6.17	16.51	3	4.08	9.70	1.451	1.441
UTILITY	23	0.30	8.92	23	0.25	10.26	1.140	0.854

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3

IBM 370/195

168 / 195

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BMKJSMP1	1	281.07	5.01	1	249.11	5.17	1.128	0.969
BMKJS01A	4	2.42	34.37	4	2.17	35.33	1.114	0.973
BMKJS02A	3	3.72	28.35	3	3.18	30.13	1.170	0.941
BMKJS03A	1	11.49	9.73	1	8.05	15.44	1.427	0.630
BMKJS03B	1	6.81	4.45	1	4.95	4.31	1.376	1.032
BMKJS04A	2	101.15	11.06	2	71.83	21.92	1.408	0.505
BMKJS05A	5	74.73	8.87	5	39.64	10.52	1.885	0.843
BMKJS06A	1	5.49	10.67	1	4.79	12.83	1.146	0.832
BMKJS06B	1	4.77	9.61	1	3.76	11.44	1.269	0.840
BMKJS07A	3	1.20	8.44	3	1.07	10.38	1.118	0.814
BMKJS07B	1	1.34	12.80	1	1.17	14.37	1.145	0.891
BMKJS08A	1	1.69	4.35	1	1.54	7.88	1.097	0.552
BMKJS08B	1	1.73	7.00	1	1.54	8.67	1.123	0.807
BMKJS09A	1	18.67	192.75	1	15.24	588.53	1.225	0.328
BMKJS09B	1	12.93	231.67	1	10.65	390.21	1.214	0.594
BMKJS10A	2	1.04	7.05	2	0.96	6.70	1.089	1.052
BMKJS10B	2	1.01	6.49	2	0.89	8.13	1.140	0.798
BMKJS11A	1	18.21	11.02	1	11.76	12.02	1.548	0.917
BMKJS11B	1	14.50	8.43	1	9.06	12.44	1.600	0.678
BMKJS12A	1	31.70	63.04*	1	27.76	57.31*	1.142	1.100
BMKJS13A	1	4.76	16.42	1	4.34	38.15	1.097	0.430
BMKJS13B	1	4.18	25.84	1	3.65	26.79	1.145	0.965
BMKJS14A	1	196.08	24.04	1	104.19	34.95	1.882	0.688
BMKJS15A	1	17.98	8.87	1	15.71	9.59	1.144	0.925
BMKJS15B	1	9.05	25.83	1	7.67	37.18	1.180	0.695
BMKJS16A	1	18.92	18.19	1	14.12	19.72	1.340	0.922
BMKJS17A	1	36.34	42.27	1	30.78	37.14	1.181	1.138
BMKJS18A	1	104.00	7.13	1	42.11	7.85	2.470	0.908
BMKJS19A	1	189.59	47.23	1	129.43	62.12	1.465	0.760
BMKJS19B	5	126.89	29.05	5	87.51	32.03	1.450	0.876
BMKJS20A	1	5.53	10.24	1	4.94	10.96	1.119	0.934
BMKJS21A	3	3.40	37.40	3	3.09	48.75	1.098	0.767
BMKJS21B	7	0.24	2.53	7	0.21	4.53	1.129	0.559
BMKJS22A	1	40.95	91.55	1	32.49	120.44	1.260	0.760
BMKJS23A	1	1.39	4.55	1	1.24	4.72	1.121	0.964
BMKJS23B	1	1.39	6.57	1	1.35	7.06	1.030	0.931
BMKJS24A	1	192.34	71.15	1	147.63	153.92	1.235	0.462
BMKJS24B	1	6.23	10.10	1	5.68	18.96	1.097	0.533
COMPHOV	1	0.52	11.33	1	0.52	13.79	1.000	0.822
COPY1	1	1.95	80.65	1	1.54	118.81	1.266	0.679
COPY2	1	0.15	2.41	1	0.10	2.89	1.500	0.834
DMATHML	1	249.18	12.35	1	94.48	13.99	2.637	0.883
EMATHML	1	208.88	11.96	1	91.32	13.02	2.287	0.919
GENPR1	5	0.25	22.78	5	0.21	29.57	1.187	0.771
GENPR2	7	0.15	3.18	7	0.12	6.22	1.212	0.511
GENUPDTR	3	0.46	3.89	3	0.46	3.98	0.986	0.977

LIST1	3	0.24	4.04	3	0.23	4.20	1.059	0.960
LIST2	3	0.19	6.14	3	0.20	4.97	0.951	1.237
LIST3	2	0.69	19.83	2	0.54	18.39	1.275	1.078
LIST4	3	0.16	5.56	3	0.14	4.17	1.119	1.333
LIST5	2	0.36	21.30	2	0.35	17.10	1.028	1.246
MVCE1	3	0.34	4.69	3	0.34	5.48	0.990	0.855
NATRAN	1	155.39	14.17	1	86.53	15.95	1.796	0.888
PTPCH1	1	0.17	2.69	1	0.18	1.40	0.944	1.921
PTPCH2	2	0.11	2.89	2	0.13	2.35	0.885	1.232
UPDAT1	3	0.21	2.00	3	0.19	2.93	1.103	0.682
UPDAT2	1	0.22	5.75	1	0.20	8.97	1.100	0.641
UPDTE1	1	0.09	2.88	1	0.12	3.04	0.750	0.947
UPDTE2	2	0.15	2.59	2	0.13	2.99	1.192	0.866
UPDTE3	1	0.06	0.72	1	0.05	0.22	1.200	3.273
UPDTE4	1	0.35	2.02	1	0.35	1.75	1.000	1.154
UPDTE5	1	0.13	1.80	1	0.12	2.44	1.083	0.738
UPDTE6	2	0.19	1.24	2	0.17	1.69	1.147	0.732
UTILITY1	1	0.69	11.76	1	0.68	11.14	1.015	1.056
TOTAL	117	3107.88	2063.47	117	1995.48	3018.41	1.557	0.684
MEAN	64	33.85	22.09	64	21.64	35.16	1.258	0.899

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJSMP1	1	279.85	1.81	1	248.08	2.34	1.128	0.774
BMKJS01A	12	0.09	1.39	12	0.08	1.19	1.124	1.167
BMKJS02A	9	0.14	2.71	9	0.12	1.91	1.193	1.416
BMKJS03A	4	2.27	0.32	4	1.45	0.36	1.562	0.903
BMKJS03B	2	2.43	1.81	2	1.59	1.73	1.531	1.049
BMKJS04A	6	33.04	0.58	6	23.29	1.65	1.419	0.351
BMKJS05A	15	23.69	0.71	15	12.13	0.78	1.953	0.914
BMKJS06A	3	0.45	0.51	3	0.37	0.73	1.225	0.700
BMKJS06B	3	1.17	2.61	3	0.90	3.24	1.296	0.806
BMKJS07A	12	0.07	0.96	12	0.07	1.05	1.024	0.912
BMKJS07B	3	0.20	2.15	3	0.18	3.20	1.132	0.671
BMKJS08A	2	0.60	1.66	2	0.55	3.10	1.100	0.536
BMKJS08B	2	0.62	2.83	2	0.55	3.66	1.127	0.774
BMKJS09A	3	5.83	62.07	3	4.74	193.77	1.230	0.320
BMKJS09B	2	5.96	114.42	2	4.90	193.81	1.217	0.590
BMKJS10A	6	0.06	0.98	6	0.06	0.95	1.086	1.032
BMKJS10B	4	0.16	2.61	4	0.14	3.18	1.161	0.823
BMKJS11A	3	4.76	0.59	3	2.75	0.77	1.728	0.765
BMKJS11B	3	4.18	2.21	3	2.45	3.48	1.706	0.634
BMKJS12A	2	0.46	0.75*	2	0.15	1.06*		
BMKJS13A	3	0.60	0.44	3	0.55	0.85	1.091	0.522
BMKJS13B	2	0.71	2.77	2	0.64	3.11	1.109	0.892
BMKJS14A	2	90.54	0.61	2	45.30	0.89	1.999	0.685
BMKJS15A	3	0.65	0.64	3	0.55	0.75	1.181	0.857
BMKJS15B	1	0.01	0.14	1	0.02	0.06	0.500	2.333
BMKJS16A	4	2.29	0.68	4	1.49	0.58	1.534	1.162
BMKJS17A	2	4.27	1.90	2	3.55	1.32	1.203	1.439
BMKJS18A	3	33.70	0.32	3	13.18	0.46	2.557	0.708
BMKJS19A	3	60.10	1.22	3	40.36	1.45	1.489	0.839
BMKJS19B	10	59.81	1.68	10	40.55	1.33	1.475	1.260
BMKJS20A	3	0.05	0.31	3	0.04	0.37	1.231	0.845
BMKJS22A	2	12.86	27.85	2	9.69	47.70	1.327	0.584
BMKJS23A	2	0.11	1.42	2	0.11	1.55	1.000	0.916
BMKJS23B	3	0.10	1.67	3	0.11	1.75	0.939	0.958
BMKJS24A	2	90.06	33.81	2	72.87	74.73	1.236	0.452
BMKJS24B	2	2.02	2.73	2	1.85	5.88	1.089	0.464
DMATHUL	1	247.30	2.02	1	92.84	2.73	2.664	0.740
EMATHUL	1	207.03	1.46	1	89.73	3.17	2.307	0.461
NATRAN	1	146.68	2.05	1	78.84	3.46	1.860	0.592
TOTAL	145	2810.96	719.18	145	1734.06	1420.34	1.621	0.506
MEAN	38	34.86	7.54	38	20.97	15.08	1.388	0.838

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = ASM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS13A	2	0.80	4.84	2	0.72	13.66	1.111	0.354	
BMKJS13B	2	0.82	9.26	2	0.70	9.64	1.171	0.961	
BMKJS19A	2	0.85	7.83	2	0.74	10.98	1.141	0.713	
BMKJS21A	39	0.26	2.88	39	0.24	3.75	1.098	0.767	
BMKJS21B	7	0.24	2.53	7	0.21	4.53	1.129	0.559	
TOTAL	52	16.79	173.80	52	15.08	246.55	1.113	0.705	
MEAN	5	0.59	5.47	5	0.52	8.51	1.130	0.671	

STEP = EDT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJS01A	8	0.48	11.36	8	0.41	12.35	1.154	0.920	
BMKJS02A	3	0.79	12.10	3	0.67	15.53	1.190	0.779	
BMKJS03A	2	0.26	3.73	2	0.20	6.23	1.293	0.599	
BMKJS04A	4	0.24	4.04	4	0.22	7.59	1.067	0.532	
BMKJS05A	5	0.22	2.57	5	0.19	3.38	1.147	0.761	
BMKJS06A	1	0.27	6.83	1	0.28	8.70	0.964	0.785	
BMKJS07A	3	0.26	3.21	3	0.19	4.21	1.386	0.763	
BMKJS09A	1	0.23	4.92	1	0.20	5.36	1.150	0.918	
BMKJS10A	2	0.19	2.78	2	0.15	2.91	1.258	0.955	
BMKJS11A	1	0.25	6.57	1	0.23	6.59	1.087	0.997	
BMKJS12A	1	0.73	12.01	1	0.67	12.96	1.090	0.927	
BMKJS13A	1	0.26	4.42	1	0.26	6.04	1.000	0.732	
BMKJS14A	1	0.53	5.84	1	0.42	10.56	1.262	0.553	
BMKJS15A	1	0.47	6.16	1	0.47	6.45	1.000	0.955	
BMKJS15B	1	0.66	13.22	1	0.51	23.97	1.294	0.552	
BMKJS16A	1	0.38	4.06	1	0.26	6.24	1.462	0.651	
BMKJS17A	1	0.61	14.08	1	0.59	13.26	1.034	1.062	
BMKJS18A	1	0.21	2.63	1	0.19	2.39	1.105	1.100	
BMKJS19A	1	0.60	8.22	1	0.57	13.57	1.053	0.606	
BMKJS19B	5	0.72	7.46	5	0.63	11.34	1.133	0.658	
BMKJS20A	1	0.42	3.74	1	0.36	4.55	1.167	0.822	
TOTAL	45	19.17	308.81	45	16.63	400.88	1.153	0.770	
MEAN	21	0.42	6.66	21	0.37	8.77	1.157	0.792	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = FTG								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS02A	3	0.40	1.95	3	0.38	2.50	1.053	0.781
BMKJS03A	1	1.87	0.97	1	1.82	1.55	1.027	0.626
BMKJS03B	1	1.94	0.82	1	1.77	0.85	1.096	0.965
BMKJS04A	2	1.54	1.25	2	1.52	1.78	1.016	0.700
BMKJS06A	1	3.86	2.10	1	3.40	1.93	1.135	1.192
BMKJS07A	3	0.65	1.41	3	0.60	1.98	1.077	0.712
BMKJS10A	2	0.66	1.34	2	0.63	0.95	1.049	1.411
BMKJS10B	2	0.69	1.26	2	0.61	1.78	1.131	0.711
BMKJS11A	1	3.69	2.69	1	3.27	3.13	1.128	0.959
BMKJS15A	1	15.55	0.79	1	13.58	0.90	1.145	0.878
TOTAL	17	35.84	25.37	17	32.30	30.83	1.110	0.823
MEAN	10	3.09	1.48	10	2.76	1.74	1.086	0.883

STEP = FTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJSMP1	1	1.22	3.20	1	1.03	2.83	1.184	1.131	
DMATHUL	1	1.88	10.33	1	1.64	11.26	1.146	0.917	
EMATHUL	1	1.85	10.50	1	1.59	9.85	1.164	1.066	
NATRAH	1	8.71	12.12	1	7.69	12.49	1.133	0.970	
TOTAL	4	13.66	36.15	4	11.95	36.43	1.143	0.992	
MEAN	4	3.41	9.04	4	2.99	9.11	1.157	1.021	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = FTH (0)								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS05A	5	3.43	4.16	5	3.05	4.80	1.124	0.866
BMKJS06R	1	1.27	1.77	1	1.06	1.71	1.198	1.035
BMKJS07R	1	0.74	6.36	1	0.64	4.77	1.156	1.333
BMKJS08A	1	0.48	1.03	1	0.44	1.69	1.091	0.609
BMKJS08R	1	0.49	1.34	1	0.44	1.36	1.114	0.995
BMKJS09A	1	0.95	1.63	1	0.82	1.87	1.159	0.872
BMKJS09B	1	1.00	2.83	1	0.85	2.59	1.176	1.093
BMKJS11R	1	1.96	1.80	1	1.71	1.99	1.146	0.905
BMKJS12A	1	30.97	51.03	1	27.09	44.35	1.103	1.151
BMKJS13A	1	1.11	0.99	1	1.00	2.24	1.110	0.442
BMKJS13B	1	1.11	1.76	1	0.96	1.28	1.156	1.375
BMKJS14A	1	14.47	16.98	1	13.17	22.61	1.099	0.751
BMKJS15R	1	8.38	12.47	1	7.14	13.15	1.174	0.949
BMKJS16A	1	9.38	11.41	1	7.89	11.14	1.199	1.024
BMKJS17A	1	27.18	24.39	1	23.08	21.24	1.178	1.149
BMKJS18A	1	2.70	3.53	1	2.38	4.09	1.134	0.863
BMKJS19A	1	6.99	19.70	1	6.30	22.24	1.110	0.686
BMKJS19R	5	6.55	17.22	5	5.78	18.02	1.134	0.956
BMKJS20A	1	4.95	5.57	1	4.45	5.31	1.112	1.042
BMKJS23A	1	1.17	1.70	1	1.02	1.61	1.147	1.056
BMKJS23R	1	1.08	1.55	1	1.02	1.82	1.059	0.852
BMKJS24A	1	2.22	3.53	1	1.89	4.46	1.175	0.791
BMKJS24R	1	2.19	4.64	1	1.97	7.20	1.112	0.644
TOTAL	31	170.71	282.93	31	149.49	292.85	1.142	0.966
MEAN	23	5.69	8.58	23	4.96	8.76	1.139	0.941

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 170/168 MOD 3				IBM 370/195			168 / 195	
STPP = GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	12	0.09	1.39	12	0.08	1.19	1.124	1.167
BMKJS02A	9	0.14	2.71	9	0.12	1.91	1.193	1.416
BMKJS03A	4	2.27	0.32	4	1.45	0.36	1.562	0.903
BMKJS04A	6	33.04	0.58	6	23.29	1.65	1.419	0.351
BMKJS05A	15	23.69	0.71	15	12.13	0.78	1.953	0.914
BMKJS06A	3	0.45	0.51	3	0.37	0.73	1.225	0.707
BMKJS07A	12	0.07	0.96	12	0.07	1.05	1.024	0.912
BMKJS09A	3	5.83	62.07	3	4.74	193.77	1.230	0.320
BMKJS10A	6	0.06	0.98	6	0.06	0.95	1.086	1.032
BMKJS11A	3	4.76	0.59	3	2.75	0.77	1.728	0.765
BMKJS12A	2	0.46	0.75*	2	0.15	1.06*		
BMKJS13A	3	0.60	0.44	3	0.55	0.85	1.091	0.522
BMKJS14A	2	90.54	0.61	2	45.30	0.89	1.999	0.685
BMKJS15A	3	0.65	0.64	3	0.55	0.75	1.181	0.857
BMKJS15P	1	0.71	0.14	1	0.02	0.06	0.500	2.333
BMKJS16A	4	2.29	0.68	4	1.49	0.58	1.534	1.162
BMKJS17A	2	4.27	1.90	2	3.55	1.32	1.203	1.439
BMKJS18A	3	33.70	0.32	3	13.18	0.46	2.557	0.708
BMKJS19A	3	60.10	1.22	3	40.36	1.45	1.489	0.333
BMKJS19B	10	59.41	1.68	10	40.55	1.33	1.475	1.260
BMKJS20A	3	0.75	0.31	3	0.04	0.37	1.231	0.845
TOTAL	107	1681.72	296.82	107	1027.58	690.37	1.637	0.430
MEAN	20	16.12	3.94	20	9.53	10.56	1.390	0.957

STEP = IPRCOMP									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPNOVP	1	0.09	1.59	1	0.09	1.79	1.000	0.888	
TOTAL	1	0.09	1.59	1	0.09	1.79	1.000	0.888	
MEAN	1	0.09	1.59	1	0.09	1.79	1.000	0.888	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 MODIFIED MODEL JOBSTREAM

TRM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = IERCOPY								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
COPY1	1	1.95	80.65	1	1.54	118.81	1.266	0.679
COPY2	1	0.15	2.41	1	0.10	2.89	1.500	0.834
TOTAL	2	2.10	83.06	2	1.64	121.70	1.280	0.682
MPAN	2	1.05	41.53	2	0.82	60.85	1.193	0.756

STEP = IERGENPR									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

GENPR1	5	0.25	22.78	5	0.21	29.57	1.187	0.771	
GENPR2	7	0.15	3.18	7	0.12	6.22	1.212	0.511	

TOTAL	12	2.37	136.19	12	1.42	191.39	1.198	0.712	
MEAN	2	0.20	12.98	2	0.17	17.89	1.199	0.641	

STEP = IEBPTPCH									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

PTPCH1	1	0.17	2.69	1	0.18	1.40	0.944	1.921	
PTPCH2	2	0.11	2.89	2	0.13	2.35	0.495	1.232	

TOTAL	3	0.40	8.48	3	0.44	6.10	0.909	1.390	
MEAN	2	0.14	2.79	2	0.15	1.87	0.915	1.577	

STEP = IERUPDAT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
UPDAT1	3	0.21	2.00	3	0.19	2.43	1.103	0.682	
UPDAT2	1	0.22	5.75	1	0.20	8.97	1.100	0.641	
TOTAL	4	0.46	11.75	4	0.78	17.77	1.103	0.661	
MEAN	2	0.22	3.87	2	0.20	5.95	1.102	0.661	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = IRRUPDTP								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
GENUPDTP	3	0.38	2.91	3	0.39	3.04	0.966	0.959
UPDTP1	1	0.09	2.88	1	0.12	3.04	0.750	0.947
UPDTP2	2	0.15	2.59	2	0.13	2.99	1.192	0.866
UPDTP3	1	0.06	0.72	1	0.05	0.22	1.200	3.273
UPDTP4	1	0.35	2.02	1	0.35	1.75	1.000	1.154
UPDTP5	1	0.13	1.80	1	0.12	2.44	1.083	0.738
UPDTP6	2	0.19	1.24	2	0.17	1.69	1.147	0.732
TOTAL	11	2.46	23.83	11	2.41	25.94	1.021	0.919
MEAN	7	0.19	2.02	7	0.19	2.17	1.048	1.238

