IMPLEMENTATION EXPERIENCES OF NASTRAN ON
CDC CYBER 74 SCOPE 3.4 OPERATING SYSTEM

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SUMMARY

This paper describes the experiences of the implementation of the NASTRAN
system on the CDC CYBER 74 SCOPE 3.4 Operating System. This Operating
System is relatively new; however, due to the great flexibility of the NASTRAN
system, no major problems were encountered.

INTRODUCTION

The implementation was fairly straightforward. Only minor changes were made.
Various sizes of benchmark and test problems, ranging from two hours to less
than one minute CP time, were run on CDC CYBER SCOPE 3.3, UNIVAC EXEC-8
and CDC CYBER SCOPE 3.4. No numerical discrepancy was found on the outputs
of these test problems.

PROGRAM IMPLEMENTATION

The NASTRAN system was installed from the Level 15.1.1 executable, TAPE 1.
This is accomplished by first making a library from the third file of the COSMIC
supplied TAPE 3. This is needed by the NASTRAN boot program to satisfy externals
(also to guarantee that SCOPE 3.4 routines would not come in and interfere). Second,
a small COMPASS program called APACTGR is placed as the second record in the
BOOT overlay.* The SCOPE utility routine COPYN is used, and the resulting file-
name must be TAPE 1. This edited file may now be used to execute NASTRAN. The
deck is listed below.

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*This was suggested by Dr. James Rogers, Langley Research Center, NASA.

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At present NASTRAN cannot be updated under SCOPE 3.4. The LRC compiler will not execute on our system and NASTRAN FORTRAN is not compatible with either RUN or FTN. Also, the NASTRAN COMPASS routines have to be modified to interface properly with 6RM. This updating problem can be fixed by acquiring LRC compiler source and LRC library and correcting the SCOPE 3.4 interface problem.

NASTRAN INSTALLATION DECK

```
NASTRAN, MT2, T6000.                              JIM GO
ACCOUNT(PW=JGO123, UN=JIMCGO)
REQUEST, TP1, HY, VSN=TAPE1.   NASTRAN TAPE1
REQUEST, TP3, HY, VSN=TAPE3.   NASTRAN TAPE3
RFL(300000)
COMPASS.              ASSEMBLY APACTGR
REWIND(LGO)
COPYN(, TAPE1, TP1, LGO)          EDIT IN APACTGR
SKIPF(TP3, 2, 17, B)          SKIP TO NASTRAN LIBRARY
COPYBF(TP3, LIB)             COPY TO DISK
UNLOAD(TP1)
UNLOAD(TP3)
REQUEST, NASTLIB, *PF.
EDITLIB.              MAKE USERS LIBRARY
CATALOG(NASTLIB, NASTRANLIBRARY, ID=JIMCGO)
LIBRARY(NASTLIB)        DECLARE USERS LIBRARY
REQUEST, NASTRAN, *PF.
TAPE1. CATLOG(NASTRAN)
EXIT.      HAVE
CATALOG(NASTRAN, NASTRAN15, ID=JIMCGO, XR=JIMCGO)
NASTRAN. ATTACH
7
 8
  9
        IDENT        APACTGR
        ENTRY        APACTGR
APACTGR   DATA         0
        EQ           APACTGR
        END
7
 8
  9
1, 1, TP1
1, 1, LGO
1, *, TP1
''
LIBRARY(NASTLIB, NEW)
ADD(*, LIB)
```

```
FINISH.
ENDRUN.
7
 8
  9
ID BAR, OFFSET
SOL 1,0
APP DISPLACEMENT
TIME 5
CEND
TITLE = BAR OFF SET TEST RUN WITH UNIFORM LOAD
LOAD = 1
MAXLINES = 10000
LINE = 38
SPCFORCE = ALL
STRESS = ALL
DISP = ALL
BEGIN BULK
GRID     1                                              123456
GRID     2                   2.5      -4.0
GRID     3                   5.0                        123456
GRID     4                            5.0               123456
CBAR     1         1         1        2        4              2        +B1
+B1                         -5.      -4.
CBAR     2         1         2        3        4              2        +B2
+B2                                            5.      -4.
PBAR     1         1         1.0      2.0      2.0     1.0    1000.     +PB1
+PB1     2.0      1.0       -2.0     -1.0      2.0    -1.0   -2.0      1.0    +PB2
+PB2     1.0      1.0
MAT1     1         3 +7      1.2+7             0.0    6.5-6  70.      0.02   +M1
+M1      2.0+4    20.+3      1.8+4
GRAV     1                   1.0              -1.0
ENDDATA
7
 8
  9
6
 7
  8
   9
```

PROGRAM CHECK RUNS

The benchmark and test problems employed range from more than two hours to less than one minute CP time. Most of these are actual reactor hardware problems that we are analyzing. These problems were run on CDC SCOPE 3.3, UNIVAC EXEC-8 and CDC SCOPE 3.4 The numerical outputs are almost identical between UNIVAC EXEC-8 and CDC and identical between CDC SCOPE 3.3 and 3.4.

Some typical run times and charge times, together with the brief description of the test problems, are shown as follows:

Test problem 1 has 994 GRID points and about 2500 DOF. The model consists only of plate elements. The run time shown was for static analysis.

Test problem II has 216 GRID points and about 500 dynamic DOF. The model consists of plate and bar elements. The run time shown was for normal mode analysis.

Problem No.		Run Time Sec.	
		CDC CYBER SCOPE 3.3	CDC CYBER SCOPE 3.4
I	CP	3316	3504
	IO	10949	411
	Charge Time	9972	7369
II	CP	1557	1708
	IO	3223	291
	Charge Time	4046	3683

WORK IN PROGRESS

We are currently implementing some special features into the NASTRAN system for our particular needs. Among these are: (a) incorporating some non-linear material capabilities which are in the formulation stage; (b) creating a seismic analysis Rigid Format which will be based on Rigid Format 3; and (c) replacing the NASTRAN plotting package with CALCOMP'S.

CONCLUSIONS

The implementation of NASTRAN on CDC SCOPE 3.4 encountered only a few minor problems which were readily corrected. This CYBER 74 SCOPE 3.4 Level 15.1.1 NASTRAN is now functioning as well as the other versions.

With similar hardware configuration, the CP time is about the same between SCOPE 3.3 and 3.4; however, the IO time of SCOPE 3.4 showed a significant improvement over SCOPE 3.3. The results obtained on CDC CYBER and UNIVAC 1108 are fairly close to those obtained by NASA. Many of the structural models had to be reduced in size in order to run them on UNIVAC 1108; with CYBER 7.4 SCOPE 3.4 we are now able to run all our structural problems without extensive model condensation. This makes the application of the NASTRAN system to large structural problems more straightforward and reduces extensive reliance on users' engineering judgment in structural modeling. We also believe this version will enable us to extend the capability of NASTRAN to non-linear material and geometry structural problems in the near future.