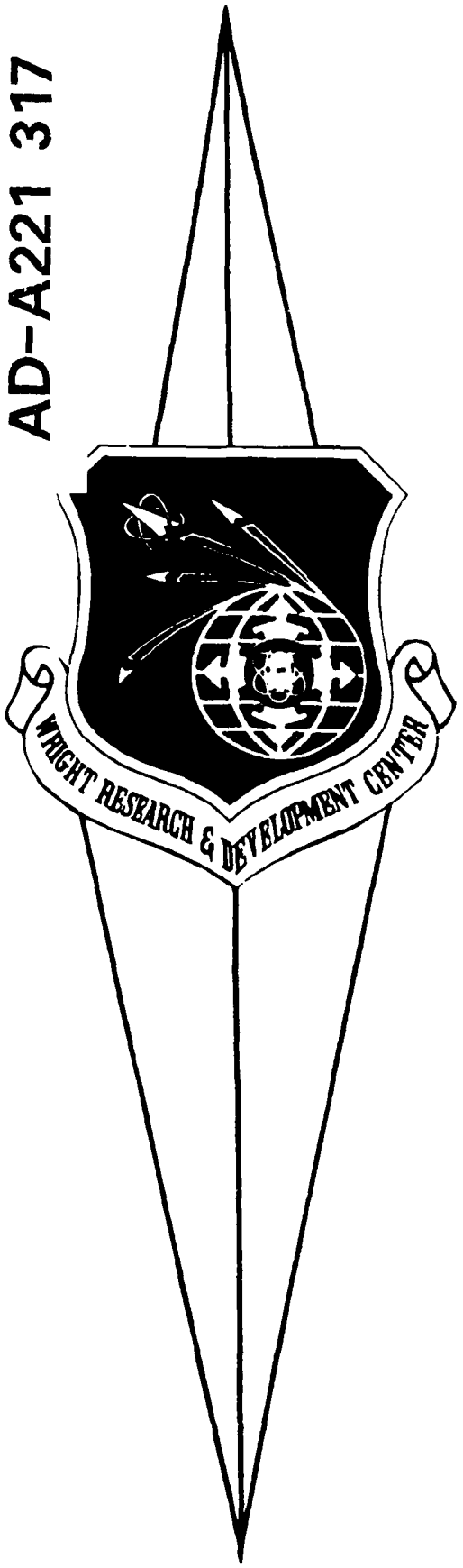

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MERC2PLOT3D User's Manual

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FORWARD

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This has been reviewed and is approved.

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Introduction

The Euler and Navier-Stokes flow solvers of computational fluid dynamics (CFD) generate so much output data that one needs interactive computer graphics to fully and quickly digest the results. Multi-block solutions can be even more difficult to interpret due to the patching required at the block abutments. Fortunately, NASA Ames developed an excellent graphics post-processor of CFD solutions, PLOT3D [1], meeting the requirements of multi-block solutions. Thus, all that is required to inspect multi-block flow solutions (when one has PLOT3D and a suitable workstation) is to convert the output from the CFD solver to match the input requirements of PLOT3D.

MERC2PLOT3D converts MERCURY [2] restart files into the proper input data for PLOT3D.

Running MERC2PLOT3D

MERC2PLOT3D.FOR is run in batch mode on a Cray computer. The user must modify the JCL of MERC2PLOT3D.JOB to access the MERCURY restart file on the Cray and fetch the appropriate connectivity file [2] from the Vax front-end. When changing file names, change only the PDN, ID and ED parameters; leave the DN parameter alone. PLOT3D requires the flow solution data and the grid data to reside in different datasets. The user must also specify the names of these two datasets which will be saved on the Cray upon completion of the MERC2PLOT3D run. See Fig. 1.