STEP = IRRUTIL									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOP	1	0.09	1.59	1	0.09	1.79	1.000	0.888	
COPY1	1	1.95	80.65	1	1.54	118.81	1.266	0.679	
COPY2	1	0.15	2.41	1	0.10	2.89	1.500	0.834	
GENPR1	5	0.25	22.78	5	0.21	29.57	1.187	0.771	
GENPR2	7	0.15	3.18	7	0.12	6.22	1.212	0.511	
GENUPDTP	3	0.38	2.91	3	0.39	3.04	0.966	0.959	
PTPCH1	1	0.17	2.69	1	0.18	1.40	0.944	1.921	
PTPCH2	2	0.11	2.89	2	0.13	2.35	0.895	1.232	
UPDAT1	3	0.21	2.00	3	0.19	2.93	1.103	0.682	
UPDAT2	1	0.22	5.75	1	0.20	8.97	1.100	0.641	
UPDTP1	1	0.09	2.88	1	0.12	3.04	0.750	0.947	
UPDTP2	2	0.15	2.59	2	0.13	2.99	1.192	0.866	
UPDTP3	1	0.06	0.72	1	0.05	0.22	1.200	3.273	
UPDTP4	1	0.35	2.02	1	0.35	1.75	1.000	1.154	
UPDTP5	1	0.13	1.80	1	0.12	2.44	1.083	0.738	
UPDTP6	2	0.19	1.24	2	0.17	1.69	1.147	0.732	
TOTAL	33	8.21	264.90	33	7.28	364.69	1.128	0.726	
MPAN	16	0.29	8.63	16	0.26	11.88	1.096	1.052	

"IRRUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = IEHLIST									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

LIST1	3	0.24	4.04	3	0.23	4.20	1.059	0.960	
LIST2	3	0.19	6.14	3	0.20	4.97	0.951	1.237	
LIST3	2	0.69	19.83	2	0.54	18.39	1.275	1.078	
LIST4	3	0.16	5.56	3	0.14	4.17	1.119	1.333	
LIST5	2	0.36	21.30	2	0.35	17.10	1.028	1.246	

TOTAL	13	3.89	129.50	13	3.51	111.02	1.108	1.166	
MEAN	5	0.33	11.38	5	0.29	9.77	1.086	1.171	

STEP = IEHMOVE									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMMOVE	1	0.43	9.74	1	0.43	12.00	1.000	0.812	
MOVE1	3	0.34	4.69	3	0.34	5.48	0.990	0.855	
UTILITY1	1	0.42	8.03	1	0.38	7.00	1.105	1.147	
TOTAL	5	1.87	31.84	5	1.84	35.45	1.016	0.899	
MEAN	3	0.40	7.49	3	0.38	8.16	1.032	0.938	

STEP = IEHPPGM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GPWUPDTE	3	0.08	0.97	3	0.07	0.94	1.091	1.032	
UTILITY1	4	0.07	0.93	4	0.07	1.03	0.900	0.901	
TOTAL	7	0.51	6.65	7	0.52	6.97	0.981	0.954	
MEAN	2	0.07	0.95	2	0.07	0.99	0.995	0.966	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = IEHUTIL									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COMEMOVE	1	0.43	9.74	1	0.43	12.00	1.000	0.812	
GENUPDTE	3	0.08	0.97	3	0.07	0.94	1.091	1.032	
LIST1	3	0.24	4.04	3	0.23	4.20	1.059	0.960	
LIST2	3	0.19	6.14	3	0.20	4.97	0.951	1.237	
LIST3	2	0.69	19.43	2	0.54	18.39	1.275	1.078	
LIST4	3	0.16	5.56	3	0.14	4.17	1.119	1.333	
LIST5	2	0.36	21.30	2	0.35	17.10	1.028	1.246	
MOVE1	3	0.34	4.69	3	0.34	5.48	0.990	0.855	
UTILITY1	5	0.14	2.35	5	0.14	2.23	1.015	1.056	

TOTAL	25	6.27	167.99	25	5.87	153.44	1.068	1.095	
MPAN	9	0.29	8.29	9	0.27	7.72	1.059	1.068	

"IPHUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

STEP = LOADGO

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJSMP1	1	279.85	1.81	1	248.08	2.34	1.128	0.774	
BMKJS03B	2	2.43	1.81	2	1.59	1.73	1.531	1.049	
BMKJS06B	3	1.17	2.61	3	0.90	3.24	1.296	0.806	
BMKJS07B	3	0.20	2.15	3	0.18	3.20	1.132	0.671	
BMKJS08A	2	0.60	1.66	2	0.55	3.10	1.100	0.536	
BMKJS08B	2	0.62	2.83	2	0.55	3.66	1.127	0.774	
BMKJS09B	2	5.96	114.42	2	4.90	193.81	1.217	0.590	
BMKJS10B	4	0.16	2.61	4	0.14	3.18	1.161	0.823	
BMKJS11B	3	4.18	2.21	3	2.45	3.48	1.706	0.634	
BMKJS13B	2	0.71	2.77	2	0.64	3.11	1.109	0.892	
BMKJS22A	2	12.86	27.85	2	9.69	47.70	1.327	0.584	
BMKJS23A	2	0.11	1.42	2	0.11	1.55	1.000	0.916	
BMKJS23B	3	0.10	1.67	3	0.11	1.75	0.939	0.958	
BMKJS24A	2	90.06	33.81	2	72.87	74.73	1.236	0.452	
BMKJS24P	2	2.02	2.73	2	1.85	5.88	1.089	0.464	
DMATMUL	1	247.30	2.02	1	92.84	2.73	2.664	0.740	
EMATMUL	1	207.03	1.46	1	89.73	3.17	2.307	0.461	
NATRAN	1	146.68	2.05	1	78.84	3.46	1.860	0.592	
TOTAL	38	1129.25	422.36	38	706.49	729.97	1.598	0.579	
MPAN	19	55.67	11.55	18	33.67	20.10	1.385	0.707	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = PL1								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	4	1.19	7.49	4	1.10	7.07	1.082	1.060
BMKJS02A	3	2.10	6.18	3	1.78	6.37	1.182	0.970
BMKJS22A	1	15.22	35.85	1	13.10	25.03	1.162	1.432
TOTAL	8	26.27	84.35	8	22.82	72.41	1.151	1.165
MEAN	3	6.17	16.51	3	5.32	12.82	1.142	1.154

STEP = UTILITY									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT
COMPMOVE	2	0.26	5.66	2	0.26	6.89		1.000	0.822
COPY1	1	1.95	80.65	1	1.54	118.81		1.266	0.679
COPY2	1	0.15	2.41	1	0.10	2.89		1.500	0.834
GENR1	5	0.25	22.78	5	0.21	29.57		1.187	0.771
GENR2	7	0.15	3.18	7	0.12	6.22		1.212	0.511
GFNUPDTE	6	0.23	1.94	6	0.23	1.99		0.986	0.977
LIST1	3	0.24	4.04	3	0.23	4.20		1.059	0.960
LIST2	3	0.19	6.14	3	0.20	4.97		0.951	1.237
LIST3	2	0.69	19.93	2	0.54	18.39		1.275	1.078
LIST4	3	0.16	5.56	3	0.14	4.17		1.119	1.333
LIST5	2	0.36	21.30	2	0.35	17.10		1.028	1.246
MOVE1	3	0.14	4.69	3	0.34	5.48		0.990	0.855
PTPCR1	1	0.17	2.69	1	0.18	1.40		0.944	1.921
PTPCR2	2	0.11	2.89	2	0.13	2.35		0.885	1.232
UPDAT1	3	0.21	2.00	3	0.19	2.93		1.193	0.682
UPDAT2	1	0.22	5.75	1	0.20	8.97		1.100	0.641
UPDTP1	1	0.09	2.88	1	0.12	3.04		0.750	0.947
UPDTP2	2	0.15	2.59	2	0.13	2.99		1.192	0.866
UPDTE3	1	0.06	0.72	1	0.05	0.22		1.200	3.273
UPDTE4	1	0.35	2.02	1	0.35	1.75		1.009	1.154
UPDTE5	1	0.13	1.80	1	0.12	2.44		1.083	0.738
UPDTE6	2	0.19	1.24	2	0.17	1.69		1.147	0.732
UTILITY1	5	0.14	2.35	5	0.14	2.23		1.015	1.056
TOTAL	58	14.48	432.89	58	13.15	518.13		1.191	0.835
MEAN	23	0.30	8.92	23	0.26	10.90		1.087	1.067

"UTILITY" COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	145	19.39	4.96	145	11.96	9.80	1.621	0.506
ASM	52	0.32	3.34	52	0.29	4.74	1.113	0.705
EDT	45	0.43	6.86	45	0.37	8.91	1.153	0.770
FTG	17	2.11	1.49	17	1.90	1.81	1.110	0.823
PTH	4	3.41	9.04	4	2.99	9.11	1.143	0.992
PTH (0)	31	5.51	9.13	31	4.82	9.45	1.142	0.966
GO	107	15.72	2.77	107	9.60	6.45	1.637	0.430
IFRUTIL	33	0.25	8.03	33	0.22	11.05	1.128	0.726
IEHUTIL	25	0.25	6.72	25	0.23	6.14	1.068	1.095
LOAD&GO	39	29.72	11.11	38	18.59	19.21	1.598	0.579
PL1	8	3.28	10.54	8	2.85	9.05	1.151	1.165
UTILITY	58	0.25	7.46	58	0.23	8.93	1.101	0.835

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	38	34.86	7.54	38	20.97	15.08	1.388	0.838
ASM	5	0.59	5.47	5	0.52	8.51	1.130	0.671
EDT	21	0.42	6.66	21	0.37	8.77	1.157	0.792
FTG	10	3.09	1.48	10	2.76	1.74	1.086	0.883
PTH	4	3.41	9.04	4	2.99	9.11	1.157	1.021
PTH (0)	23	5.69	8.58	23	4.96	8.76	1.139	0.941
GO	20	16.12	3.94	20	9.53	10.56	1.390	0.957
IFRUTIL	16	0.29	8.63	16	0.26	11.88	1.096	1.052
IEHUTIL	9	0.29	8.29	9	0.27	7.72	1.059	1.069
LOAD&GO	18	55.67	11.55	18	33.67	20.10	1.385	0.707
PL1	3	6.17	16.51	3	5.32	12.82	1.142	1.154
UTILITY	23	0.30	8.92	23	0.26	10.90	1.087	1.067

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IFRUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6

IBM 370/195

470V6 / 195

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BMKJSMP1	1	174.77	7.64	1	249.11	5.17	0.702	1.478
BMKJS01A	4	1.80	36.69	4	2.17	35.33	0.831	1.038
BMKJS02A	3	2.50	31.46	3	3.18	30.13	0.785	1.044
BMKJS03A	1	8.63	15.85	1	8.05	15.44	1.072	1.027
BMKJS03B	1	5.22	5.28	1	4.95	4.31	1.055	1.225
BMKJS04A	2	98.34	20.48	2	71.83	21.92	1.369	0.934
BMKJS05A	5	67.25	12.44	5	39.64	10.52	1.697	1.182
BMKJS06A	1	3.92	16.69	1	4.79	12.83	0.818	1.301
BMKJS06B	1	3.69	17.34	1	3.76	11.44	0.981	1.516
BMKJS07A	3	0.84	11.53	3	1.07	10.38	0.786	1.111
BMKJS07B	1	1.04	16.45	1	1.17	14.37	0.849	1.145
BMKJS08A	1	1.26	9.23	1	1.54	7.88	0.819	1.171
BMKJS08B	1	1.30	7.74	1	1.54	8.67	0.844	0.893
BMKJS09A	1	14.25	520.20	1	15.24	588.53	0.935	0.884
BMKJS09B	1	9.98	466.03	1	10.65	390.21	0.937	1.194
BMKJS10A	2	0.80	7.80	2	0.96	6.70	0.833	1.163
BMKJS10B	2	0.74	7.05	2	0.89	8.13	0.831	0.867
BMKJS11A	1	10.65	11.66	1	11.76	12.02	0.906	0.970
BMKJS11B	1	9.28	6.64	1	9.06	12.44	1.024	0.534
BMKJS12A	1	23.35	67.08*	1	27.76	57.31*	0.941	1.170
BMKJS13A	1	3.70	35.40	1	4.34	38.15	0.853	0.928
BMKJS13B	1	3.15	27.04	1	3.65	26.79	0.863	1.009
BMKJS14A	1	157.82	36.47	1	104.19	34.95	1.515	1.043
BMKJS15A	1	12.71	13.73	1	15.71	9.59	0.809	1.432
BMKJS15B	1	6.53	47.84	1	7.67	37.18	0.851	1.287
BMKJS16A	1	12.12	23.78	1	14.12	19.72	0.858	1.206
BMKJS17A	1	25.96	53.37	1	30.78	37.14	0.843	1.437
BMKJS18A	1	97.53	7.19	1	42.11	7.85	2.316	0.916
BMKJS19A	1	128.70	58.18	1	129.43	62.12	0.994	0.937
BMKJS19B	5	85.69	37.35	5	87.51	32.03	0.979	1.166
BMKJS20A	1	4.01	13.23	1	4.94	10.96	0.812	1.207
BMKJS21A	3	2.88	43.54	3	3.09	48.75	0.931	0.893
BMKJS21B	7	0.21	3.29	7	0.21	4.53	0.980	0.727
BMKJS22A	1	25.45	56.36	1	32.49	120.44	0.783	0.473
BMKJS23A	1	1.09	5.45	1	1.24	4.72	0.879	1.155
BMKJS23B	1	1.15	11.67	1	1.35	7.06	0.852	1.653
BMKJS24A	1	124.29	159.39	1	147.63	153.92	0.842	1.036
BMKJS24B	1	4.91	13.47	1	5.68	18.96	0.864	0.710
COMPMOVE	1	0.48	16.54	1	0.52	13.79	0.923	1.199
COPY1	1	1.45	86.34	1	1.54	118.81	0.942	0.727
COPY2	1	0.11	2.53	1	0.10	2.89	1.100	0.875
DNATMUL	1	252.57	13.02	1	94.48	13.99	2.673	0.931
EPATMUL	1	145.18	11.51	1	91.32	13.02	1.590	0.884
GFNPR1	5	0.23	19.65	5	0.21	29.57	1.043	0.664
GFNPR2	7	0.10	6.19	7	0.12	6.22	0.835	0.995
GENUPDTF	3	0.45	5.80	3	0.46	3.98	0.978	1.456

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJSMP1	1	173.93	1.72	1	248.08	2.34	0.701	0.735
BMKJS01A	12	0.07	1.10	12	0.08	1.19	0.845	0.923
BMKJS02A	9	0.10	1.94	9	0.12	1.91	0.844	1.017
BMKJS03A	4	1.72	0.36	4	1.45	0.36	1.182	1.007
BMKJS03B	2	1.91	2.03	2	1.59	1.73	1.201	1.173
BMKJS04A	6	32.30	1.67	6	23.29	1.65	1.387	1.012
BMKJS05A	15	21.55	0.97	15	12.13	0.78	1.777	1.246
BMKJS06A	3	0.33	1.65	3	0.37	0.73	0.883	2.245
BMKJS06B	3	0.93	4.75	3	0.90	3.24	1.033	1.465
BMKJS07A	12	0.05	1.26	12	0.07	1.05	0.786	1.202
BMKJS07B	3	0.17	2.20	3	0.18	3.20	0.943	0.689
BMKJS08A	2	0.44	2.89	2	0.55	3.10	0.800	0.934
BMKJS08B	2	0.47	2.93	2	0.55	3.66	0.855	0.802
BMKJS09A	3	4.46	170.60	3	4.74	193.77	0.940	0.880
BMKJS09B	2	4.63	231.69	2	4.90	193.81	0.946	1.195
BMKJS10A	6	0.06	0.69	6	0.06	0.95	1.000	0.733
BMKJS10B	4	0.13	2.57	4	0.14	3.18	0.911	0.810
BMKJS11A	3	2.65	0.57	3	2.75	0.77	0.952	0.748
BMKJS11B	3	2.62	1.60	3	2.45	3.48	1.069	0.460
BMKJS12A	2	1.18	0.93*	2	0.15	1.06*		
BMKJS13A	3	0.45	0.45	3	0.55	0.85	0.829	0.533
BMKJS13B	2	0.54	1.84	2	0.64	3.11	0.837	0.593
BMKJS14A	2	73.40	0.65	2	45.30	0.89	1.620	0.736
BMKJS15A	3	0.53	0.83	3	0.55	0.75	0.952	1.116
BMKJS15B	1	0.02	0.13	1	0.02	0.06	1.000	2.167
BMKJS16A	4	1.37	0.88	4	1.49	0.58	0.918	1.513
BMKJS17A	2	2.99	1.09	2	3.55	1.32	0.841	0.830
BMKJS18A	3	31.81	0.30	3	13.18	0.46	2.413	0.657
BMKJS19A	3	40.54	1.22	3	40.36	1.45	1.004	0.839
BMKJS19B	10	40.15	1.59	10	40.55	1.33	0.990	1.194
BMKJS20A	3	0.05	0.34	3	0.04	0.37	1.077	0.918
BMKJS22A	2	7.76	20.67	2	9.69	47.70	0.800	0.433
BMKJS23A	2	0.09	1.56	2	0.11	1.55	0.864	1.006
BMKJS23B	3	0.08	2.70	3	0.11	1.75	0.727	1.544
BMKJS24A	2	61.29	76.55	2	72.87	74.73	0.841	1.024
BMKJS24B	2	1.60	4.52	2	1.85	5.88	0.865	0.770
DNATMUL	1	251.26	2.69	1	92.84	2.73	2.706	0.985
ENATMUL	1	143.89	1.90	1	89.73	3.17	1.604	0.599
NATRAM	1	88.22	2.73	1	78.84	3.46	1.119	0.789
TOTAL	145	2155.56	1369.52	145	1734.06	1420.34	1.243	0.964
MEAN	38	26.17	14.63	38	20.97	15.08	1.081	0.987

"ALL GO" COMBINES ALL GO, LOADGO, AND EDTEGO STEPS.

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195	
STEP = ASM								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

BMKJS13A	2	0.63	11.11	2	0.72	13.66	0.882	0.813
BMKJS13B	2	0.61	10.95	2	0.70	9.64	0.871	1.136
BMKJS19A	2	0.65	8.93	2	0.74	10.98	0.879	0.813
BMKJS21A	39	0.22	3.35	39	0.24	3.75	0.931	0.893
BMKJS21B	7	0.21	3.29	7	0.21	4.53	0.980	0.727

TOTAL	52	13.88	215.65	52	15.08	246.55	0.920	0.875
MPAN	5	0.47	7.53	5	0.52	8.51	0.909	0.876

STEP = EDT								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS01A	8	0.35	13.33	8	0.41	12.35	0.840	1.079
BMKJS02A	3	0.49	16.40	3	0.67	15.53	0.735	1.056
BMKJS03A	2	0.19	6.72	2	0.20	6.23	0.902	1.080
BMKJS04A	4	0.18	6.92	4	0.22	7.59	0.800	0.911
BMKJS05A	5	0.14	3.80	5	0.19	3.38	0.758	1.126
BMKJS06A	1	0.21	8.66	1	0.28	8.70	0.750	0.995
BMKJS07A	3	0.15	4.55	3	0.19	4.21	0.789	1.082
BMKJS09A	1	0.19	6.16	1	0.20	5.36	0.950	1.149
BMKJS10A	2	0.14	3.63	2	0.15	2.91	0.903	1.247
BMKJS11A	1	0.17	8.38	1	0.23	6.59	0.739	1.272
BMKJS12A	1	0.57	25.66	1	0.67	12.96	0.851	1.980
BMKJS13A	1	0.22	7.13	1	0.26	6.04	0.846	1.180
BMKJS14A	1	0.42	7.12	1	0.42	10.56	1.000	0.674
BMKJS15A	1	0.36	9.94	1	0.47	6.45	0.766	1.541
BMKJS15B	1	0.48	18.62	1	0.51	23.97	0.941	0.777
BMKJS16A	1	0.21	6.49	1	0.26	6.24	0.808	1.040
BMKJS17A	1	0.48	17.84	1	0.59	13.26	0.814	1.345
BMKJS18A	1	0.19	2.28	1	0.19	2.39	1.000	0.954
BMKJS19A	1	0.44	9.69	1	0.57	13.57	0.772	0.714
BMKJS19B	5	0.48	10.58	5	0.63	11.34	0.759	0.933
BMKJS20A	1	0.30	5.38	1	0.36	4.55	0.833	1.182
TOTAL	45	13.44	423.11	45	16.63	400.88	0.808	1.055
MEAN	21	0.30	9.49	21	0.37	8.77	0.836	1.110

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 MODIFIED MODEL JOBSTREAM

ANDAHL 470V/6				IBM 370/195			470V6 / 195	
STEP = FTG								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS02A	3	0.30	2.48	3	0.38	2.50	0.805	0.992
BMKJS03A	1	1.38	0.96	1	1.82	1.55	0.754	0.619
BMKJS03B	1	1.40	1.22	1	1.77	0.85	0.791	1.435
BMKJS04A	2	1.08	1.63	2	1.52	1.78	0.714	0.913
BMKJS06A	1	2.73	3.09	1	3.40	1.93	0.803	1.601
BMKJS07A	3	0.47	1.94	3	0.60	1.98	0.785	0.978
BMKJS10A	2	0.49	2.08	2	0.63	0.95	0.770	2.195
BMKJS10B	2	0.48	1.90	2	0.61	1.78	0.795	1.067
BMKJS11A	1	2.53	1.56	1	3.27	3.13	0.774	0.498
BMKJS15A	1	10.77	1.29	1	13.58	0.90	0.793	1.433
TOTAL	17	25.25	32.60	17	32.30	30.83	0.782	1.057
MEAN	10	2.16	1.82	10	2.76	1.74	0.779	1.173

STEP = PTH									
*****				*****				*****	
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BMKJSMP1	1	0.84	5.92	1	1.03	2.83	0.816	2.092	
DMATHUL	1	1.31	10.33	1	1.64	11.26	0.799	0.917	
PMATHUL	1	1.29	9.61	1	1.59	9.85	0.811	0.976	
NATRAN	1	6.21	16.89	1	7.69	12.49	0.808	1.352	

TOTAL	4	9.65	42.75	4	11.95	36.43	0.808	1.173	
MEAN	4	2.41	10.69	4	2.99	9.11	0.808	1.334	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195	
STEP = PTH (0)								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BMKJS05A	5	2.45	5.72	5	3.05	4.80	0.803	1.190
BMKJS06B	1	0.90	3.09	1	1.06	1.71	0.849	1.807
BMKJS07P	1	0.54	9.84	1	0.64	4.77	0.844	2.063
BMKJS08A	1	0.38	3.45	1	0.44	1.69	0.864	2.041
BMKJS08B	1	0.36	1.88	1	0.44	1.36	0.818	1.382
BMKJS09A	1	0.69	2.23	1	0.82	1.87	0.841	1.193
BMKJS09B	1	0.71	2.65	1	0.85	2.59	0.835	1.023
BMKJS11B	1	1.42	1.83	1	1.71	1.99	0.830	0.920
BMKJS12A	1	22.78	41.42	1	27.09	44.35	0.841	0.934
BMKJS13A	1	0.85	4.69	1	1.00	2.24	0.850	2.094
BMKJS13B	1	0.85	1.44	1	0.96	1.28	0.885	1.125
BMKJS14A	1	10.60	28.04	1	13.17	22.61	0.805	1.240
BMKJS15B	1	6.03	29.09	1	7.14	13.15	0.845	2.212
BMKJS16A	1	6.43	13.75	1	7.89	11.14	0.815	1.234
BMKJS17A	1	19.50	33.34	1	23.08	21.24	0.845	1.570
BMKJS18A	1	1.92	4.01	1	2.38	4.09	0.807	0.980
BMKJS19A	1	5.34	26.98	1	6.30	22.24	0.848	1.213
BMKJS19P	5	4.92	23.58	5	5.78	18.02	0.851	1.308
BMKJS20A	1	3.57	6.84	1	4.45	5.31	0.802	1.288
BMKJS23A	1	0.90	2.32	1	1.02	1.61	0.882	1.441
BMKJS23B	1	0.91	3.58	1	1.02	1.82	0.892	1.967
BMKJS24A	1	1.70	6.28	1	1.89	4.46	0.899	1.408
BMKJS24B	1	1.70	4.42	1	1.97	7.20	0.863	0.614
TOTAL	31	124.93	377.64	31	143.49	292.85	0.836	1.290
MEAN	23	4.15	11.32	23	4.96	8.76	0.844	1.402

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 MODIFIED MODEL JOBSTREAM

ANDAHL 470V/6				IBM 370/195			470V6 / 195		
STRP = GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BHKJS01A	12	0.07	1.10	12	0.08	1.19	0.845	0.923	
BHKJS02A	9	0.10	1.94	9	0.12	1.91	0.844	1.017	
BHKJS03A	4	1.72	0.36	4	1.45	0.36	1.192	1.007	
BHKJS04A	6	32.30	1.67	6	23.29	1.65	1.387	1.012	
BHKJS05A	15	21.55	0.97	15	12.13	0.78	1.777	1.246	
BHKJS06A	3	0.33	1.65	3	0.37	0.73	0.893	2.245	
BHKJS07A	12	0.05	1.26	12	0.07	1.05	0.786	1.202	
BHKJS09A	3	4.46	170.60	3	4.74	193.77	0.940	0.880	
BHKJS10A	6	0.06	0.69	6	0.06	0.95	1.000	0.733	
BHKJS11A	3	2.65	0.57	3	2.75	0.77	0.962	0.748	
BHKJS12A	2	1.18	0.93*	2	0.15	1.06*			
BHKJS13A	3	0.45	0.45	3	0.55	0.85	0.829	0.533	
BHKJS14A	2	73.40	0.65	2	45.30	0.89	1.620	0.736	
BHKJS15A	3	0.53	0.83	3	0.55	0.75	0.952	1.116	
BHKJS15B	1	0.02	0.13	1	0.02	0.06	1.000	2.167	
BHKJS16A	4	1.37	0.88	4	1.49	0.58	0.918	1.513	
BHKJS17A	2	2.99	1.09	2	3.55	1.32	0.841	0.830	
BHKJS18A	3	31.81	0.30	3	13.18	0.46	2.413	0.657	
BHKJS19A	3	40.54	1.22	3	40.36	1.45	1.004	0.839	
BHKJS19B	10	40.15	1.59	10	40.55	1.33	0.990	1.194	
BHKJS20A	3	0.05	0.34	3	0.04	0.37	1.077	0.918	

TOTAL	107	1328.87	627.02	107	1027.58	690.37	1.293	0.908	
MEAN	20	12.73	9.42	20	9.53	10.56	1.113	1.076	

STEP = IERCOMPR

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.09	1.26	1	0.09	1.79	1.000	0.704	
TOTAL	1	0.09	1.26	1	0.09	1.79	1.000	0.704	
MEAN	1	0.09	1.26	1	0.09	1.79	1.000	0.704	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IRBCOPY									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

COPY1	1	1.45	86.34	1	1.54	118.81	0.942	0.727	
COPY2	1	0.11	2.53	1	0.10	2.89	1.100	0.875	

TOTAL	2	1.56	88.87	2	1.64	121.70	0.951	0.730	
MEAN	2	0.78	44.43	2	0.82	60.85	1.021	0.801	

STEP = IRGENER									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENER1	5	0.23	19.65	5	0.21	29.57	1.093	0.664	
GENER2	7	0.10	6.19	7	0.12	6.22	0.835	0.995	
TOTAL	12	1.88	141.58	12	1.92	191.39	0.979	0.740	
MEAN	2	0.17	12.92	2	0.17	17.89	0.964	0.830	

STEP = IERPTPCH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
PTPCH1	1	0.19	3.10	1	0.18	1.40	1.000	2.214	
PTPCH2	2	0.12	2.28	2	0.13	2.35	0.962	0.972	
TOTAL	3	0.43	7.67	3	0.44	6.10	0.977	1.257	
MEAN	2	0.15	2.69	2	0.15	1.87	0.981	1.593	

STEP = IEBUPDAT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
UPDAT1	3	0.18	2.86	3	0.19	2.93	0.948	0.975	
UPDAT2	1	0.26	4.21	1	0.20	8.97	1.300	0.469	
TOTAL	4	0.81	12.79	4	0.78	17.77	1.038	0.720	
MEAN	2	0.22	3.53	2	0.20	5.95	1.124	0.722	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 MODIFIED MODEL JOBSTREAM

ANDAHL 470V/6				IBM 370/195			470V6 / 195	
STEP = IEBUPDTE								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

GFNUPDTE	3	0.39	4.84	3	0.39	3.04	1.009	1.593
PPDTE1	1	0.13	2.84	1	0.12	3.04	1.093	0.934
PPDTE2	2	0.10	3.18	2	0.13	2.99	0.808	1.063
UPDTE3	1	0.04	0.46	1	0.05	0.22	0.800	2.091
PPDTE4	1	0.34	3.34	1	0.35	1.75	0.971	1.909
PPDTE5	1	0.10	5.26	1	0.12	2.44	0.833	2.156
UPDTE6	2	0.18	1.91	2	0.17	1.69	1.029	1.127

TOTAL	11	2.35	16.60	11	2.41	25.94	0.975	1.411
MEAN	7	0.18	3.12	7	0.19	2.17	0.933	1.553

STEP = IFRUTIL

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.09	1.26	1	0.09	1.79	1.000	0.704	
COPY1	1	1.45	86.34	1	1.54	118.81	0.942	0.727	
COPY2	1	0.11	2.53	1	0.10	2.89	1.100	0.875	
GENPR1	5	0.23	19.65	5	0.21	29.57	1.093	0.664	
GENPR2	7	0.10	6.19	7	0.12	6.22	0.835	0.995	
GENUPDTE	3	0.39	4.84	3	0.39	3.04	1.009	1.593	
PTPCH1	1	0.18	3.10	1	0.18	1.40	1.000	2.214	
PTPCH2	2	0.12	2.28	2	0.13	2.35	0.962	0.972	
UPDAT1	3	0.18	2.86	3	0.19	2.93	0.948	0.975	
UPDAT2	1	0.26	4.21	1	0.20	8.97	1.300	0.469	
UPDTE1	1	0.13	2.84	1	0.12	3.04	1.093	0.934	
UPDTE2	2	0.10	3.18	2	0.13	2.99	0.808	1.063	
UPDTE3	1	0.04	0.46	1	0.05	0.22	0.800	2.091	
UPDTE4	1	0.34	3.34	1	0.35	1.75	0.971	1.909	
UPDTE5	1	0.10	5.26	1	0.12	2.44	0.833	2.156	
UPDTE6	2	0.18	1.91	2	0.17	1.69	1.029	1.127	
TOTAL	33	7.12	288.77	33	7.28	364.69	0.978	0.792	
MEAN	16	0.25	9.39	16	0.26	11.88	0.982	1.217	

"IEBUTIL" COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IEHLIST									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

LIST1	3	0.22	5.86	3	0.23	4.20	0.971	1.395	
LIST2	3	0.20	5.96	3	0.20	4.97	1.000	1.200	
LIST3	2	0.52	20.91	2	0.54	18.39	0.954	1.137	
LIST4	3	0.14	5.19	3	0.14	4.17	1.024	1.244	
LIST5	2	0.31	24.94	2	0.35	17.10	0.873	1.458	

TOTAL	13	3.36	142.75	13	3.51	111.02	0.957	1.286	
MEAN	5	0.28	12.57	5	0.29	9.77	0.964	1.287	

STEP = IPRMOVE									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.39	15.28	1	0.43	12.00	0.907	1.273	
MOVE1	3	0.35	13.81	3	0.34	5.48	1.010	2.518	
UTILITY1	1	0.29	13.57	1	0.38	7.00	0.763	1.939	
TOTAL	5	1.72	70.27	5	1.84	35.45	0.935	1.982	
MEAN	3	0.34	14.22	3	0.38	8.16	0.893	1.910	

STEP = IEHPRGM									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
GENUPDTE	3	0.06	0.96	3	0.07	0.94	0.818	1.018	
UTILITY1	4	0.06	1.56	4	0.07	1.03	0.833	1.510	
TOTAL	7	0.43	9.13	7	0.52	6.97	0.827	1.310	
MEAN	2	0.06	1.26	2	0.07	0.99	0.826	1.264	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195		
STEP = IEHUTIL									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	1	0.39	15.28	1	0.43	12.00	0.907	1.273	
GFNUPDTE	3	0.06	0.96	3	0.07	0.94	0.818	1.018	
LIST1	3	0.22	5.86	3	0.23	4.20	0.971	1.395	
LIST2	3	0.20	5.96	3	0.20	4.97	1.000	1.200	
LIST3	2	0.52	20.91	2	0.54	18.39	0.954	1.137	
LIST4	3	0.14	5.19	3	0.14	4.17	1.024	1.244	
LIST5	2	0.31	24.94	2	0.35	17.10	0.873	1.458	
MOVE1	3	0.35	13.81	3	0.34	5.48	1.010	2.518	
UTILITY1	5	0.11	3.96	5	0.14	2.23	0.794	1.779	
TOTAL	25	5.51	222.15	25	5.87	153.44	0.939	1.448	
MEAN	9	0.26	10.76	9	0.27	7.72	0.928	1.447	

"IFHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

STPP = LOADSGO

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BMKJSMP1	1	173.93	1.72	1	248.08	2.34	0.701	0.735	
BMKJS03B	2	1.91	2.03	2	1.59	1.73	1.201	1.173	
BMKJS06B	3	0.93	4.75	3	0.90	3.24	1.033	1.465	
BMKJS07B	3	0.17	2.20	3	0.18	3.20	0.943	0.689	
BMKJS08A	2	0.44	2.89	2	0.55	3.10	0.800	0.934	
BMKJS08B	2	0.47	2.93	2	0.55	3.66	0.855	0.802	
BMKJS09B	2	4.63	231.69	2	4.90	193.81	0.946	1.195	
BMKJS10B	4	0.13	2.57	4	0.14	3.18	0.911	0.810	
BMKJS11B	3	2.62	1.60	3	2.45	3.48	1.069	0.460	
BMKJS13B	2	0.54	1.84	2	0.64	3.11	0.837	0.593	
BMKJS22A	2	7.76	20.67	2	9.69	47.70	0.800	0.433	
BMKJS23A	2	0.09	1.56	2	0.11	1.55	0.864	1.006	
BMKJS23B	3	0.08	2.70	3	0.11	1.75	0.727	1.544	
BMKJS24A	2	61.29	76.55	2	72.87	74.73	0.841	1.024	
BMKJS24B	2	1.60	4.52	2	1.85	5.88	0.865	0.770	
DNATHUL	1	251.26	2.69	1	92.84	2.73	2.706	0.985	
PHATHUL	1	143.89	1.90	1	89.73	3.17	1.604	0.599	
NATRAN	1	88.22	2.73	1	78.84	3.46	1.119	0.789	
TOTAL	38	826.70	742.50	38	706.49	729.97	1.170	1.017	
MEAN	18	41.11	20.42	18	33.67	20.10	1.046	0.889	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6				IBM 370/195			470V6 / 195			
STEP = PL1										

	JOBNAME		STEPS	CPU	WAIT		STEPS	CPU	WAIT	

	BMKJS01A		4	0.90	6.74		4	1.10	7.07	
	BMKJS02A		3	1.40	6.75		3	1.78	6.37	
	BMKJS22A		1	9.93	15.62		1	13.10	25.03	

	TOTAL		8	17.73	62.81		8	22.82	72.41	
	MEAN		3	4.08	9.70		3	5.32	12.82	

STEP = UTILITY									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
COMPMOVE	2	0.24	8.27	2	0.26	6.89	0.923	1.199	
COPY1	1	1.45	86.34	1	1.54	118.81	0.942	0.727	
COPY2	1	0.11	2.53	1	0.10	2.89	1.100	0.875	
GENER1	5	0.23	19.65	5	0.21	29.57	1.093	0.664	
GENFR2	7	0.10	6.19	7	0.12	6.22	0.835	0.995	
GENUPDTE	6	0.23	2.90	6	0.23	1.99	0.978	1.456	
LIST1	3	0.22	5.86	3	0.23	4.20	0.971	1.395	
LIST2	3	0.20	5.96	3	0.20	4.97	1.000	1.200	
LIST3	2	0.52	20.91	2	0.54	18.39	0.954	1.137	
LIST4	3	0.14	5.19	3	0.14	4.17	1.024	1.244	
LIST5	2	0.31	24.94	2	0.35	17.10	0.873	1.458	
MOVE1	3	0.35	13.81	3	0.34	5.48	1.010	2.518	
PTPCH1	1	0.18	3.10	1	0.18	1.40	1.000	2.214	
PTPCH2	2	0.12	2.28	2	0.13	2.35	0.962	0.972	
UPDAT1	3	0.18	2.86	3	0.19	2.93	0.948	0.975	
UPDAT2	1	0.26	4.21	1	0.20	8.97	1.300	0.469	
UPDTE1	1	0.13	2.84	1	0.12	3.04	1.083	0.934	
UPDTE2	2	0.10	3.18	2	0.13	2.99	0.808	1.063	
UPDTE3	1	0.04	0.46	1	0.05	0.22	0.800	2.091	
UPDTE4	1	0.34	3.34	1	0.35	1.75	0.971	1.909	
UPDTE5	1	0.10	5.26	1	0.12	2.44	0.833	2.156	
UPDTE6	2	0.18	1.91	2	0.17	1.69	1.029	1.127	
UTILITY1	5	0.11	3.96	5	0.14	2.23	0.794	1.779	
TOTAL	58	12.63	510.92	58	13.15	518.13	0.960	0.986	
MEAN	23	0.25	10.26	23	0.26	10.90	0.967	1.329	

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
MODIFIED MODEL JOBSTREAM

AMDAHL 470V/6

IBM 370/195

470V6 / 195

SUMMARY OF STEP TIMES WEIGHTED BY THE NUMBER OF TIMES EACH STEP WAS RUN

STEPNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ALL GO	145	14.87	9.44	145	11.96	9.80	1.243	0.964
ASM	52	0.27	4.15	52	0.29	4.74	0.920	0.875
EDT	45	0.30	9.40	45	0.37	8.91	0.908	1.055
PTG	17	1.49	1.92	17	1.90	1.81	0.782	1.057
PTH	4	2.41	10.69	4	2.99	9.11	0.808	1.173
PTH (C)	31	4.03	12.18	31	4.82	9.45	0.836	1.290
GO	107	12.42	5.86	107	9.60	6.45	1.293	0.908
IEBUTIL	33	0.22	8.75	33	0.22	11.05	0.978	0.792
IEHUTIL	25	0.22	8.89	25	0.23	6.14	0.939	1.448
LOAD&GO	38	21.76	19.54	38	18.59	19.21	1.170	1.017
PL1	8	2.22	7.85	8	2.85	9.05	0.777	0.867
UTILITY	58	0.22	8.81	58	0.23	8.93	0.960	0.986

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	38	26.17	14.63	38	20.97	15.08	1.081	0.987
ASM	5	0.47	7.53	5	0.52	8.51	0.909	0.876
EDT	21	0.30	9.49	21	0.37	8.77	0.836	1.110
PTG	10	2.16	1.82	10	2.76	1.74	0.779	1.173
PTH	4	2.41	10.69	4	2.99	9.11	0.808	1.334
PTH (C)	23	4.15	11.32	23	4.96	8.76	0.844	1.402
GO	20	12.73	9.42	20	9.53	10.56	1.113	1.076
IEBUTIL	16	0.25	9.39	16	0.26	11.88	0.982	1.217
IEHUTIL	9	0.26	10.76	9	0.27	7.72	0.928	1.447
LOAD&GO	18	41.11	20.42	18	33.67	20.10	1.046	0.889
PL1	3	4.08	9.70	3	5.32	12.82	0.789	0.879
UTILITY	23	0.25	10.26	23	0.26	10.90	0.967	1.329

"ALL GO " COMBINES ALL GO, LOAD&GO, AND EDT&GO STEPS.

"IEBUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEB" PREFIX.

"IEHUTIL " COMBINES ALL IBM UTILITIES WITH THE "IEH" PREFIX.

"UTILITY " COMBINES ALL IBM UTILITIES ("IEB" AND "IEH").