Following the JCL in MERC2PLOT3D.JOB is FORTRAN unit 5 (or $IN) which MERC2PLOT3D reads as input. See Fig. 2. The required input should be self-explanatory except for the question regarding the version of MERCURY that created the restart file. On 27 December 1989, the MERCURY restart file structure was changed in order to reduce the restart file size by 11%. Thus, edit MERCURY.FOR to determine the date of the last revision. This date occurs on line eight. If that date is 27 December 1989, or later, the correct response is: 0. Otherwise, your restart file was created by an old version of MERCURY and the correct response is: 1.

```
JOB,JN=PIX,MFL,T=500,SSD=10000.
ACCOUNT,AC=D840262,APW=SIRBAUGH.
OPTION,STAT=OFF.
*.
*.************************************************
*.  ACCESS THE MERCURY RESTART FILE ON THE CRAY
*.************************************************
*.
ACCESS,DN=REST,PDN=CYLNDR_AOR,ID=GREG.
*.
*.************************************************
*.  FETCH THE CONNECTIVITY FILE FROM THE FRONT-END
*.  VAX ACCOUNT
*.************************************************
*.
FETCH,DN=CAPRI,TEXT='CYLNDRCN.DAT'.
*.
*.************************************************
*.  LEAVE THE FOLLOWING EIGHT JCL LINES ALONE
*.************************************************
*.
FETCH,DN=COMET,TEXT='MERC2PLOT3D.FOR'.
ASSIGN,DN=REST,A=FT01,LM=200000.
ASSIGN,DN=QOUT,A=FT02,LM=200000.
ASSIGN,DN=XOUT,A=FT03,LM=200000.
UPDATE,P=0,I=CAPRI:COMET.
CFT77,I=$CPL,DEBUG.
SEGLDR,L=0,CMD='ABS=PIX'.
PIX.
*.
*.************************************************
*. SAVE THE Q AND X PLOT3D FILES ON THE CRAY
*.************************************************
*.
SAVE,DN=QOUT,PDN=CYLNDR_AO,ID=QPLOT3D.
SAVE,DN=XOUT,PDN=CYLNDR_AO,ID=XPLOT3D.
*.
AUDIT.
EXIT.
DUMPJOB.
DEBUG.
/EOF
```

Figure 1

```
I/O DEVICE (O=SSD, 1=DISKS)
        0
RESTART FILE OF A MERCURY VERSION PRIOR TO 27 DEC 89 (O=NO, 1=YES)?
        1
HOW MANY BLOCKS ARE TO BE OUTPUT?
        4
OUTPUT WHAT BLOCKS?
        4
        1
        3
        2
MACH NO.    ALPHA    BETA    DT
 0.20         0.0     0.0     0.
RATIO OF SPECIFIC HEATS
 1.4
```

Figure 2

MERC2PLOT3D allows one to output any number of blocks (you don't have to output all the blocks) in any order. For example, consider a multi-block solution and grid of four blocks. The user can specify MERC2PLOT3D to order the blocks on output such that block four is the first block output, block one is the second to be output, block three is the third and block two is last by listing the blocks to be output as:

4
1
3
2

See Fig. 2. Reordering the blocks upon output is helpful when dealing with complex configurations where the solid surfaces defining the vehicle of interest are scattered throughout the multi-block grid in a, usually, random fashion.

MERC2PLOT3D creates an IBLANK [1] array for each grid block. PLOT3D uses the IBLANK values to properly patch flow features (such as streamlines) across block boundaries. Thus, to properly read the datasets created by MERC2PLOT3D into PLOT3D, use the "read/mgrid/blank" command.

Lastly, MERC2PLOT3D uses the Cray I/O devices. Further, it expects those devices to have certain device names. Therefore, if you are not using the ASD Cray you must edit MERC2PLOT3D.FOR and search for SUBROUTINE SCRATCH. In this subroutine you will find the ASD Cray device names spelled out. Simply swap those names with the device names at your installation. If you are using the ASD Cray, be aware that if the SSD is down and you are forced to use the disks, and one or more of the disks are down, MERC2PLOT3D will bomb. If this does happen, inspect the dayfile. In it you will see the device name of the disk that is down. Then edit MERC2PLOT3D, find SUBROUTINE SCRATCH, and swap the name of the down disk for one that is operational.

References

1. Walatka, P. P. and Buning, P. G., "PLOT3D User's Manual," NASA TM 101067, 1989.

2. Strang, W. Z., "MERCURY User's Manual," AFWAL-TM-88-217, November 1988.