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470

IBM 370/168 MOD 3				ANDAHL 470V/6				168 / 470	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT		CPU	WAIT
ANLTRIM	1	177.20	32.50	1	138.71	34.80		1.277	0.934
DOT2	1	566.22	61.68	1	349.07	90.54		1.622	0.681
DROPLET	1	500.72	2.98	1	489.70	5.06		1.023	0.589
EIGEN	1	26.66	5.33	1	23.76	9.28		1.122	0.574
EROS	1	245.36	120.54	1	154.55	145.78		1.588	0.827
HEPCVT	1	117.21	60.16	1	78.99	54.11		1.484	1.112
KTTFLCK	1	120.55	18.59	1	70.43	23.70		1.712	0.784
LIFE1A	1	252.94	44.97	1	170.15	40.45		1.487	1.112
LINDA	1	449.27	130.36	1	266.36	207.74		1.687	0.628
MATRIX	3	88.95	13.59	3	75.06	22.68		1.185	0.599
MONTE	1	284.07	6.69	1	210.30	16.17		1.351	0.414
MULTC	1	125.64	17.41	1	100.59	60.74		1.249	0.287
NVERTEX	3	148.85	51.31	3	100.97	75.01		1.474	0.684
OWL	1	198.08	18.02	1	116.93	47.88		1.694	0.376
REXCO	1	241.14	16.33	1	196.46	19.18		1.227	0.851
SDIAG	1	36.03	4.50	1	35.17	23.16		1.024	0.194
SUMX	1	41.00	160.11*	1	29.57	207.70*			
TOTAL	16	3578.88	604.96	16	2577.20	876.28		1.389	0.690
MEAN	16	223.68	37.81	16	161.08	54.77		1.388	0.665

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

ANLTRIM	1	158.46	11.21	1	125.36	9.22	1.264	1.216	
DOT2	1	529.39	29.82	1	322.36	41.89	1.642	0.712	
DROPLET	1	498.40	1.70	1	488.00	1.94	1.021	0.876	
EIGEN	1	23.46	1.53	1	21.48	2.87	1.092	0.533	
EROS	1	217.42	69.91	1	134.63	83.14	1.615	0.841	
HEPCVT	1	89.51	10.10	1	61.64	10.64	1.452	0.949	
KTTFLCK	1	116.04	1.69	1	67.29	1.48	1.724	1.142	
LIFE1A	1	222.32	4.71	1	149.42	7.21	1.488	0.653	
LINDA	1	393.32	79.42	1	225.98	102.50	1.741	0.775	
MATRIX	3	79.28	1.77	3	68.02	3.04	1.165	0.581	
MONTE	1	276.47	1.67	1	204.29	1.82	1.353	0.918	
MULTC	1	111.88	2.07	1	90.23	2.56	1.240	0.809	
NVERTEX	3	127.56	2.60	3	85.58	3.40	1.491	0.765	
OWL	1	193.85	1.66	1	113.75	3.05	1.704	0.544	
REXCO	1	216.49	3.35	1	178.25	3.08	1.215	1.088	
SDIAG	1	33.47	1.51	1	33.30	6.41	1.005	0.236	
SUMX	1	95.61	20.88*	1	0.44	4.39*			

TOTAL	16	3287.32	224.72	16	2369.58	284.25	1.387	0.791	
MEAN	16	205.46	14.04	16	148.10	17.77	1.388	0.790	

STEP = ASM

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
EROS	1	0.57	3.89	1	0.41	3.93	1.390	0.990	
SUMX	1	0.76	4.94	1	0.62	3.60	1.226	1.372	
TOTAL	2	1.33	8.83	2	1.03	7.53	1.291	1.173	
MEAN	2	0.66	4.41	2	0.51	3.76	1.308	1.181	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = EDT&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT

LINDA	1	393.32	79.42	1	225.98	102.50		1.741	0.775
SUMX	1	95.61	20.88*	1	0.44	4.39*			

TOTAL	1	393.32	79.42	1	225.98	102.50		1.741	0.775
MEAN	1	393.32	79.42	1	225.98	102.50		1.741	0.775

STEP = FTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
ANLTRIM	1	18.74	21.29	1	13.35	25.58	1.404	0.832	
DOT2	1	36.83	31.86	1	26.71	48.65	1.379	0.655	
DROPLET	1	2.32	1.28	1	1.70	3.12	1.365	0.410	
EIGEN	1	3.20	3.80	1	2.28	6.41	1.404	0.593	
EROS	1	27.37	46.74	1	19.51	58.71	1.403	0.796	
KTTFLCK	1	4.51	16.90	1	3.14	22.22	1.436	0.761	
LIFE1A	1	30.62	40.26	1	20.73	33.24	1.477	1.211	
LINDA	1	55.95	50.94	1	40.38	105.24	1.386	0.484	
MATRIX	3	9.67	11.82	3	7.04	19.64	1.374	0.602	
MONTE	1	7.60	5.02	1	6.01	14.35	1.265	0.350	
MULTC	1	13.76	15.34	1	10.36	58.18	1.328	0.264	
NVERTEX	3	21.29	48.71	3	15.39	71.61	1.383	0.680	
OWL	1	4.23	16.36	1	3.18	44.83	1.330	0.365	
REXCO	1	24.65	12.98	1	18.21	16.10	1.354	0.806	
SDIAG	1	2.56	2.99	1	1.87	16.75	1.369	0.179	
SUMX	1	40.24	155.17	1	28.95	204.10	1.390	0.760	
TOTAL	16	303.54	481.47	16	218.81	748.73	1.387	0.643	
MEAN	16	18.97	30.09	16	13.68	46.80	1.378	0.609	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

ANLTRIM	1	158.46	11.21	1	125.36	9.22	1.264	1.216	
DOT2	1	529.39	29.82	1	322.36	41.89	1.642	0.712	
DROPLET	1	498.40	1.70	1	488.00	1.94	1.021	0.876	
EIGEN	1	23.46	1.53	1	21.48	2.87	1.092	0.533	
EROS	1	217.42	69.91	1	134.63	83.14	1.615	0.841	
HEPCVT	1	89.51	10.10	1	61.64	10.64	1.452	0.949	
KTTFLCK	1	116.04	1.69	1	67.29	1.48	1.724	1.142	
LIFE1A	1	222.32	4.71	1	149.42	7.21	1.488	0.653	
MATRIX	3	79.28	1.77	3	68.02	3.04	1.165	0.581	
MONTE	1	276.47	1.67	1	204.29	1.82	1.353	0.918	
MULTC	1	111.88	2.07	1	90.23	2.56	1.240	0.809	
NVERTEX	3	127.56	2.60	3	85.58	3.40	1.491	0.765	
OWL	1	193.85	1.66	1	113.75	3.05	1.704	0.544	
REXCO	1	216.49	3.35	1	178.25	3.08	1.215	1.088	
SDIAG	1	33.47	1.51	1	33.30	6.41	1.005	0.236	

TOTAL	15	2894.00	145.30	15	2143.60	181.75	1.350	0.799	
MEAN	15	192.93	9.69	15	142.91	12.12	1.365	0.791	

STEP = PL1

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
HEPCVT	1	27.70	50.06	1	17.35	43.47	1.597	1.152	
TOTAL	1	27.70	50.06	1	17.35	43.47	1.597	1.152	
MEAN	1	27.70	50.06	1	17.35	43.47	1.597	1.152	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3

AMDAHL 470V/6

168 / 470

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	16	205.46	14.04	16	148.10	17.77	1.387	0.791
ASM	2	0.66	4.41	2	0.51	3.76	1.291	1.173
EDT&GO	1	393.32	79.42	1	225.98	102.50	1.741	0.775
PTH	16	18.97	30.09	16	13.68	46.80	1.387	0.643
LOAD&GO	15	192.93	9.69	15	142.91	12.12	1.350	0.799
PL1	1	27.70	50.06	1	17.35	43.47	1.597	1.152

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	16	205.46	14.04	16	148.10	17.77	1.388	0.790
ASM	2	0.66	4.41	2	0.51	3.76	1.308	1.181
EDT&GO	1	393.32	79.42	1	225.98	102.50	1.741	0.775
PTH	16	18.97	30.09	16	13.68	46.80	1.378	0.609
LOAD&GO	15	192.93	9.69	15	142.91	12.12	1.365	0.791
PL1	1	27.70	50.06	1	17.35	43.47	1.597	1.152

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 SINGLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DOT2	1	529.39	29.82	1	322.36	41.89	1.642	0.712	
EROS	1	217.42	69.91	1	134.63	83.14	1.615	0.841	
KTTFLCK	1	116.04	1.69	1	67.29	1.48	1.724	1.142	
LINDA	1	393.32	79.42	1	225.98	102.50	1.741	0.775	
NVERTEX	3	127.56	2.60	3	85.58	3.40	1.491	0.765	
OWL	1	193.85	1.66	1	113.75	3.05	1.704	0.544	

TOTAL	6	1577.58	185.10	6	949.59	235.46	1.661	0.786	
MEAN	6	262.93	30.85	6	158.26	39.24	1.653	0.797	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 DOUBLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

ANLTRIM	1	158.46	11.21	1	125.36	9.22	1.264	1.216
DROPLET	1	498.40	1.70	1	488.00	1.94	1.021	0.876
EIGEN	1	23.46	1.53	1	21.48	2.87	1.092	0.533
LIFE1A	1	222.32	4.71	1	149.42	7.21	1.488	0.653
MATRIX	3	79.28	1.77	3	68.02	3.04	1.165	0.581
MONTE	1	276.47	1.67	1	204.29	1.82	1.353	0.918
MULTC	1	111.88	2.07	1	90.23	2.56	1.240	0.809
REXCO	1	216.49	3.35	1	178.25	3.08	1.215	1.088
SDIAG	1	33.47	1.51	1	33.30	6.41	1.005	0.236

TOTAL	9	1620.23	29.52	9	1358.35	38.15	1.193	0.774
MEAN	9	180.03	3.28	9	150.93	4.24	1.205	0.768

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	177.20	32.50	1	113.74	34.83	1.558	0.933
DOT2	1	566.22	61.68	1	408.06	85.52	1.388	0.721
DROPLET	1	500.72	2.98	1	283.43	5.21	1.767	0.572
EIGEN	1	26.66	5.33	1	15.38	8.55	1.733	0.623
EROS	1	245.36	120.54	1	171.95	145.33	1.427	0.829
HEPCVT	1	117.21	60.16	1	99.41	84.12	1.179	0.715
KTTFLCK	1	120.55	18.59	1	72.72	16.19	1.658	1.149
LIFE1A	1	252.94	44.97	1	153.32	85.46	1.650	0.526
LINDA	1	449.27	130.36	1	328.30	148.19	1.368	0.880
MATRIX	3	88.95	13.59	3	45.11	13.61	1.972	0.998
MONTE	1	284.07	6.69	1	169.67	7.71	1.674	0.868
MULTC	1	125.64	17.41	1	81.16	34.55	1.548	0.504
NVERTEX	3	148.85	51.31	3	112.83	73.05	1.319	0.702
OWL	1	198.08	18.02	1	127.70	22.50	1.551	0.801
REXCO	1	241.14	16.33	1	156.20	16.92	1.544	0.965
SDIAG	1	36.03	4.50	1	15.63	4.62	2.305	0.974
SUMX	1	41.00	160.11*	1	36.46	152.75*		
TOTAL	16	3578.88	604.96	16	2354.61	786.37	1.520	0.769
MEAN	16	223.68	37.81	16	147.16	49.15	1.603	0.798

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	158.46	11.21	1	95.97	12.27	1.651	0.914
DOT2	1	529.39	29.82	1	372.95	51.08	1.419	0.584
DROPLET	1	498.40	1.70	1	281.29	3.06	1.772	0.556
EIGEN	1	23.46	1.53	1	12.33	3.87	1.903	0.395
EROS	1	217.42	69.91	1	145.51	89.77	1.494	0.779
HEPCVT	1	89.51	10.10	1	74.68	12.21	1.199	0.827
KTTFLCK	1	116.04	1.69	1	68.53	1.60	1.693	1.056
LIFE1A	1	222.32	4.71	1	126.06	10.00	1.764	0.471
LINDA	1	393.32	79.42	1	276.35	91.07	1.423	0.872
MATRIX	3	79.28	1.77	3	36.27	1.92	2.186	0.920
MONTE	1	276.47	1.67	1	162.42	2.22	1.702	0.752
MULTC	1	111.88	2.07	1	68.69	18.69	1.629	0.111
NVERTEX	3	127.56	2.60	3	92.88	21.28	1.373	0.122
OWL	1	193.85	1.66	1	123.64	4.99	1.568	0.333
REXCO	1	216.49	3.35	1	133.82	3.76	1.618	0.891
SDIAG	1	33.47	1.51	1	13.32	1.44	2.513	1.049
SUMX	1	95.61	20.88*	1	72.57	31.80*		
TOTAL	16	3287.32	224.72	16	2084.71	329.23	1.577	0.683
MEAN	16	205.46	14.04	16	130.29	20.58	1.682	0.664

STEP = ASM									

JCBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

EROS	1	0.57	3.89	1	0.52	5.70	1.096	0.682	
SUMX	1	0.76	4.94	1	0.65	4.53	1.169	1.091	

TOTAL	2	1.33	8.83	2	1.17	10.23	1.137	0.863	
MEAN	2	0.66	4.41	2	0.58	5.11	1.133	0.886	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = EDT&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

LINDA	1	393.32	79.42	1	276.35	91.07	1.423	0.872	
SUMX	1	95.61	20.88*	1	72.57	31.80*			

TOTAL	1	393.32	79.42	1	276.35	91.07	1.423	0.872	
MEAN	1	393.32	79.42	1	276.35	91.07	1.423	0.872	

STEP = PTH									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

ANLTRIM	1	18.74	21.29	1	17.77	22.56	1.055	0.944	
DOT2	1	36.83	31.86	1	35.11	34.44	1.049	0.925	
DROPLET	1	2.32	1.28	1	2.14	2.15	1.084	0.595	
EIGEN	1	3.20	3.80	1	3.05	4.68	1.049	0.812	
EROS	1	27.37	46.74	1	25.92	49.86	1.056	0.937	
KTTFLCK	1	4.51	16.90	1	4.19	14.59	1.076	1.158	
LIPB1A	1	30.62	40.26	1	27.26	75.46	1.123	0.534	
LINDA	1	55.95	50.94	1	51.95	57.12	1.077	0.892	
MATRIX	3	9.67	11.82	3	8.84	11.69	1.094	1.011	
MCNTE	1	7.60	5.02	1	7.25	5.49	1.048	0.914	
MULTC	1	13.76	15.34	1	12.47	15.86	1.103	0.967	
NVERTEX	3	21.29	48.71	3	19.95	51.78	1.067	0.941	
OWL	1	4.23	16.36	1	4.06	17.51	1.042	0.934	
REXCO	1	24.65	12.98	1	22.38	13.16	1.101	0.986	
SDIAG	1	2.56	2.99	1	2.31	3.18	1.108	0.940	
SUMX	1	40.24	155.17	1	35.81	148.22	1.124	1.047	

TOTAL	16	303.54	481.47	16	280.46	527.75	1.082	0.912	
MEAN	16	18.97	30.09	16	17.53	32.98	1.079	0.909	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD&GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

ANLTRIM	1	158.46	11.21	1	95.97	12.27	1.651	0.914
DOT2	1	529.39	29.82	1	372.95	51.08	1.419	0.584
DROPLET	1	498.40	1.70	1	281.29	3.06	1.772	0.556
EIGEN	1	23.46	1.53	1	12.33	3.87	1.903	0.395
EROS	1	217.42	69.91	1	145.51	89.77	1.494	0.779
HEPCVT	1	89.51	10.10	1	74.68	12.21	1.199	0.827
KTTFLCK	1	116.04	1.69	1	68.53	1.60	1.693	1.056
LIFE1A	1	222.32	4.71	1	126.06	10.00	1.764	0.471
MATRIX	3	79.28	1.77	3	36.27	1.92	2.186	0.920
MONTE	1	276.47	1.67	1	162.42	2.22	1.702	0.752
MULTC	1	111.88	2.07	1	68.69	18.69	1.629	0.111
NVERTEX	3	127.56	2.60	3	92.88	21.28	1.373	0.122
OWL	1	193.85	1.66	1	123.64	4.99	1.568	0.333
REXCO	1	216.49	3.35	1	133.82	3.76	1.618	0.891
SDIAG	1	33.47	1.51	1	13.32	1.44	2.513	1.049

TOTAL	15	2894.00	145.30	15	1808.36	238.16	1.600	0.610
MEAN	15	192.93	9.69	15	120.56	15.88	1.699	0.651

STEP = PL1									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
HEPCVT	1	27.70	50.06	1	24.73	71.91	1.120	0.696	
TOTAL	1	27.70	50.06	1	24.73	71.91	1.120	0.696	
MEAN	1	27.70	50.06	1	24.73	71.91	1.120	0.696	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
APPLICATIONS PROBLEMS

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	16	205.46	14.04	16	130.29	20.58	1.577	0.683
ASH	2	0.66	4.41	2	0.58	5.11	1.137	0.863
EDT&GO	1	393.32	79.42	1	276.35	91.07	1.423	0.872
PTH	16	18.97	30.09	16	17.53	32.98	1.082	0.912
LOAD&GO	15	192.93	9.69	15	120.56	15.88	1.600	0.610
PL1	1	27.70	50.06	1	24.73	71.91	1.120	0.696

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	16	205.46	14.04	16	130.29	20.58	1.682	0.664
ASH	2	0.66	4.41	2	0.58	5.11	1.133	0.886
EDT&GO	1	393.32	79.42	1	276.35	91.07	1.423	0.872
PTH	16	18.97	30.09	16	17.53	32.98	1.079	0.909
LOAD&GO	15	192.93	9.69	15	120.56	15.88	1.699	0.651
PL1	1	27.70	50.06	1	24.73	71.91	1.120	0.696

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 SINGLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
DOT2	1	529.39	29.82	1	372.95	51.08	1.419	0.584
EROS	1	217.42	69.91	1	145.51	89.77	1.494	0.779
KTTFLCK	1	116.04	1.69	1	68.53	1.60	1.693	1.056
LINDA	1	393.32	79.42	1	276.35	91.07	1.423	0.872
NVERTEX	3	127.56	2.60	3	92.88	21.28	1.373	0.122
OWL	1	193.85	1.66	1	123.64	4.99	1.568	0.333
TOTAL	6	1577.58	185.10	6	1079.86	259.79	1.461	0.713
MEAN	6	262.93	30.85	6	179.98	43.30	1.495	0.624

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 DOUBLE PRECISION APPLICATIONS PROBLEMS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = LOAD&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	158.46	11.21	1	95.97	12.27	1.651	0.914
DROPLET	1	498.40	1.70	1	281.29	3.06	1.772	0.556
EIGEN	1	23.46	1.53	1	12.33	3.87	1.903	0.395
LIFE1A	1	222.32	4.71	1	126.06	10.00	1.764	0.471
MATRIX	3	79.28	1.77	3	36.27	1.92	2.186	0.920
MONTE	1	276.47	1.67	1	162.42	2.22	1.702	0.752
MULTC	1	111.88	2.07	1	68.69	18.69	1.629	0.111
REXCO	1	216.49	3.35	1	133.82	3.76	1.618	0.891
SDIAG	1	33.47	1.51	1	13.32	1.44	2.513	1.049
TOTAL	9	1620.23	29.52	9	930.17	57.23	1.742	0.516
MEAN	9	180.03	3.28	9	103.35	6.36	1.860	0.673

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
APPLICATIONS PROBLEMS

AMDAHL 470V/6				IBM 370/195			470 / 195	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	138.71	34.80	1	113.74	34.83	1.220	0.999
DOT2	1	349.07	90.54	1	408.06	85.52	0.855	1.059
DROPLET	1	489.70	5.06	1	283.43	5.21	1.728	0.971
EIGEN	1	23.76	9.28	1	15.38	8.55	1.545	1.085
EROS	1	154.55	145.78	1	171.95	145.33	0.899	1.003
HEPCVT	1	78.99	54.11	1	99.41	84.12	0.795	0.643
KTTFLCK	1	70.43	23.70	1	72.72	16.19	0.969	1.464
LIFE1A	1	170.15	40.45	1	153.32	85.46	1.110	0.473
LINDA	1	266.36	207.74	1	328.30	148.19	0.811	1.402
MATRIX	3	75.06	22.68	3	45.11	13.61	1.664	1.666
MONTE	1	210.30	16.17	1	169.67	7.71	1.239	2.097
MULTC	1	100.59	60.74	1	81.16	34.55	1.239	1.758
NVERTEX	3	100.97	75.01	3	112.83	73.05	0.895	1.027
OWL	1	116.93	47.88	1	127.70	22.50	0.916	2.128
REXCO	1	196.46	19.18	1	156.20	16.92	1.258	1.134
SDIAG	1	35.17	23.16	1	15.63	4.62	2.250	5.013
SUMX	1	29.57	207.70*	1	36.46	152.75*		
TOTAL	16	2577.20	876.28	16	2354.61	786.37	1.095	1.114
MEAN	16	161.08	54.77	16	147.16	49.15	1.212	1.495

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
APPLICATIONS PROBLEMS

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = ALL GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
ANLTRIM	1	125.36	9.22	1	95.97	12.27	1.306	0.751	
DOT2	1	322.36	41.89	1	372.95	51.08	0.864	0.820	
DROPLET	1	488.00	1.94	1	281.29	3.06	1.735	0.634	
EIGEN	1	21.48	2.87	1	12.33	3.87	1.742	0.742	
EROS	1	134.63	83.14	1	145.51	89.77	0.925	0.926	
HEPCVT	1	61.64	10.64	1	74.68	12.21	0.825	0.871	
KTTFLCK	1	67.29	1.48	1	68.53	1.60	0.982	0.925	
LIFE1A	1	149.42	7.21	1	126.06	10.00	1.185	0.721	
LINDA	1	225.98	102.50	1	276.35	91.07	0.818	1.126	
MATRIX	3	68.02	3.04	3	36.27	1.92	1.875	1.583	
MONTE	1	204.29	1.82	1	162.42	2.22	1.258	0.820	
MULTC	1	90.23	2.56	1	68.69	18.69	1.314	0.137	
NVERTEX	3	85.58	3.40	3	92.88	21.28	0.921	0.160	
OWL	1	113.75	3.05	1	123.64	4.99	0.920	0.611	
REXCO	1	178.25	3.08	1	133.82	3.76	1.332	0.819	
SDIAG	1	33.30	6.41	1	13.32	1.44	2.500	4.451	
SUMX	1	0.44	4.39*	1	72.57	31.80*			
TOTAL	16	2369.58	284.25	16	2084.71	329.23	1.137	0.863	
MEAN	16	148.10	17.77	16	130.29	20.58	1.281	1.006	

STEP = ASM

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
EROS	1	0.41	3.93	1	0.52	5.70	0.788	0.689	
SUMX	1	0.62	3.60	1	0.65	4.53	0.954	0.795	
TOTAL	2	1.03	7.53	2	1.17	10.23	0.880	0.736	
MEAN	2	0.51	3.76	2	0.58	5.11	0.871	0.742	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
APPLICATIONS PROBLEMS

AMDAHL 470V/6				IBM 370/195			470 / 195	
STEP = EDT&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
LINDA	1	225.98	102.50	1	276.35	91.07	0.818	1.126
SUMX	1	0.44	4.39*	1	72.57	31.80*		
TOTAL	1	225.98	102.50	1	276.35	91.07	0.818	1.126
MEAN	1	225.98	102.50	1	276.35	91.07	0.818	1.126
STEP = FTH								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	13.35	25.58	1	17.77	22.56	0.751	1.134
DOT2	1	26.71	48.65	1	35.11	34.44	0.761	1.413
DROPLET	1	1.70	3.12	1	2.14	2.15	0.794	1.451
EIGEN	1	2.28	6.41	1	3.05	4.68	0.748	1.370
EROS	1	19.51	58.71	1	25.92	49.86	0.753	1.177
KTTFLICK	1	3.14	22.22	1	4.19	14.59	0.749	1.523
LIFE1A	1	20.73	33.24	1	27.26	75.46	0.760	0.440
LINDA	1	40.38	105.24	1	51.95	57.12	0.777	1.842
MATRIX	3	7.04	19.64	3	8.84	11.69	0.796	1.680
MONTE	1	6.01	14.35	1	7.25	5.49	0.829	2.614
MULTC	1	10.36	58.18	1	12.47	15.86	0.831	3.668
NVERTEX	3	15.39	71.61	3	19.95	51.78	0.772	1.383
OWL	1	3.18	44.83	1	4.06	17.51	0.783	2.560
REXCO	1	18.21	16.10	1	22.38	13.16	0.814	1.223
SDIAG	1	1.87	16.75	1	2.31	3.18	0.810	5.267
SUMX	1	28.95	204.10	1	35.81	148.22	0.808	1.377
TOTAL	16	218.81	748.73	16	280.46	527.75	0.780	1.419
MEAN	16	13.68	46.80	16	17.53	32.98	0.784	1.883

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
APPLICATIONS PROBLEMS

AMDAHL 470V/6				IBM 370/195			470 / 195	
STEP = LOAD&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	125.36	9.22	1	95.97	12.27	1.306	0.751
DOT2	1	322.36	41.89	1	372.95	51.08	0.864	0.820
DROPLET	1	488.00	1.94	1	281.29	3.06	1.735	0.634
EIGEN	1	21.48	2.87	1	12.33	3.87	1.742	0.742
EROS	1	134.63	83.14	1	145.51	89.77	0.925	0.926
HEPCVT	1	61.64	10.64	1	74.68	12.21	0.825	0.871
KTTFLCK	1	67.29	1.48	1	68.53	1.60	0.982	0.925
LIFE1A	1	149.42	7.21	1	126.06	10.00	1.185	0.721
MATRIX	3	68.02	3.04	3	36.27	1.92	1.875	1.583
MONTE	1	204.29	1.82	1	162.42	2.22	1.258	0.820
MULTC	1	90.23	2.56	1	68.69	18.69	1.314	0.137
NVERTEX	3	85.58	3.40	3	92.88	21.28	0.921	0.160
OWL	1	113.75	3.05	1	123.64	4.99	0.920	0.611
REXCO	1	178.25	3.08	1	133.82	3.76	1.332	0.819
SDIAG	1	33.30	6.41	1	13.32	1.44	2.500	4.451
TOTAL	15	2143.60	181.75	15	1808.36	238.16	1.185	0.763
MEAN	15	142.91	12.12	15	120.56	15.88	1.312	0.998

STEP = PL1

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
HEPCVT	1	17.35	43.47	1	24.73	71.91	0.702	0.605	
TOTAL	1	17.35	43.47	1	24.73	71.91	0.702	0.605	
MEAN	1	17.35	43.47	1	24.73	71.91	0.702	0.605	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
APPLICATIONS PROBLEMS

AMDAHL 470V/6

IBM 370/195

470 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	16	148.10	17.77	16	130.29	20.58	1.137	0.863
ASM	2	0.51	3.76	2	0.58	5.11	0.880	0.736
EDT&GO	1	225.98	102.50	1	276.35	91.07	0.818	1.126
PTH	16	13.68	46.80	16	17.53	32.98	0.780	1.419
LOAD&GO	15	142.91	12.12	15	120.56	15.88	1.185	0.763
PL1	1	17.35	43.47	1	24.73	71.91	0.702	0.605

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	16	148.10	17.77	16	130.29	20.58	1.281	1.006
ASM	2	0.51	3.76	2	0.58	5.11	0.871	0.742
EDT&GO	1	225.98	102.50	1	276.35	91.07	0.818	1.126
PTH	16	13.68	46.80	16	17.53	32.98	0.784	1.883
LOAD&GO	15	142.91	12.12	15	120.56	15.88	1.312	0.998
PL1	1	17.35	43.47	1	24.73	71.91	0.702	0.605

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
SINGLE PRECISION APPLICATIONS PROBLEMS

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DOT2	1	322.36	41.89	1	372.95	51.08	0.864	0.820	
EROS	1	134.63	83.14	1	145.51	89.77	0.925	0.926	
KTTFLCK	1	67.29	1.48	1	68.53	1.60	0.982	0.925	
LINDA	1	225.98	102.50	1	276.35	91.07	0.818	1.126	
NVERTEX	3	85.58	3.40	3	92.88	21.28	0.921	0.160	
OWL	1	113.75	3.05	1	123.64	4.99	0.920	0.611	
TOTAL	6	949.59	235.46	6	1079.86	259.79	0.879	0.906	
MEAN	6	158.26	39.24	6	179.98	43.30	0.905	0.761	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
DOUBLE PRECISION APPLICATIONS PROBLEMS

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

ANLTRIM	1	125.36	9.22	1	95.97	12.27	1.306	0.751	
DROPLET	1	488.00	1.94	1	281.29	3.06	1.735	0.634	
EIGEN	1	21.48	2.87	1	12.33	3.87	1.742	0.742	
LIFE1A	1	149.42	7.21	1	126.06	10.00	1.185	0.721	
MATRIX	3	68.02	3.04	3	36.27	1.92	1.875	1.583	
MONTE	1	204.29	1.82	1	162.42	2.22	1.258	0.820	
MULTC	1	90.23	2.56	1	68.69	18.69	1.314	0.137	
REXCO	1	178.25	3.08	1	133.82	3.76	1.332	0.819	
SDIAG	1	33.30	6.41	1	13.32	1.44	2.500	4.451	

TOTAL	9	1358.35	38.15	9	930.17	57.23	1.460	0.667	
MEAN	9	150.93	4.24	9	103.35	6.36	1.583	1.184	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
NRL BENCHMARK KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
NRLICH01	1	249.20	6.43	1	163.54	21.77	1.524	0.295
NRLICH02	1	174.94	4.70	1	129.98	15.13	1.346	0.311
NRLICH04	1	192.58	5.61	1	127.92	20.89	1.505	0.269
NRLICH05	1	255.83	6.02	1	150.43	7.07	1.701	0.851
NRLICH06	1	238.43	6.57	1	154.67	5.94	1.542	1.106
NRLICH07	1	232.10	5.04	1	221.75	4.14	1.047	1.217
TOTAL	6	1343.08	34.37	6	948.29	74.94	1.416	0.459
MEAN	6	223.85	5.73	6	158.05	12.49	1.444	0.675

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
NRL BENCHMARK KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = EDT									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NRLICH01	1	0.25	2.56	1	0.13	5.52	1.923	0.464	
NRLICH02	1	0.18	1.86	1	0.12	5.76	1.500	0.323	
NRLICH04	1	0.17	1.80	1	0.12	4.49	1.417	0.401	
NRLICH05	1	0.15	2.33	1	0.16	2.92	0.938	0.798	
NRLICH06	1	0.14	3.22	1	0.13	2.72	1.077	1.184	
NRLICH07	1	0.18	2.86	1	0.16	2.21	1.125	1.294	

TOTAL	6	1.07	14.63	6	0.82	23.62	1.305	0.619	
MEAN	6	0.18	2.44	6	0.14	3.94	1.330	0.744	

STEP = FTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	1.39	3.66	1	1.03	15.99	1.350	0.229	
NRLICH02	1	0.99	2.64	1	0.68	8.96	1.456	0.295	
NRLICH04	1	0.88	3.66	1	0.70	16.12	1.257	0.227	
NRLICH05	1	1.52	3.55	1	1.01	3.92	1.505	0.906	
NRLICH06	1	1.38	3.12	1	0.96	3.01	1.437	1.037	
NRLICH07	1	1.75	1.99	1	1.14	1.66	1.535	1.199	
TOTAL	6	7.91	18.62	6	5.52	49.66	1.433	0.375	
MEAN	6	1.32	3.10	6	0.92	8.28	1.423	0.649	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	247.56	0.21	1	162.38	0.26	1.525	0.808	
NRLICH02	1	173.77	0.20	1	129.18	0.41	1.345	0.488	
NRLICH04	1	191.53	0.15	1	127.10	0.28	1.507	0.536	
NRLICH05	1	254.16	0.14	1	149.26	0.23	1.703	0.609	
NRLICH06	1	236.91	0.23	1	153.58	0.21	1.543	1.095	
NRLICH07	1	230.17	0.19	1	220.45	0.27	1.044	0.704	
TOTAL	6	1334.10	1.12	6	941.95	1.66	1.416	0.675	
MEAN	6	222.35	0.19	6	156.99	0.28	1.444	0.706	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 NRL BENCHMARK KERNELS

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
EDT	6	0.18	2.44	6	0.14	3.94	1.305	0.619
PTH	6	1.32	3.10	6	0.92	8.28	1.433	0.375
GO	6	222.35	0.19	6	156.99	0.28	1.416	0.675

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
EDT	6	0.18	2.44	6	0.14	3.94	1.330	0.744
PTH	6	1.32	3.10	6	0.92	8.28	1.423	0.649
GO	6	222.35	0.19	6	156.99	0.28	1.444	0.706

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 SINGLE PRECISION NRL KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	247.56	0.21	1	162.38	0.26	1.525	0.808	
NRLICH02	1	173.77	0.20	1	129.18	0.41	1.345	0.488	
NRLICH04	1	191.53	0.15	1	127.10	0.28	1.507	0.536	
NRLICH05	1	254.16	0.14	1	149.26	0.23	1.703	0.609	
NRLICH06	1	236.91	0.23	1	153.58	0.21	1.543	1.095	
TOTAL	5	1103.93	0.93	5	721.50	1.39	1.530	0.669	
MEAN	5	220.79	0.19	5	144.30	0.28	1.524	0.707	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 NRL BENCHMARK KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
NRLICH01	1	249.20	6.43	1	157.47	6.98	1.583	0.921
NRLICH02	1	174.94	4.70	1	111.97	4.49	1.562	1.047
NRLICH04	1	192.58	5.61	1	110.59	8.69	1.741	0.646
NRLICH05	1	255.83	6.02	1	136.43	7.82	1.875	0.770
NRLICH06	1	238.43	6.57	1	124.94	5.25	1.908	1.251
NRLICH07	1	232.10	5.04	1	94.29	3.66	2.462	1.377
TOTAL	6	1343.08	34.37	6	735.69	36.89	1.826	0.932
MEAN	6	223.85	5.73	6	122.61	6.15	1.855	1.002

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
NRL BENCHMARK KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = EDT									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	0.25	2.56	1	0.17	3.04	1.471	0.842	
NRLICH02	1	0.18	1.86	1	0.15	2.02	1.200	0.921	
NRLICH04	1	0.17	1.80	1	0.15	4.69	1.133	0.384	
NRLICH05	1	0.15	2.33	1	0.16	3.68	0.938	0.633	
NRLICH06	1	0.14	3.22	1	0.16	2.74	0.875	1.175	
NRLICH07	1	0.18	2.86	1	0.16	2.14	1.125	1.336	
TOTAL	6	1.07	14.63	6	0.95	18.31	1.126	0.799	
MEAN	6	0.18	2.44	6	0.16	3.05	1.124	0.882	

STEP = PTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	1.39	3.66	1	1.25	3.36	1.112	1.089	
NRLICH02	1	0.99	2.64	1	0.84	2.29	1.179	1.153	
NRLICH04	1	0.88	3.66	1	0.83	3.70	1.060	0.989	
NRLICH05	1	1.52	3.55	1	1.33	3.94	1.143	0.901	
NRLICH06	1	1.38	3.12	1	1.16	2.29	1.190	1.362	
NRLICH07	1	1.75	1.99	1	1.43	1.31	1.224	1.519	
TOTAL	6	7.91	18.62	6	6.84	16.89	1.156	1.102	
MEAN	6	1.32	3.10	6	1.14	2.81	1.151	1.169	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	247.56	0.21	1	156.05	0.58	1.586	0.362	
NRLICH02	1	173.77	0.20	1	110.98	0.18	1.566	1.111	
NRLICH04	1	191.53	0.15	1	109.61	0.30	1.747	0.500	
NRLICH05	1	254.16	0.14	1	134.94	0.20	1.884	0.700	
NRLICH06	1	236.91	0.23	1	123.62	0.22	1.916	1.045	
NRLICH07	1	230.17	0.19	1	92.70	0.21	2.483	0.905	
TOTAL	6	1334.10	1.12	6	727.90	1.69	1.833	0.683	
MEAN	6	222.35	0.19	6	121.32	0.28	1.864	0.771	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 WRL BENCHMARK KERNELS

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
EDT	6	0.18	2.44	6	0.16	3.05	1.126	0.799
FTH	6	1.32	3.10	6	1.14	2.81	1.156	1.102
GO	6	222.35	0.19	6	121.32	0.28	1.833	0.663

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
EDT	6	0.18	2.44	6	0.16	3.05	1.124	0.882
FTH	6	1.32	3.10	6	1.14	2.81	1.151	1.169
GO	6	222.35	0.19	6	121.32	0.28	1.864	0.771

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 SINGLE PRECISION NRL KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = GO									
-----*									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
-----*									
NRLICH01	1	247.56	0.21	1	156.05	0.58	1.586	0.362	
NRLICH02	1	173.77	0.20	1	110.98	0.18	1.566	1.111	
NRLICH04	1	191.53	0.15	1	109.61	0.30	1.747	0.500	
NRLICH05	1	254.16	0.14	1	134.94	0.20	1.884	0.700	
NRLICH06	1	236.91	0.23	1	123.62	0.22	1.916	1.045	
-----*									
TOTAL	5	1103.93	0.93	5	635.20	1.48	1.738	0.628	
MEAN	5	220.79	0.19	5	127.04	0.30	1.740	0.744	
-----*									

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 NRL BENCHMARK KERNELS

AMDAHL 470V/6

IBM 370/195

470 / 195

AMDAHL 470V/6				IBM 370/195			470 / 195	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
NRlich01	1	163.54	21.77	1	157.47	6.98	1.039	3.119
NRlich02	1	129.98	15.13	1	111.97	4.49	1.161	3.370
NRlich04	1	127.92	20.89	1	110.59	8.69	1.157	2.404
NRlich05	1	150.43	7.07	1	136.43	7.82	1.103	0.904
NRlich06	1	154.67	5.94	1	124.94	5.25	1.238	1.131
NRlich07	1	221.75	4.14	1	94.29	3.66	2.352	1.131
TOTAL	6	948.29	74.94	6	735.69	36.89	1.289	2.031
MEAN	6	158.05	12.49	6	122.61	6.15	1.341	2.010

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
NRL BENCHMARK KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195	
STEP = EDT								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

NRLICH01	1	0.13	5.52	1	0.17	3.04	0.765	1.816
NRLICH02	1	0.12	5.76	1	0.15	2.02	0.800	2.851
NRLICH04	1	0.12	4.49	1	0.15	4.69	0.800	0.957
NRLICH05	1	0.16	2.92	1	0.16	3.68	1.000	0.793
NRLICH06	1	0.13	2.72	1	0.16	2.74	0.813	0.993
NRLICH07	1	0.16	2.21	1	0.16	2.14	1.000	1.033

TOTAL	6	0.82	23.62	6	0.95	18.31	0.863	1.290
MEAN	6	0.14	3.94	6	0.16	3.05	0.863	1.407

STEP = FTH									
*****				*****				*****	
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT
*****				*****				*****	
NRLICH01	1	1.03	15.99	1	1.25	3.36		0.824	4.759
NRLICH02	1	0.68	8.96	1	0.84	2.29		0.810	3.913
NRLICH04	1	0.70	16.12	1	0.83	3.70		0.843	4.357
NRLICH05	1	1.01	3.92	1	1.33	3.94		0.759	0.995
NRLICH06	1	0.96	3.01	1	1.16	2.29		0.828	1.314
NRLICH07	1	1.14	1.66	1	1.43	1.31		0.797	1.267
*****				*****				*****	
TOTAL	6	5.52	49.66	6	6.84	16.89		0.807	2.940
MEAN	6	0.92	8.28	6	1.14	2.81		0.810	2.767
*****				*****				*****	

STEP = GO								

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT

NRLICH01	1	162.38	0.26	1	156.05	0.58	1.041	0.448
NRLICH02	1	129.18	0.41	1	110.98	0.18	1.164	2.278
NRLICH04	1	127.10	0.28	1	109.61	0.30	1.160	0.933
NRLICH05	1	149.26	0.23	1	134.94	0.20	1.106	1.150
NRLICH06	1	153.58	0.21	1	123.62	0.22	1.242	0.955
NRLICH07	1	220.45	0.27	1	92.70	0.21	2.378	1.286

TOTAL	6	941.95	1.66	6	727.90	1.69	1.294	0.982
MEAN	6	156.99	0.28	6	121.32	0.28	1.348	1.175

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 MRL BENCHMARK KERNELS

ANDAHL 470V/6

IBM 370/195

470 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
EDT	6	0.14	3.94	6	0.16	3.05	0.863	1.290
PTH	6	0.92	8.28	6	1.14	2.81	0.807	2.940
GO	6	156.99	0.28	6	121.32	0.28	1.294	0.982

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
EDT	6	0.14	3.94	6	0.16	3.05	0.863	1.407
PTH	6	0.92	8.28	6	1.14	2.81	0.810	2.767
GO	6	156.99	0.28	6	121.32	0.28	1.348	1.175

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 SINGLE PRECISION NRL KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NRLICH01	1	162.38	0.26	1	156.05	0.58	1.041	0.448	
NRLICH02	1	129.18	0.41	1	110.98	0.18	1.164	2.278	
NRLICH04	1	127.10	0.28	1	109.61	0.30	1.160	0.933	
NRLICH05	1	149.26	0.23	1	134.94	0.20	1.106	1.150	
NRLICH06	1	153.58	0.21	1	123.62	0.22	1.242	0.955	

TOTAL	5	721.50	1.39	5	635.20	1.48	1.136	0.939	
MEAN	5	144.30	0.28	5	127.04	0.30	1.143	1.153	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276
BITSET	2	43.17	0.13	1	28.63	0.15	1.508	0.900
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103
DIF1DNOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103
DHATHUL	1	233.50	10.04	1	244.10	10.52	0.957	0.954
EHATHUL	1	205.67	11.35	1	140.50	9.83	1.464	1.155
PORTLIBD	1	159.95	5.45	1	117.13	8.28	1.366	0.658
PORTLIBE	1	112.43	4.24	1	72.03	8.87	1.561	0.478
PSQRT	1	327.40	5.21	1	297.06	5.70	1.102	0.914
PX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029
MINVERT	1	142.86	4.98	1	81.49	6.17	1.753	0.807
MORETEST	1	54.86	0.25	2	33.39	0.25	1.643	1.000
NATRAM	1	157.74	15.19	1	95.08	16.21	1.659	0.937
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716
TOTAL	18	5220.95	1161.58	18	4326.91	1684.19	1.207	0.690
MEAN	18	290.05	64.53	18	240.38	93.57	1.312	0.848

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BIGREBUS	1	581.09	356.68	1	536.52	382.78	1.147	0.932
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276
BITSET	2	43.17	0.13	1	28.63	0.15	1.508	0.900
DIP1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103
DIP1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749
DIP1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103
DNATHUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091
ENATHUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096
PORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891
PORTLIBE	1	111.71	1.88	1	71.51	2.66	1.562	0.707
PSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370
PX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029
MINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022
NORETEST	1	54.86	0.25	2	33.39	0.25	1.643	1.000
NATRAM	1	148.83	2.18	1	88.98	2.11	1.673	1.033
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716
TOTAL	18	5205.29	1117.90	18	4315.89	1631.58	1.206	0.685
MEAN	18	289.18	62.11	18	239.77	90.64	1.313	0.920

STEP = PTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DNATHUL	1	1.73	8.48	1	1.27	9.09	1.362	0.933	
ENATHUL	1	1.80	9.75	1	1.26	8.37	1.429	1.165	
PORTLIBD	1	0.71	3.15	1	0.56	5.70	1.268	0.553	
PORTLIBE	1	0.72	2.36	1	0.52	6.21	1.385	0.380	
PSQRT	1	0.63	3.36	1	0.45	4.35	1.400	0.772	
MINVERT	1	1.16	3.57	1	0.86	4.79	1.349	0.745	
NATRAM	1	8.91	13.01	1	6.10	14.10	1.461	0.923	
TOTAL	7	15.66	43.58	7	11.02	52.61	1.421	0.830	
MEAN	7	2.24	6.24	7	1.57	7.52	1.379	0.782	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
BITSET	2	43.17	0.13	1	28.63	0.15	1.508	0.900	
DIP1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIP1DNOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIP1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
MORETEST	1	54.86	0.25	2	33.39	0.25	1.643	1.000	
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	

TOTAL	11	3881.41	1105.12	11	3279.52	1618.61	1.184	0.683	
MEAN	11	352.86	100.47	11	298.14	147.15	1.251	0.850	

STEP = LOAD6GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DNATHUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091	
ENATHUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096	
PORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891	
PORTLIBE	1	111.71	1.88	1	71.51	2.66	1.562	0.707	
PSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370	
HINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022	
NATRAM	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
TOTAL	7	1323.89	12.78	7	1036.37	12.97	1.277	0.985	
MEAN	7	189.13	1.83	7	148.05	1.85	1.411	1.030	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	18	289.18	62.11	18	239.77	90.64	1.206	0.685
PTH	7	2.24	6.24	7	1.57	7.52	1.421	0.830
GO	11	352.86	100.47	11	298.14	147.15	1.184	0.683
LOAD&GO	7	189.13	1.83	7	148.05	1.85	1.277	0.985

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	18	289.18	62.11	18	239.77	90.64	1.313	0.920
PTH	7	2.24	6.24	7	1.57	7.52	1.379	0.782
GO	11	352.86	100.47	11	298.14	147.15	1.251	0.850
LOAD&GO	7	189.13	1.93	7	148.05	1.85	1.411	1.030

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
LARGE USER JOBS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIF1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
NATRAM	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	

TOTAL	10	3932.21	1106.92	10	3306.48	1620.32	1.189	0.683	
MEAN	10	393.22	110.69	10	330.65	162.03	1.228	0.849	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIF1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	
TOTAL	9	3783.38	1104.74	9	3217.50	1618.21	1.176	0.683	
MEAN	9	420.38	122.75	9	357.50	179.80	1.179	0.828	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 LARGE USER JOBS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NATRAM	1	148.83	2.18	1	88.98	2.11	1.673	1.033	

TOTAL	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
MEAN	1	148.83	2.18	1	88.98	2.11	1.673	1.033	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 SINGLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NATRAM	1	148.83	2.18	1	88.98	2.11	1.673	1.033	

TOTAL	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
BEAN	1	148.83	2.18	1	88.98	2.11	1.673	1.033	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 DOUBLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIF1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	
TOTAL	9	3783.38	1104.74	9	3217.50	1618.21	1.176	0.683	
MEAN	9	420.38	122.75	9	357.50	179.80	1.179	0.828	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
TUNED KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BITSET	2	43.17	0.13	1	28.63	0.15	1.508	0.900	
DNATHUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091	
ENATHUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096	
FORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891	
FORTLIBE	1	111.71	1.88	1	71.51	2.66	1.562	0.707	
FSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370	
MINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022	
MORETEST	1	54.86	0.25	2	33.39	0.25	1.643	1.000	

TOTAL	8	1273.09	10.98	8	1009.41	11.26	1.261	0.976	
MEAN	8	159.14	1.37	8	126.18	1.41	1.420	1.010	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BITSET	2	43.17	0.13	1	28.63	0.15	1.508	0.900	
MORETEST	1	54.86	0.25	2	33.39	0.25	1.643	1.000	
TOTAL	2	98.03	0.38	2	62.02	0.40	1.581	0.962	
MEAN	2	49.02	0.19	2	31.01	0.20	1.575	0.950	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DNATHUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091	
ENATHUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096	
FORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891	
FORTLIBE	1	111.71	1.88	1	71.51	2.66	1.562	0.707	
FSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370	
MINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022	
TOTAL	6	1175.06	10.60	6	947.39	10.86	1.240	0.976	
MEAN	6	195.84	1.77	6	157.90	1.81	1.368	1.030	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 SINGLE PRECISION KERNELS

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

EMATHUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096	
PORTLIBE	1	111.71	1.88	1	71.51	2.66	1.562	0.707	

TOTAL	2	315.58	3.48	2	210.75	4.12	1.497	0.845	
MEAN	2	157.79	1.74	2	105.37	2.06	1.513	0.901	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 DOUBLE PRECISION KERNELS

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = LOADSGO									

JCBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DNATHUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091	
PORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891	
PSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370	
HINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022	

TOTAL	4	859.48	7.12	4	736.64	6.74	1.167	1.056	
MEAN	4	214.87	1.78	4	184.16	1.68	1.295	1.094	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3

IBM 370/195

168 / 195

JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497
BITSET	2	43.17	0.13	1	39.27	0.18	1.099	0.750
DIF1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108
DIF1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180
DMATMUL	1	233.50	10.04	1	89.49	9.58	2.609	1.048
EMATMUL	1	205.67	11.35	1	90.03	12.79	2.284	0.887
FORTLIBD	1	159.95	5.45	1	78.72	6.38	2.032	0.854
FORTLIBE	1	112.43	4.24	1	83.42	9.31	1.348	0.455
FSQRT	1	327.40	5.21	1	83.30	6.08	3.930	0.857
FX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996
MINVERT	1	142.86	4.98	1	70.86	4.74	2.016	1.051
MCRETEST	1	54.86	0.25	2	40.56	0.44	1.352	0.562
NATRAN	1	157.74	15.19	1	87.58	18.29	1.801	0.831
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440
TOTAL	18	5220.95	1161.58	18	2558.78	1382.40	2.040	0.840
MEAN	18	290.05	64.53	18	142.15	76.80	1.996	0.817

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497
BITSET	2	43.17	0.13	1	39.27	0.18	1.099	0.750
DIF1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108
DIF1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180
DMATHUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061
EMATHUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119
FORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613
FORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.283
FSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889
PX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068
MORETEST	1	54.86	0.25	2	40.56	0.44	1.352	0.562
NATRAH	1	148.83	2.18	1	79.69	4.42	1.868	0.493
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440
TOTAL	18	5205.29	1117.90	18	2544.78	1336.35	2.045	0.837
MEAN	18	289.18	62.11	18	141.38	74.24	2.004	0.791

STEP = PTH								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
DMATHUL	1	1.73	8.48	1	1.53	8.11	1.131	1.046
EMATHUL	1	1.80	9.75	1	1.56	11.36	1.154	0.858
FORTLIBD	1	0.71	3.15	1	0.67	2.63	1.060	1.198
FORTLIBE	1	0.72	2.36	1	0.67	2.66	1.075	0.887
FSQRT	1	0.63	3.36	1	0.64	4.00	0.984	0.840
MINVERT	1	1.16	3.57	1	1.04	3.42	1.115	1.044
NATRAH	1	8.91	13.01	1	7.89	13.87	1.129	0.938
TOTAL	7	15.66	43.68	7	14.00	46.05	1.119	0.949
MEAN	7	2.24	6.24	7	2.00	6.58	1.093	0.973

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497
BITSET	2	43.17	0.13	1	39.27	0.18	1.099	0.750
DIF1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108
DIF1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180
FX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996
HORETEST	1	54.86	0.25	2	40.56	0.44	1.352	0.562
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440
TOTAL	11	3881.41	1105.12	11	1975.38	1315.23	1.965	0.840
MEAN	11	352.86	100.47	11	179.58	119.57	1.809	0.792
STEP = LOAD&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
DNATHUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061
ENATHUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119
PORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613
PORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.283
PSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889
NINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068
NATRAM	1	148.83	2.18	1	79.69	4.42	1.868	0.493
TOTAL	7	1323.89	12.78	7	569.40	21.12	2.325	0.605
MEAN	7	189.13	1.83	7	81.34	3.02	2.311	0.790

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
LARGE USER JOBS AND TUNED KERNELS

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	18	289.18	62.11	18	141.38	74.24	2.045	0.837
PTH	7	2.24	6.24	7	2.00	6.58	1.119	0.949
GO	11	352.86	100.47	11	179.58	119.57	1.965	0.840
LOAD&GO	7	189.13	1.83	7	81.34	3.02	2.325	0.605

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	18	289.18	62.11	18	141.38	74.24	2.004	0.791
PTH	7	2.24	6.24	7	2.00	6.58	1.093	0.973
GO	11	352.86	100.47	11	179.58	119.57	1.809	0.792
LOAD&GO	7	189.13	1.83	7	81.34	3.02	2.311	0.790

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
LARGE USER JOBS

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = ALL GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063	
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497	
DIP1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108	
DIP1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503	
DIP1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180	
PX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996	
NATBAN	1	148.83	2.18	1	79.69	4.42	1.868	0.493	
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575	
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043	
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440	
TOTAL	10	3932.21	1106.92	10	1975.24	1319.03	1.991	0.839	
MEAN	10	393.22	110.69	10	197.52	131.90	1.932	0.790	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063	
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497	
DIP1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108	
DIP1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503	
DIP1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180	
PX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996	
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575	
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043	
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440	
TOTAL	9	3783.38	1104.74	9	1895.55	1314.61	1.996	0.840	
MEAN	9	420.38	122.75	9	210.62	146.07	1.939	0.823	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 LARGE USER JOBS

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NATRAN	1	148.83	2.18	1	79.69	4.42	1.868	0.493	

TOTAL	1	148.83	2.18	1	79.69	4.42	1.868	0.493	
MEAN	1	148.83	2.18	1	79.69	4.42	1.868	0.493	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 SINGLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NATRAM	1	148.83	2.18	1	79.69	4.42	1.868	0.493	

TOTAL	1	148.83	2.18	1	79.69	4.42	1.868	0.493	
MEAN	1	148.83	2.18	1	79.69	4.42	1.868	0.493	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 DOUBLE PRECISION LARGE USER CODES

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063	
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497	
DIF1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108	
DIF1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503	
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180	
FX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996	
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575	
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043	
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440	
TOTAL	9	3783.38	1104.74	9	1895.55	1314.61	1.996	0.840	
MEAN	9	420.38	122.75	9	210.62	146.07	1.939	0.823	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
TUNED KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BITSET	2	43.17	0.13	1	39.27	0.18	1.099	0.750
DNATHUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061
EMATHUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119
FORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613
FORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.283
FSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068
MORETEST	1	54.86	0.25	2	40.56	0.44	1.352	0.562
TOTAL	8	1273.09	10.98	8	569.54	17.32	2.235	0.634
MEAN	8	159.14	1.37	8	71.19	2.17	2.096	0.793

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BITSET	2	43.17	0.13	1	39.27	0.18	1.099	0.750	
MORETEST	1	54.86	0.25	2	40.56	0.44	1.352	0.562	
TOTAL	2	98.03	0.38	2	79.83	0.62	1.228	0.616	
MEAN	2	49.02	0.19	2	39.92	0.31	1.226	0.656	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DMATHUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061	
EMATHUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119	
PORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613	
PORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.283	
PSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889	
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068	
TOTAL	6	1175.06	10.60	6	489.71	16.70	2.400	0.635	
MEAN	6	195.84	1.77	6	81.62	2.78	2.385	0.839	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 SINGLE PRECISION KERNELS

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

EMATHUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119	
PORTLIB	1	111.71	1.88	1	82.75	6.65	1.350	0.283	

TOTAL	2	315.58	3.48	2	171.22	8.08	1.843	0.431	
MEAN	2	157.79	1.74	2	85.61	4.04	1.827	0.701	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 DOUBLE PRECISION KERNELS

IBM 370/16C MOD 3				IBM 370/195			168 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DMATMUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061	
FORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613	
FSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889	
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068	

TOTAL	4	859.48	7.12	4	318.49	8.62	2.699	0.826	
MEAN	4	214.87	1.78	4	79.62	2.15	2.664	0.908	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 LARGE USER JOBS AND TUNED KERNELS

ANDAHL 470V/6				IBM 370/195			470 / 195	
JOBNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
DIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802
BITSET	1	28.63	0.15	1	39.27	0.18	0.729	0.833
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070
DHATHUL	1	244.10	10.52	1	89.49	9.58	2.728	1.098
EHATHUL	1	140.50	9.83	1	90.03	12.79	1.561	0.769
FORTLIBD	1	117.13	8.28	1	78.72	6.38	1.488	1.298
FORTLIBE	1	72.03	8.87	1	83.42	9.31	0.863	0.953
PSQRT	1	297.06	5.70	1	83.30	6.08	3.566	0.937
PX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967
HINVERT	1	81.49	6.17	1	70.86	4.74	1.150	1.302
MORETEST	2	33.39	0.25	2	40.56	0.44	0.823	0.562
NATBAN	1	95.08	16.21	1	87.58	18.29	1.086	0.886
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614
TOTAL	18	4326.91	1684.19	18	2558.78	1382.40	1.691	1.218
MEAN	18	240.38	93.57	18	142.15	76.80	1.606	1.008

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
LARGE USER JOBS AND TUNED KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = ALL GC									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
BITSET	1	28.63	0.15	1	39.27	0.18	0.729	0.833	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
DMATMUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973	
EMATMUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021	
FORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688	
FORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400	
FSORT	1	296.61	1.35	1	82.66	2.08	3.588	0.649	
FX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045	
MORETEST	2	33.39	0.25	2	40.56	0.44	0.823	0.562	
NATRAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	

TOTAL	18	4315.89	1631.58	18	2544.78	1336.35	1.696	1.221	
MEAN	18	239.77	90.64	18	141.38	74.24	1.612	0.897	

STEP = FTH									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DMATMUL	1	1.27	9.09	1	1.53	8.11	0.830	1.121	
EMATMUL	1	1.26	8.37	1	1.56	11.36	0.808	0.737	
FORTLIBD	1	0.56	5.70	1	0.67	2.63	0.836	2.167	
FORTLIBE	1	0.52	6.21	1	0.67	2.66	0.776	2.335	
FSORT	1	0.45	4.35	1	0.64	4.00	0.703	1.087	
MINVERT	1	0.86	4.79	1	1.04	3.42	0.827	1.401	
NATRAN	1	6.10	14.10	1	7.89	13.87	0.773	1.017	
TOTAL	7	11.02	52.61	7	14.00	46.05	0.787	1.142	
MEAN	7	1.57	7.52	7	2.00	6.58	0.793	1.409	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 LARGE USER JOBS AND TUNED KERNELS

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
BITSET	1	28.63	0.15	1	39.27	0.18	0.729	0.833	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
PX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
MORETEST	2	33.39	0.25	2	40.56	0.44	0.823	0.562	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	
TOTAL	11	3279.52	1618.61	11	1975.38	1315.23	1.660	1.231	
MEAN	11	298.14	147.15	11	179.58	119.57	1.497	0.990	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DMATHUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973	
EMATHUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021	
FORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688	
FORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400	
FSQRT	1	296.61	1.35	1	82.66	2.08	3.588	0.649	
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045	
NATRAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
TOTAL	7	1036.37	12.97	7	569.40	21.12	1.820	0.614	
MEAN	7	148.05	1.85	7	81.34	3.02	1.793	0.751	

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
LARGE USER JOBS AND TUNED KERNELS

AMDAHL 470V/6

IBM 370/195

470 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	18	239.77	90.64	18	141.38	74.24	1.696	1.221
PTH	7	1.57	7.52	7	2.00	6.58	0.787	1.142
GO	11	298.14	147.15	11	179.58	119.57	1.660	1.231
LOAD&GO	7	148.05	1.85	7	81.34	3.02	1.820	0.614

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	18	239.77	90.64	18	141.38	74.24	1.612	0.897
PTH	7	1.57	7.52	7	2.00	6.58	0.793	1.409
GO	11	298.14	147.15	11	179.58	119.57	1.497	0.990
LOAD&GO	7	148.05	1.85	7	81.34	3.02	1.793	0.751

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 LARGE USER JOBS

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
FX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
NATLAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	

TOTAL	10	3306.48	1620.32	10	1975.24	1319.03	1.674	1.228	
MEAN	10	330.65	162.03	10	197.52	131.90	1.603	0.998	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
FX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	
TOTAL	9	3217.50	1618.21	9	1895.55	1314.61	1.697	1.231	
MEAN	9	357.50	179.80	9	210.62	146.07	1.657	1.055	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 LARGE USER JOBS

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

NATRAM	1	88.98	2.11	1	79.69	4.42	1.117	0.477	

TOTAL	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
MEAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 SINGLE PRECISION LARGE USER CODES

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NATRAM	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
TOTAL	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
MEAN	1	88.98	2.11	1	79.69	4.42	1.117	0.477	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 DOUBLE PRECISION LARGE USER CODES

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
FX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	
TOTAL	9	3217.50	1618.21	9	1895.55	1314.61	1.697	1.231	
MEAN	9	357.50	179.80	9	210.62	146.07	1.657	1.055	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 TUNED KERNELS

ANDAHL 470V/6				IBM 370/195			470 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
BITSET	1	28.63	0.15	1	39.27	0.18	0.729	0.833
DNATHUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973
BNATHUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021
FORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688
FORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400
PSQRT	1	296.61	1.35	1	82.66	2.08	3.588	0.649
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045
MORETEST	2	33.39	0.25	2	40.56	0.44	0.823	0.562
TOTAL	8	1009.41	11.26	8	569.54	17.32	1.772	0.650
MEAN	8	126.18	1.41	8	71.19	2.17	1.623	0.771

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BITSET	1	28.63	0.15	1	39.27	0.18	0.729	0.833	
MORETEST	2	33.39	0.25	2	40.56	0.44	0.823	0.562	
TOTAL	2	62.02	0.40	2	79.83	0.62	0.777	0.640	
MEAN	2	31.01	0.20	2	39.92	0.31	0.776	0.698	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DNATHUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973	
BNATHUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021	
PORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688	
PORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400	
PSQRT	1	296.61	1.35	1	82.66	2.08	3.588	0.649	
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045	
TOTAL	6	947.39	10.86	6	489.71	16.70	1.935	0.650	
MEAN	6	157.90	1.81	6	81.62	2.78	1.906	0.796	

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 SINGLE PRECISION KERNELS

AMDAHL 470V/6				IBM 370/195			470 / 195	
STEP = LOAD&GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ENATMUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021
PORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400
TOTAL	2	210.75	4.12	2	171.22	8.08	1.231	0.510
MEAN	2	105.37	2.06	2	85.61	4.04	1.219	0.710

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 DOUBLE PRECISION KERNELS

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOADSGO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DMATHUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973	
FORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688	
PSQRT	1	296.61	1.35	1	82.66	2.08	3.588	0.649	
SINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045	

TOTAL	4	736.64	6.74	4	318.49	8.62	2.313	0.782	
MEAN	4	184.16	1.68	4	79.62	2.15	2.249	0.839	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
ALL SINGLE PRECISION

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DOT2	1	529.39	29.82	1	322.36	41.89	1.642	0.712	
EMATMUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096	
EROS	1	217.42	69.91	1	134.63	83.14	1.615	0.841	
FORTLIBE	1	111.71	1.88	1	71.51	2.66	1.562	0.707	
KTTFLCK	1	116.04	1.69	1	67.29	1.48	1.724	1.142	
LINDA	1	393.32	79.42	1	225.98	102.50	1.741	0.775	
NATRAN	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
NRLICH01	1	247.56	0.21	1	162.38	0.26	1.525	0.808	
NRLICH02	1	173.77	0.20	1	129.18	0.41	1.345	0.488	
NRLICH04	1	191.53	0.15	1	127.10	0.28	1.507	0.536	
NRLICH05	1	254.16	0.14	1	149.26	0.23	1.703	0.609	
NRLICH06	1	236.91	0.23	1	153.58	0.21	1.543	1.095	
NVERTEX	3	127.56	2.60	3	85.58	3.40	1.491	0.765	
OWL	1	193.85	1.66	1	113.75	3.05	1.704	0.544	

TOTAL	14	3145.92	191.69	14	1970.82	243.08	1.596	0.789	
MEAN	14	224.71	13.69	14	140.77	17.36	1.588	0.796	

STEP = GO

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	247.56	0.21	1	162.38	0.26	1.525	0.808	
NRLICH02	1	173.77	0.20	1	129.18	0.41	1.345	0.488	
NRLICH04	1	191.53	0.15	1	127.10	0.28	1.507	0.536	
NRLICH05	1	254.16	0.14	1	149.26	0.23	1.703	0.609	
NRLICH06	1	236.91	0.23	1	153.58	0.21	1.543	1.095	
TOTAL	5	1103.93	0.93	5	721.50	1.39	1.530	0.669	
MEAN	5	220.79	0.19	5	144.30	0.28	1.524	0.707	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 ALL SINGLE PRECISION

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DOT2	1	529.39	29.82	1	322.36	41.89	1.642	0.712	
ENATHUL	1	203.87	1.60	1	139.24	1.46	1.464	1.096	
EROS	1	217.42	69.91	1	134.63	83.14	1.615	0.841	
FORTLIBB	1	111.71	1.88	1	71.51	2.66	1.562	0.707	
KTTFLCK	1	116.04	1.69	1	67.29	1.48	1.724	1.142	
LINDA	1	393.32	79.42	1	225.98	102.50	1.741	0.775	
NATRAM	1	148.83	2.18	1	88.98	2.11	1.673	1.033	
NVERTEX	3	127.56	2.60	3	85.58	3.40	1.491	0.765	
OWL	1	193.85	1.66	1	113.75	3.05	1.704	0.544	

TOTAL	9	2041.99	190.76	9	1249.32	241.69	1.634	0.789	
MEAN	9	226.89	21.20	9	138.81	26.85	1.624	0.846	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 ALL SINGLE PRECISION

IBM 370/168 MOD 3

AMDAHL 470V/6

168 / 470

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	14	224.71	13.69	14	140.77	17.36	1.596	0.789
GO	5	220.79	0.19	5	144.30	0.28	1.530	0.669
LOAD&GO	9	226.89	21.20	9	138.81	26.85	1.634	0.789

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	14	224.71	13.69	14	140.77	17.36	1.588	0.796
GO	5	220.79	0.19	5	144.30	0.28	1.524	0.707
LOAD&GO	9	226.89	21.20	9	138.81	26.85	1.624	0.846

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470 /6
 ALL DOUBLE PRECISION

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

ANLTRIM	1	158.46	11.21	1	125.36	9.22	1.264	1.216	
BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIF1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
DMATHUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091	
DROPLET	1	498.40	1.70	1	488.00	1.94	1.021	0.876	
EIGEN	1	23.46	1.53	1	21.48	2.87	1.092	0.533	
PORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891	
FSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
LIFE1A	1	222.32	4.71	1	149.42	7.21	1.488	0.653	
MATRIX	3	79.28	1.77	3	68.02	3.04	1.165	0.581	
MINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022	
MONTE	1	276.47	1.67	1	204.29	1.82	1.353	0.918	
MULTC	1	111.88	2.07	1	90.23	2.56	1.240	0.809	
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097	
REXCO	1	216.49	3.35	1	178.25	3.08	1.215	1.088	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	
SDIAG	1	33.47	1.51	1	33.30	6.41	1.005	0.236	

TOTAL	22	6263.07	1141.37	22	5312.48	1663.10	1.179	0.686	
MEAN	22	284.68	51.88	22	241.48	75.60	1.211	0.852	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
ALL DOUBLE PRECISION

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	506.52	382.78	1.147	0.932	
BISONINT	1	831.54	163.48	1	649.65	593.18	1.280	0.276	
DIF1DADJ	1	150.81	18.79	1	130.59	17.03	1.155	1.103	
DIF1DMOD	1	573.86	27.49	1	512.97	36.72	1.119	0.749	
DIF1DRL	1	40.62	19.31	1	35.51	17.51	1.144	1.103	
FX2DEMO	1	538.39	289.27	1	453.98	281.06	1.186	1.029	
OVCBENCH	1	676.77	60.12	1	621.05	133.81	1.090	0.449	
REBUSTST	1	130.91	166.50	1	113.64	151.79	1.152	1.097	
SASBENCH	1	259.39	3.10	1	193.59	4.33	1.340	0.716	
TOTAL	9	3783.38	1104.74	9	3217.50	1618.21	1.176	0.683	
MEAN	9	420.38	122.75	9	357.50	179.80	1.179	0.828	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
ANLTRIM	1	158.46	11.21	1	125.36	9.22	1.264	1.216	
DMATMUL	1	231.77	1.56	1	242.83	1.43	0.954	1.091	
DROPLET	1	498.40	1.70	1	488.00	1.94	1.021	0.876	
EIGEN	1	23.46	1.53	1	21.48	2.87	1.092	0.533	
FORTLIBD	1	159.24	2.30	1	116.57	2.58	1.366	0.891	
FSQRT	1	326.77	1.85	1	296.61	1.35	1.102	1.370	
LIFE1A	1	222.32	4.71	1	149.42	7.21	1.488	0.653	
MATRIX	3	79.28	1.77	3	68.02	3.04	1.165	0.581	
MINVERT	1	141.70	1.41	1	80.63	1.38	1.757	1.022	
MONTE	1	276.47	1.67	1	204.29	1.82	1.353	0.918	
MULTC	1	111.88	2.07	1	90.23	2.56	1.240	0.809	
REXCO	1	216.49	3.35	1	178.25	3.08	1.215	1.088	
SDIAG	1	33.47	1.51	1	33.30	6.41	1.005	0.236	
TOTAL	13	2479.71	36.64	13	2094.99	44.89	1.184	0.816	
MEAN	13	190.75	2.82	13	161.15	3.45	1.233	0.868	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. ANDAHL 470V/6
 ALL DOUBLE PRECISION

IBM 370/168 MOD 3

ANDAHL 470V/6

168 / 470

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	STEPNAME	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	22	284.68	51.88	ALL GO	22	241.48	75.60	1.179	0.686
GO	9	420.38	122.75	GO	9	357.50	179.80	1.176	0.683
LOAD&GO	13	190.75	2.82	LOAD&GO	13	161.15	3.45	1.184	0.816

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	STEPNAME	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	22	284.68	51.88	ALL GO	22	241.48	75.60	1.211	0.852
GO	9	420.38	122.75	GO	9	357.50	179.80	1.179	0.828
LOAD&GO	13	190.75	2.82	LOAD&GO	13	161.15	3.45	1.233	0.868

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
ALL SINGLE PRECISION

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = ALL GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DOT2	1	529.39	29.82	1	372.95	51.08	1.419	0.584	
ENATMUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119	
EROS	1	217.42	69.91	1	145.51	89.77	1.494	0.779	
FORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.283	
KTTLFLCK	1	116.04	1.69	1	68.53	1.60	1.693	1.056	
LINDA	1	393.32	79.42	1	276.35	91.07	1.423	0.872	
NATRAN	1	148.83	2.18	1	79.69	4.42	1.868	0.493	
NRlich01	1	247.56	0.21	1	156.05	0.58	1.586	0.362	
NRlich02	1	173.77	0.20	1	110.98	0.18	1.566	1.111	
NRlich04	1	191.53	0.15	1	109.61	0.30	1.747	0.500	
NRlich05	1	254.16	0.14	1	134.94	0.20	1.884	0.700	
NRlich06	1	236.91	0.23	1	123.62	0.22	1.916	1.045	
NVERTEX	3	127.56	2.60	3	92.88	21.28	1.373	0.122	
OWL	1	193.85	1.66	1	123.64	4.99	1.568	0.333	
TOTAL	14	3145.92	191.69	14	1965.97	273.77	1.600	0.700	
MEAN	14	224.71	13.69	14	140.43	19.55	1.657	0.669	

STEP = GO									
-----				*-----*				*-----*	
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT		CPU	WAIT

NRLICH01	1	247.56	0.21	1	156.05	0.58		1.586	0.362
NRLICH02	1	173.77	0.20	1	110.98	0.18		1.566	1.111
NRLICH04	1	191.53	0.15	1	109.61	0.30		1.747	0.500
NRLICH05	1	254.16	0.14	1	134.94	0.20		1.884	0.700
NRLICH06	1	236.91	0.23	1	123.62	0.22		1.916	1.045

TOTAL	5	1103.93	0.93	5	635.20	1.48		1.738	0.628
MEAN	5	220.79	0.19	5	127.04	0.30		1.740	0.744

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
ALL SINGLE PRECISION

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = LOAD&GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

DOT2	1	529.39	29.82	1	372.95	51.08	1.419	0.584	
EMATHUL	1	203.87	1.60	1	88.47	1.43	2.304	1.119	
EROS	1	217.42	69.91	1	145.51	89.77	1.494	0.779	
FORTLIBE	1	111.71	1.88	1	82.75	6.65	1.350	0.283	
KTTFLCK	1	116.04	1.69	1	68.53	1.60	1.693	1.056	
LINDA	1	393.32	79.42	1	276.35	91.07	1.423	0.872	
NATRAH	1	148.83	2.18	1	79.69	4.42	1.868	0.493	
NVERTEX	3	127.56	2.60	3	92.88	21.28	1.373	0.122	
OWL	1	193.85	1.66	1	123.64	4.99	1.568	0.333	

TOTAL	9	2041.99	190.76	9	1330.77	272.29	1.534	0.701	
MEAN	9	226.89	21.20	9	147.86	30.25	1.610	0.627	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 ALL SINGLE PRECISION

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	14	224.71	13.69	14	140.43	19.55	1.600	0.700
GO	5	220.79	0.19	5	127.04	0.30	1.738	0.628
LOAD&GO	9	226.89	21.20	9	147.86	30.25	1.534	0.701

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	14	224.71	13.69	14	140.43	19.55	1.657	0.669
GO	5	220.79	0.19	5	127.04	0.30	1.740	0.744
LOAD&GO	9	226.89	21.20	9	147.86	30.25	1.610	0.627

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
ALL DOUBLE PRECISION

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
STEP = ALL GO								
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT
ANLTRIM	1	158.46	11.21	1	95.97	12.27	1.651	0.914
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497
DIF1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108
DIF1DHOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180
DNATHUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061
DROPLET	1	498.40	1.70	1	281.29	3.06	1.772	0.556
EIGEN	1	23.46	1.53	1	12.33	3.87	1.903	0.395
PORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613
PSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889
PX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996
LIFE1A	1	222.32	4.71	1	126.06	10.00	1.764	0.471
MATRIX	3	79.28	1.77	3	36.27	1.92	2.186	0.920
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068
MONTE	1	276.47	1.67	1	162.42	2.22	1.702	0.752
MULTC	1	111.88	2.07	1	68.69	18.69	1.629	0.111
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043
REXCO	1	216.49	3.35	1	133.82	3.76	1.618	0.891
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440
SDIAG	1	33.47	1.51	1	13.32	1.44	2.513	1.049
TOTAL	22	6263.07	1141.37	22	3144.21	1380.46	1.992	0.827
MEAN	22	284.68	51.88	22	142.92	62.75	2.038	0.777

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. IBM 370/195
ALL DOUBLE PRECISION

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	581.09	356.68	1	279.36	335.52	2.080	1.063	
BISONINT	1	831.54	163.48	1	379.54	329.20	2.191	0.497	
DIF1DADJ	1	150.81	18.79	1	73.94	16.96	2.040	1.108	
DIF1DMOD	1	573.86	27.49	1	292.34	54.68	1.963	0.503	
DIF1DRL	1	40.62	19.31	1	21.70	16.37	1.872	1.180	
FX2DEMO	1	538.39	289.27	1	321.12	290.55	1.677	0.996	
OVCBENCH	1	676.77	60.12	1	278.66	104.60	2.429	0.575	
REBUSTST	1	130.91	166.50	1	77.86	159.68	1.681	1.043	
SASBENCH	1	259.39	3.10	1	171.03	7.05	1.517	0.440	
TOTAL	9	3783.38	1104.74	9	1895.55	1314.61	1.996	0.840	
MEAN	9	420.38	122.75	9	210.62	146.07	1.939	0.823	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
ANLTRIM	1	158.46	11.21	1	95.97	12.27	1.651	0.914	
DNATHUL	1	231.77	1.56	1	87.96	1.47	2.635	1.061	
DROPLET	1	498.40	1.70	1	281.29	3.06	1.772	0.556	
EIGEN	1	23.46	1.53	1	12.33	3.87	1.903	0.395	
PORTLIBD	1	159.24	2.30	1	78.05	3.75	2.040	0.613	
PSQRT	1	326.77	1.85	1	82.66	2.08	3.953	0.889	
LIFE1A	1	222.32	4.71	1	126.06	10.00	1.764	0.471	
MATRIX	3	79.28	1.77	3	36.27	1.92	2.186	0.920	
MINVERT	1	141.70	1.41	1	69.82	1.32	2.030	1.068	
MONTE	1	276.47	1.67	1	162.42	2.22	1.702	0.752	
MULTC	1	111.88	2.07	1	68.69	18.69	1.629	0.111	
REXCO	1	216.49	3.35	1	133.82	3.76	1.618	0.891	
SDIAG	1	33.47	1.51	1	13.32	1.44	2.513	1.049	
TOTAL	13	2479.71	36.64	13	1248.66	65.85	1.986	0.556	
MEAN	13	190.75	2.82	13	96.05	5.07	2.107	0.745	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 ALL DOUBLE PRECISION

IBM 370/168 MOD 3

IBM 370/195

168 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	22	284.68	51.88	22	142.92	62.75	1.992	0.827
GO	9	420.38	122.75	9	210.62	146.07	1.996	0.840
LOAD&GO	13	190.75	2.82	13	96.05	5.07	1.986	0.556

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	22	284.68	51.88	22	142.92	62.75	2.038	0.777
GO	9	420.38	122.75	9	210.62	146.07	1.939	0.823
LOAD&GO	13	190.75	2.82	13	96.05	5.07	2.107	0.745

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
ALL SINGLE PRECISION

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = ALL GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DOT2	1	322.36	41.89	1	372.95	51.08	0.864	0.820	
EMATHUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021	
EROS	1	134.63	83.14	1	145.51	89.77	0.925	0.926	
FORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400	
KTTPLCK	1	67.29	1.48	1	68.53	1.60	0.982	0.925	
LINDA	1	225.98	102.50	1	276.35	91.07	0.818	1.126	
NATRAH	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
NRLICH01	1	162.38	0.26	1	156.05	0.58	1.041	0.448	
NRLICH02	1	129.18	0.41	1	110.98	0.18	1.164	2.278	
NRLICH04	1	127.10	0.28	1	109.61	0.30	1.160	0.933	
NRLICH05	1	149.26	0.23	1	134.94	0.20	1.106	1.150	
NRLICH06	1	153.58	0.21	1	123.62	0.22	1.242	0.955	
NVERTEX	3	85.58	3.40	3	92.88	21.28	0.921	0.160	
OWL	1	113.75	3.05	1	123.64	4.99	0.920	0.611	
TOTAL	14	1970.82	243.08	14	1965.97	273.77	1.002	0.888	
MEAN	14	140.77	17.36	14	140.43	19.55	1.050	0.874	

STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
NRLICH01	1	162.38	0.26	1	156.05	0.58	1.041	0.448	
NRLICH02	1	129.18	0.41	1	110.98	0.18	1.164	2.278	
NRLICH04	1	127.10	0.28	1	109.61	0.30	1.160	0.933	
NRLICH05	1	149.26	0.23	1	134.94	0.20	1.106	1.150	
NRLICH06	1	153.58	0.21	1	123.62	0.22	1.242	0.955	
TOTAL	5	721.50	1.39	5	635.20	1.48	1.136	0.939	
MEAN	5	144.30	0.28	5	127.04	0.30	1.143	1.153	

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 ALL SINGLE PRECISION

ANDAHL 470V/6				IBM 370/195			470 / 195		
STEP = LOAD&GO									
JCBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
DOT2	1	322.36	41.89	1	372.95	51.08	0.864	0.820	
EMATMUL	1	139.24	1.46	1	88.47	1.43	1.574	1.021	
EROS	1	134.63	83.14	1	145.51	89.77	0.925	0.926	
PORTLIBE	1	71.51	2.66	1	82.75	6.65	0.864	0.400	
KTTFLCK	1	67.29	1.48	1	68.53	1.60	0.982	0.925	
LINDA	1	225.98	102.50	1	276.35	91.07	0.818	1.126	
NATRAH	1	88.98	2.11	1	79.69	4.42	1.117	0.477	
NVERTEX	3	85.58	3.40	3	92.88	21.28	0.921	0.160	
OWL	1	113.75	3.05	1	123.64	4.99	0.920	0.611	
TOTAL	9	1249.32	241.69	9	1330.77	272.29	0.939	0.888	
MEAN	9	138.81	26.85	9	147.86	30.25	0.998	0.718	

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 ALL SINGLE PRECISION

AMDAHL 470V/6

IBM 370/195

470 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	14	140.77	17.36	14	140.43	19.55	1.002	0.888
GO	5	144.30	0.28	5	127.04	0.30	1.136	0.939
LOAD&GO	9	138.81	26.85	9	147.86	30.25	0.939	0.888

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOBS	CPU	WAIT	JOBS	CPU	WAIT	CPU	WAIT
ALL GO	14	140.77	17.36	14	140.43	19.55	1.050	0.874
GO	5	144.30	0.28	5	127.04	0.30	1.143	1.153
LOAD&GO	9	138.81	26.85	9	147.86	30.25	0.998	0.718

ARGONNE NATIONAL LABORATORY
AMDAHL 470V/6 VS. IBM 370/195
ALL DOUBLE PRECISION

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = ALL GO									

JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	

ANLTRIM	1	125.36	9.22	1	95.97	12.27	1.306	0.751	
BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
DMATHUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973	
DROPLET	1	488.00	1.94	1	281.29	3.06	1.735	0.634	
EIGEN	1	21.48	2.87	1	12.33	3.87	1.742	0.742	
FORTLIED	1	116.57	2.58	1	78.05	3.75	1.494	0.688	
FSQRT	1	296.61	1.35	1	82.66	2.08	3.588	0.649	
FX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
LIFE1A	1	149.42	7.21	1	126.06	10.00	1.185	0.721	
MATRIX	3	68.02	3.04	3	36.27	1.92	1.875	1.583	
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045	
MONTE	1	204.29	1.82	1	162.42	2.22	1.258	0.820	
MULTC	1	90.23	2.56	1	68.69	18.69	1.314	0.137	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
REXCO	1	178.25	3.08	1	133.82	3.76	1.332	0.819	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	
SDIAG	1	33.30	6.41	1	13.32	1.44	2.500	4.451	

TOTAL	22	5312.48	1663.10	22	3144.21	1380.46	1.690	1.205	
MEAN	22	241.48	75.60	22	142.92	62.75	1.735	1.069	

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 ALL DOUBLE PRECISION

AMDAHL 470V/6				IBM 370/195			470 / 195		
STEP = GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
BIGREBUS	1	506.52	382.78	1	279.36	335.52	1.813	1.141	
BISONINT	1	649.65	593.18	1	379.54	329.20	1.712	1.802	
DIF1DADJ	1	130.59	17.03	1	73.94	16.96	1.766	1.004	
DIF1DMOD	1	512.97	36.72	1	292.34	54.68	1.755	0.672	
DIF1DRL	1	35.51	17.51	1	21.70	16.37	1.636	1.070	
FX2DEMO	1	453.98	281.06	1	321.12	290.55	1.414	0.967	
OVCBENCH	1	621.05	133.81	1	278.66	104.60	2.229	1.279	
REBUSTST	1	113.64	151.79	1	77.86	159.68	1.460	0.951	
SASBENCH	1	193.59	4.33	1	171.03	7.05	1.132	0.614	
TOTAL	9	3217.50	1618.21	9	1895.55	1314.61	1.697	1.231	
MEAN	9	357.50	179.80	9	210.62	146.07	1.657	1.055	

STEP = LOAD&GO									
JOBNAME	STEPS	CPU	WAIT	STEPS	CPU	WAIT	CPU	WAIT	
ANLTRIM	1	125.36	9.22	1	95.97	12.27	1.306	0.751	
DMATHUL	1	242.83	1.43	1	87.96	1.47	2.761	0.973	
DROPLET	1	488.00	1.94	1	281.29	3.06	1.735	0.634	
EIGEN	1	21.48	2.87	1	12.33	3.87	1.742	0.742	
FORTLIBD	1	116.57	2.58	1	78.05	3.75	1.494	0.688	
FSQRT	1	296.61	1.35	1	82.66	2.08	3.588	0.649	
LIFE1A	1	149.42	7.21	1	126.06	10.00	1.185	0.721	
MATRIX	3	68.02	3.04	3	36.27	1.92	1.875	1.583	
MINVERT	1	80.63	1.38	1	69.82	1.32	1.155	1.045	
MONTE	1	204.29	1.82	1	162.42	2.22	1.258	0.820	
MULTC	1	90.23	2.56	1	68.69	18.69	1.314	0.137	
REXCO	1	178.25	3.08	1	133.82	3.76	1.332	0.819	
SDIAG	1	33.30	6.41	1	13.32	1.44	2.500	4.451	
TOTAL	13	2094.99	44.89	13	1248.66	65.85	1.678	0.682	
MEAN	13	161.15	3.45	13	96.05	5.07	1.788	1.078	

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 ALL DOUBLE PRECISION

AMDAHL 470V/6

IBM 370/195

470 / 195

SUMMARY OF STEP TIMES (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	22	241.48	75.60	22	142.92	62.75	1.690	1.205
GO	9	357.50	179.80	9	210.62	146.07	1.697	1.231
LOAD&GO	13	161.15	3.45	13	96.05	5.07	1.678	0.682

SUMMARY OF STEP MEANS (EACH JOB COUNTED ONLY ONCE)

STEPNAME	JOB	CPU	WAIT	JOB	CPU	WAIT	CPU	WAIT
ALL GO	22	241.48	75.60	22	142.92	62.75	1.735	1.069
GO	9	357.50	179.80	9	210.62	146.07	1.657	1.055
LOAD&GO	13	161.15	3.45	13	96.05	5.07	1.788	1.078

APPENDIX D

EISPACK ROUTINE TIMING SUMMARY

EISPACK⁴ is a package of Fortran IV subroutines which compute the eigenvalues and/or eigenvectors of six classes of matrices: complex general (CG), complex Hermitian (CH), real general (RG), real symmetric (RS), real symmetric tridiagonal (RT), and special real tridiagonal matrices (RSP). The subroutines have been adapted and thoroughly tested on several different machines, and have been certified and are supported by the NATS⁵ project.

The standard EISPACK timing package, which was used in field testing of the routines, was included as part of the benchmark job collection for the IBM 370/168 MOD 3 and the IBM 370/195. EISPACK was not a part of our AMDAHL 470V/6 benchmark collection, but timings on the 470 came from EISPACK field tests at the University of Michigan. Caution must be exercised in comparing the 470V/6 numbers with those for the 168 and 195 however, as the University of Michigan timings were performed under the MTS (Michigan Time Sharing) system, while the others were under OS/MVT. Thus, differences in the manner in which MTS and OS/MVT assess CPU time could give rise to a bias in the reported machine CPU ratios.

The tables report CPU times and ratios for individual subroutines and the recommended basic paths in EISPACK for matrices of order 40 and order 80. Descriptions of the individual subroutines and basic paths can be found in the EISPACK Guide,⁴ along with many more timing statistics reported in a somewhat different form. Briefly, the most important numbers are for the following basic paths:

CG(0)	all eigenvalues of a complex general matrix
CG(1)	all eigenvalues and all eigenvectors of a complex general matrix
CH(0)	all eigenvalues of a complex Hermitian matrix
CH(1)	all eigenvalues and all eigenvectors of a complex Hermitian matrix
RG(0)	all eigenvalues of a real general matrix
RG(1)	all eigenvalues and all eigenvectors of a real general matrix
RS(0)	all eigenvalues of a real symmetric matrix
RS(1)	all eigenvalues and all eigenvectors of a real symmetric matrix
RT(0)	all eigenvalues of a real symmetric tridiagonal matrix
RT(1)	all eigenvalues and all eigenvectors of a real symmetric tridiagonal matrix

RSP(0) all eigenvalues of a special real tridiagonal matrix
RSP(1) all eigenvalues and all eigenvectors of a special real
 tridiagonal matrix

Note that CPU ratios have not been computed where absolute CPU times were judged to be too short to be significant.

The EISPACK routines are characterized by a high density of floating point double precision addition and multiplication in short nested DO loops. Thus it comes as no surprise that the 370/195, with its sophisticated doubleword oriented floating point unit and the high performance associated with loops that can be contained in its instruction stack ("loop mode"), outperforms both the 370/168 and 470V/6 by large factors (2.3-2.8). More remarkable is the near identity in performance of the 370/168 and the 470V/6 on this, nearly "pure," floating point double precision kernel collection. The 168, slower than the 470 for nearly all other work in the benchmark, enjoys here the advantages of doubleword data paths, a doubleword oriented floating point unit, twice the cache size of the 470, and the high speed multiply feature which significantly enhances the floating point multiply speed.

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY :

AMDAHL 470V/6				IBM 370/195			470 / 195	
TIMER = OTIME								
ROUTINE	STEPS	40X40	30X30	STEPS	40X40	80X80	40X40	80X80
BAKVEC	1	0.00	0.01	1	0.00	0.00		
CH(0)	1	0.35	2.71	1	0.14	1.00	2.575	2.707
CH(1)	1	1.21	9.57	1	0.44	3.24	2.786	2.955
FIGI	1	0.00	0.00	1	0.00	0.00		
FIGI2	1	0.00	0.01	1	0.00	0.01		
HTRIBK	1	0.46	3.88	1	0.18	1.41	2.618	2.749
HTRIB3	1	0.48	3.85	1	0.21	1.65	2.312	2.329
HTRIDI	1	0.31	2.60	1	0.12	0.94	2.558	2.770
HTRID3	1	0.31	2.52	1	0.14	1.04	2.273	2.424
RSP(0)	1	0.13	0.91	1	0.06	0.39	2.094	2.137
RSP(1)	1	0.66	4.90	1	0.24	1.63	2.916	2.945
RT(0)	1	0.08	0.30	1	0.04	0.16	1.868	1.887
RT(1)	1	0.47	3.30	1	0.15	0.97	3.093	3.396
TBBAK3	1	0.13	0.97	1	0.05	0.42	2.317	2.343
TRED1	1	0.09	0.70	1	0.04	0.28	2.200	2.546
TRED3	1	0.09	0.67	1	0.05	0.33	1.982	2.071
TOTAL	16	4.73	36.71	16	1.85	13.44	2.584	2.730
MEAN	13	0.37	2.82	13	0.14	1.03	2.422	2.553

ARGONNE NATIONAL LABORATORY
 AMDAHL 470V/6 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY

AMDAHL 470V/6				IBM 370/195			470 / 195	
TIMER = CGTIME								
ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80
CBABK2	1	0.01	0.03	1	0.00	0.01		
CBAL	1	0.01	0.03	1	0.00	0.01		
CG (0)	1	2.25	16.95	1	0.77	5.72	2.912	2.963
CG (1)	1	5.22	40.48	1	1.73	13.19	3.015	3.070
CINVIT	1	0.84	6.48	1	0.42	2.88	1.972	2.252
COMBAK	1	0.18	1.70	1	0.06	0.78	2.994	2.172
COMHFS	1	0.34	2.83	1	0.10	0.86	3.382	3.295
CONLR	1	0.80	5.66	1	0.35	2.20	2.303	2.574
CONLR2	1	2.25	17.43	1	0.93	6.89	2.426	2.528
CONQR	1	1.50	10.95	1	0.48	3.30	3.142	3.321
CONQR2	1	4.48	34.46	1	1.43	10.78	3.131	3.195
CORTB	1	0.40	3.23	1	0.14	1.15	2.879	2.803
CORTH	1	0.74	5.97	1	0.30	2.40	2.497	2.492
TOTAL	13	19.00	146.17	13	6.71	50.16	2.832	2.914
MEAN	11	1.73	13.28	11	0.61	4.56	2.787	2.788

ARGONNE NATIONAL LABORATORY
 AIDAH 470V/6 VS. IBM 370/195
 RISPAC ROUTINE TIMING SUMMARY :

AIDAH 470V/6				IBM 370/195			470 / 195	
TIMER = PSTIME								
ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80
BISECT	1	0.34	1.29	1	0.20	0.76	1.663	1.704
INTOLV	1	0.09	0.30	1	0.04	0.17	1.783	1.828
INTQL1	1	0.08	0.30	1	0.04	0.16	1.866	1.925
INTQL2	1	0.48	3.39	1	0.15	0.97	3.125	3.476
RATOR	1	0.15	0.65	1	0.06	0.26	2.462	2.551
RS(0)	1	0.13	0.82	1	0.06	0.33	2.292	2.529
RS(1)	1	0.64	4.70	1	0.22	1.47	2.945	3.209
RST(0)	1	0.08	0.30	1	0.04	0.16	1.866	1.891
RST(1)	1	0.48	3.39	1	0.15	0.97	3.122	3.493
TINVIT	1	0.04	0.21	1	0.02	0.08	2.184	2.551
TQLRAT	1	0.04	0.13	1	0.01	0.05	2.548	2.693
TQL1	1	0.08	0.30	1	0.04	0.14	1.998	2.060
TQL2	1	0.46	3.27	1	0.13	0.87	3.430	3.758
TBAK1	1	0.14	1.11	1	0.07	0.49	2.103	2.264
TRED1	1	0.09	0.70	1	0.04	0.28	2.184	2.551
TRED2	1	0.18	1.43	1	0.08	0.59	2.151	2.409
TRIDIB	1	0.34	1.31	1	0.19	0.70	1.818	1.869
TSTUR4	1	0.39	1.53	1	0.22	0.83	1.747	1.839
TOTAL	18	4.18	25.15	18	1.77	9.27	2.363	2.712
MEAN	18	0.23	1.40	18	0.10	0.52	2.293	2.477

ARGONNE NATIONAL LABORATORY
 ANDAHL 470V/6 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY

ANDAHL 470V/6				IBM 370/195			470 / 195	
TIMER = RGTIME								

ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80

BALANC	1	0.00	0.02	1	0.00	0.01		
BALBAK	1	0.00	0.01	1	0.00	0.01		
ELMBAK	1	0.07	0.58	1	0.03	0.23	2.362	2.486
ELMHES	1	0.12	0.98	1	0.05	0.36	2.486	2.697
ELTRAN	1	0.00	0.02	1	0.00	0.01		1.798
HQR	1	0.61	3.87	1	0.26	1.54	2.381	2.512
HQR2	1	1.46	10.52	1	0.61	4.20	2.402	2.503
INVT	1	0.32	2.25	1	0.20	1.36	1.586	1.656
ORTBAK	1	0.11	0.88	1	0.04	0.28	2.935	3.112
ORTHES	1	0.24	1.88	1	0.12	0.95	1.935	1.981
ORTHAN	1	0.08	0.59	1	0.03	0.19	2.993	3.173
RG(0)	1	0.73	4.84	1	0.31	1.89	2.354	2.557
RG(1)	1	1.58	11.54	1	0.66	4.59	2.383	2.513

TOTAL	13	5.31	37.99	13	2.31	15.63	2.306	2.430
MEAN		0.53	3.45		0.23	1.42	2.382	2.453

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
TIMER = OTIME									
ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80	
BAKVEC	1	0.00	0.31	1	0.00	0.00			
CH(0)	1	0.36	2.58	1	0.14	1.00	2.650	2.593	
CH(1)	1	1.23	9.17	1	0.44	3.24	2.812	2.834	
FIGI	1	0.00	0.00	1	0.00	0.00			
FIGI2	1	0.00	0.01	1	0.00	0.01			
HTRIBK	1	0.46	3.57	1	0.18	1.41	2.571	2.532	
HTRIB3	1	0.49	3.87	1	0.21	1.65	2.360	2.340	
HTRIDI	1	0.32	2.45	1	0.12	0.94	2.623	2.607	
HTRID3	1	0.33	2.53	1	0.14	1.04	2.388	2.439	
RSP(0)	1	0.14	0.91	1	0.06	0.38	2.389	2.412	
RSP(1)	1	0.70	5.05	1	0.24	1.63	2.965	3.094	
RT(0)	1	0.10	0.37	1	0.04	0.16	2.275	2.297	
RT(1)	1	0.47	3.31	1	0.15	0.97	3.100	3.403	
TRBAK3	1	0.14	1.08	1	0.05	0.42	2.569	2.595	
TRED1	1	0.10	0.71	1	0.04	0.28	2.398	2.562	
TRED3	1	0.10	0.76	1	0.05	0.33	2.259	2.344	
TOTAL	16	4.94	36.37	16	1.85	13.44	2.565	2.705	
MEAN	13	0.38	2.80	13	0.14	1.03	2.565	2.619	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				IBM 370/195			168 / 195	
TIMER = CGTIME								
ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80
CBABK2	1	0.00	0.02	1	0.00	0.01		
CPAL	1	0.01	0.02	1	0.00	0.01		
CG(0)	1	2.13	15.88	1	0.77	5.72	2.765	2.777
CG(1)	1	5.12	39.11	1	1.73	13.19	2.959	2.966
CINVIT	1	0.93	5.46	1	0.42	2.88	2.183	2.072
COMBAK	1	0.17	1.50	1	0.06	0.78	2.751	1.915
COMHES	1	0.30	2.41	1	0.10	0.86	2.997	2.810
COMLE	1	0.82	5.38	1	0.35	2.20	2.368	2.448
COMLP2	1	2.15	15.97	1	0.93	6.89	2.320	2.317
COMQR	1	1.40	9.94	1	0.48	3.30	2.941	3.015
COMQR2	1	4.37	33.23	1	1.43	10.78	3.055	3.081
CORTB	1	0.40	3.23	1	0.14	1.15	2.870	2.810
CORTH	1	0.73	5.91	1	0.30	2.40	2.454	2.468
TOTAL	13	18.53	138.58	13	6.71	50.16	2.761	2.763
MEAN	11	1.68	12.59	11	0.61	4.56	2.697	2.607

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
TIMER = RSTIME									
ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80	
BISECT	1	0.41	1.57	1	0.20	0.76	2.017	2.076	
INTQLV	1	0.10	0.37	1	0.04	0.17	2.196	2.253	
INTQL1	1	0.10	0.37	1	0.04	0.16	2.277	2.327	
INTQL2	1	0.47	3.29	1	0.15	0.97	3.095	3.382	
RATQR	1	0.16	0.67	1	0.06	0.26	2.544	2.606	
RS(0)	1	0.14	0.84	1	0.06	0.33	2.493	2.594	
RS(1)	1	0.65	4.67	1	0.22	1.47	3.015	3.185	
RST(0)	1	0.10	0.37	1	0.04	0.16	2.277	2.287	
RST(1)	1	0.47	3.30	1	0.15	0.97	3.106	3.389	
TINVIT	1	0.04	0.21	1	0.02	0.08	2.251	2.551	
TQLRAT	1	0.04	0.15	1	0.01	0.05	2.764	2.976	
TQL1	1	0.09	0.36	1	0.04	0.14	2.445	2.502	
TQL2	1	0.46	3.22	1	0.13	0.87	3.402	3.701	
TRBAK1	1	0.14	1.09	1	0.07	0.49	2.179	2.221	
TRRED1	1	0.10	0.70	1	0.04	0.28	2.369	2.551	
TRRED2	1	0.13	1.45	1	0.08	0.59	2.334	2.444	
TRIDIB	1	0.42	1.56	1	0.19	0.70	2.189	2.229	
TSTURN	1	0.44	1.75	1	0.22	0.83	2.035	2.102	
TOTAL	18	4.51	25.94	18	1.77	9.27	2.548	2.797	
MEAN	18	0.25	1.44	18	0.10	0.52	2.499	2.632	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. IBM 370/195
 EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				IBM 370/195			168 / 195		
TIMER = RGTIME									

ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80	

BALANC	1	0.00	0.02	1	0.00	0.01			
BALBAK	1	0.00	0.01	1	0.00	0.01			
ELMBAK	1	0.06	0.49	1	0.03	0.23	2.181	2.101	
ELMHES	1	0.10	0.82	1	0.05	0.36	2.181	2.241	
ELTRAN	1	0.00	0.01	1	0.00	0.01			
HQR	1	0.61	3.80	1	0.26	1.54	2.394	2.469	
HQR2	1	1.44	10.39	1	0.61	4.20	2.377	2.472	
INVIT	1	0.35	2.46	1	0.20	1.36	1.753	1.808	
ORTBAK	1	0.12	0.95	1	0.04	0.28	3.101	3.332	
ORTHES	1	0.25	1.94	1	0.12	0.95	1.993	2.051	
ORTTRAN	1	0.08	0.60	1	0.03	0.19	3.029	3.251	
RG(0)	1	0.71	4.64	1	0.31	1.89	2.317	2.452	
RG(1)	1	1.55	11.25	1	0.66	4.59	2.341	2.449	

TOTAL	13	5.29	37.38	13	2.31	15.63	2.296	2.391	
MEAN	10	0.53	3.73	10	0.23	1.56	2.367	2.463	

ARGONNE NATIONAL LABORATORY
 IBM 370/168 MOD 3 VS. AMDAHL 470V/6
 EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470		
TIMER = OTIME									
ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80	
BAKVEC	1	0.00	0.01	1	0.00	0.01			
CH(0)	1	0.36	2.58	1	0.35	2.71	1.029	0.954	
CH(1)	1	1.23	9.17	1	1.21	9.57	1.009	0.959	
FIG1	1	0.00	0.00	1	0.00	0.00			
FIG12	1	0.00	0.01	1	0.00	0.01			
HTRIBK	1	0.46	3.57	1	0.46	3.88	0.982	0.921	
HTRIB3	1	0.49	3.87	1	0.48	3.85	1.020	1.004	
HTRIDI	1	0.32	2.45	1	0.31	2.60	1.025	0.941	
HTRID3	1	0.33	2.53	1	0.31	2.52	1.051	1.006	
RSP(0)	1	0.14	0.91	1	0.13	0.81	1.140	1.129	
RSP(1)	1	0.70	5.05	1	0.66	4.80	1.053	1.050	
RT(0)	1	0.10	0.37	1	0.08	0.30	1.218	1.217	
RT(1)	1	0.47	3.31	1	0.47	3.30	1.002	1.002	
TRBAK3	1	0.14	1.08	1	0.13	0.97	1.109	1.108	
TRED1	1	0.10	0.71	1	0.09	0.70	1.085	1.006	
TRED3	1	0.10	0.76	1	0.09	0.67	1.140	1.132	
TOTAL	16	4.94	36.37	16	4.79	36.71	1.031	0.991	
MEAN	13	0.39	2.90	13	0.37	2.82	1.066	1.033	

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. ANDAHL 470V/6
ETSPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				ANDAHL 470V/6			168 / 470	
TIMER = CGTIME								
ROUTINF	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80
CBABK2	1	0.00	0.02	1	0.01	0.03		0.853
CBAL	1	0.01	0.02	1	0.01	0.03		0.853
CG(0)	1	2.13	15.88	1	2.25	16.95	0.950	0.937
CG(1)	1	5.12	39.11	1	5.22	40.48	0.981	0.966
CINVIT	1	0.93	5.96	1	0.84	6.48	1.107	0.920
COMBAK	1	0.17	1.50	1	0.18	1.70	0.919	0.881
COMHES	1	0.30	2.41	1	0.34	2.83	0.886	0.853
COMLR	1	0.82	5.38	1	0.80	5.66	1.028	0.951
COMLR2	1	2.15	15.97	1	2.25	17.43	0.956	0.917
COMQR	1	1.40	9.94	1	1.50	10.95	0.936	0.908
COMQR2	1	4.37	33.23	1	4.48	34.46	0.976	0.964
CORTB	1	0.40	3.23	1	0.40	3.23	0.997	1.003
CORTH	1	0.73	5.91	1	0.74	5.97	0.983	0.990
TOTAL	13	18.53	138.58	13	19.00	146.17	0.975	0.948
MEAN		1.68	10.66		1.73	11.24	0.974	0.923

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470	
TIMER = RSTIME								

ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80

BISECT	1	0.41	1.57	1	0.34	1.29	1.213	1.218
INTQLV	1	0.10	0.37	1	0.08	0.30	1.231	1.232
INTQL1	1	0.10	0.37	1	0.08	0.30	1.221	1.209
INTQL2	1	0.47	3.29	1	0.48	3.39	0.990	0.973
BATQR	1	0.16	0.67	1	0.15	0.65	1.033	1.021
RS(0)	1	0.14	0.84	1	0.13	0.82	1.093	1.025
RS(1)	1	0.65	4.67	1	0.64	4.70	1.024	0.992
RST(0)	1	0.10	0.37	1	0.08	0.30	1.221	1.209
RST(1)	1	0.47	3.30	1	0.48	3.39	0.995	0.973
TINVIT	1	0.04	0.21	1	0.04	0.21	1.031	1.070
TQLSAT	1	0.04	0.15	1	0.04	0.13	1.085	1.105
TQL1	1	0.09	0.36	1	0.08	0.30	1.224	1.214
TQL2	1	0.46	3.22	1	0.46	3.27	0.992	0.985
TRBAK1	1	0.14	1.09	1	0.14	1.11	1.036	0.991
TRED1	1	0.10	0.70	1	0.09	0.70	1.085	1.000
TRED2	1	0.19	1.45	1	0.18	1.43	1.085	1.015
TRID18	1	0.42	1.56	1	0.34	1.31	1.204	1.193
TSTURN	1	0.44	1.75	1	0.38	1.53	1.165	1.143

TOTAL	18	4.51	25.94	18	4.18	25.15	1.078	1.031
MEAN	18	0.25	1.44	18	0.23	1.40	1.107	1.083

ARGONNE NATIONAL LABORATORY
IBM 370/168 MOD 3 VS. AMDAHL 470V/6
EISPACK ROUTINE TIMING SUMMARY

IBM 370/168 MOD 3				AMDAHL 470V/6			168 / 470	
TIMER = RGTIME								

ROUTINE	STEPS	40X40	80X80	STEPS	40X40	80X80	40X40	80X80

BALANC	1	0.00	0.02	1	0.00	0.02		0.831
BALBAK	1	0.00	0.01	1	0.00	0.01		
ELMBAK	1	0.06	0.49	1	0.07	0.58	0.924	0.845
ELMHES	1	0.10	0.82	1	0.12	0.98	0.877	0.831
ELTRAN	1	0.00	0.01	1	0.00	0.02		
HQR	1	0.61	3.80	1	0.61	3.87	1.005	0.983
HQR2	1	1.44	10.39	1	1.46	10.52	0.990	0.988
INVIT	1	0.35	2.46	1	0.32	2.25	1.106	1.092
ORTBAK	1	0.12	0.95	1	0.11	0.88	1.056	1.071
ORTHES	1	0.25	1.94	1	0.24	1.88	1.030	1.035
ORTTRAN	1	0.08	0.60	1	0.08	0.59	1.012	1.025
RG(0)	1	0.71	4.64	1	0.73	4.84	0.985	0.959
RG(1)	1	1.55	11.25	1	1.58	11.54	0.983	0.974

TOTAL	13	5.29	37.38	13	5.31	37.99	0.996	0.984
MEAN		0.53	3.40		0.53	3.45	0.997	0.967