

FluSol User Interface Manual

Version 1

April 2008



Mesh Generation



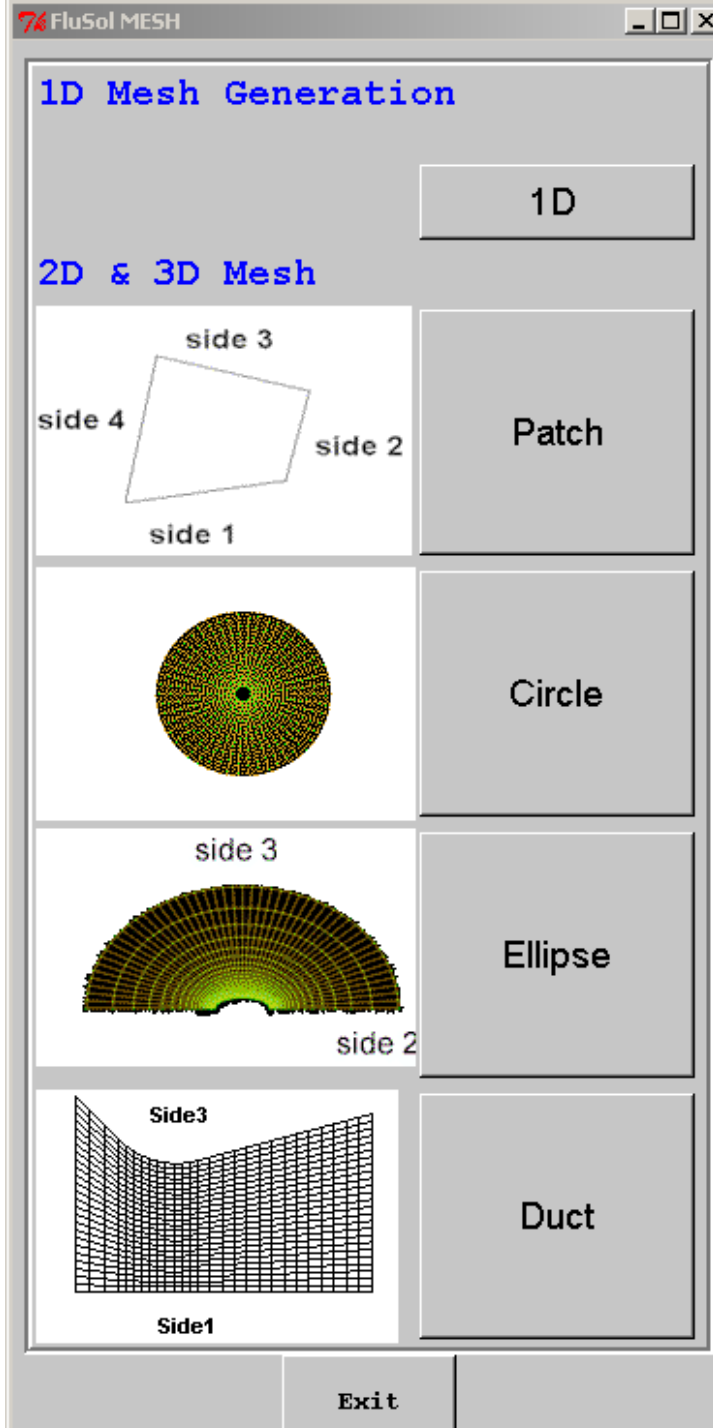
fluSol

Solver



Post-Processing

Exit



File

1D Mesh Initial Conditions

1D Mesh Generation

☒ 1D Plane

☐ 1D Cylinder

☐ 1D Sphere

Left end coordinate

0.0

Right end coordinate

1.0

Total elements

1000

DX

0.001

Diaphragm Location

0.0

Number of iterations

100

Residue

1e-006

maximum iteration number

2001

DT

0.001

Side End Boundary Conditions

Left end opened/closed

Right end opened/closed

☒ opened

☐ closed

☒ opened

☐ closed

Preview Mesh

Write mesh (*.msh)

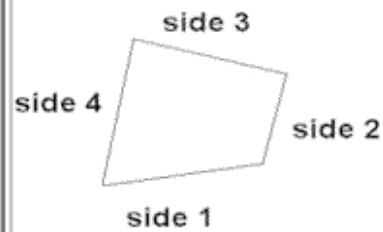
Exact Solution

Exit

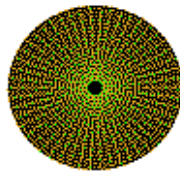
1D Mesh Generation

1D

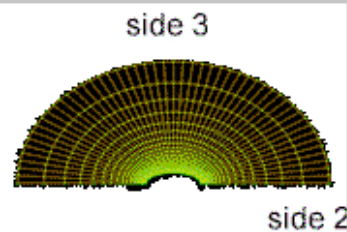
2D & 3D Mesh



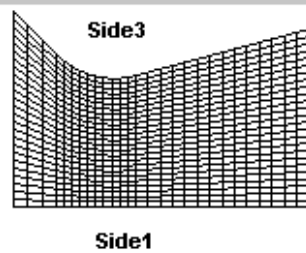
Patch



Circle

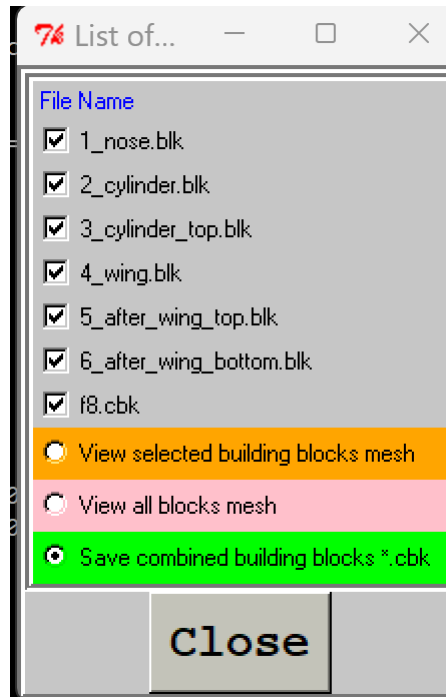


Ellipse



Duct

Exit



<https://editor.mywebsite-now.com/en-US/b0411247-ed81-4ecb-8f27-74d46a81c8c1/content>

74 *** Patch - FluSol Patch Mesh Generator Version 1.0 ***

File Editor

Patch Initial & Boundary conditions

Patch Mesh Generation View mesh Assembly blocks

Region Number: 0 Write Mesh Preview Mesh Close

Upper Curve (Side 3) **Lower Curve (Side 1)**

ityu 0 Straight line ▼ ityb 0 Straight line ▼

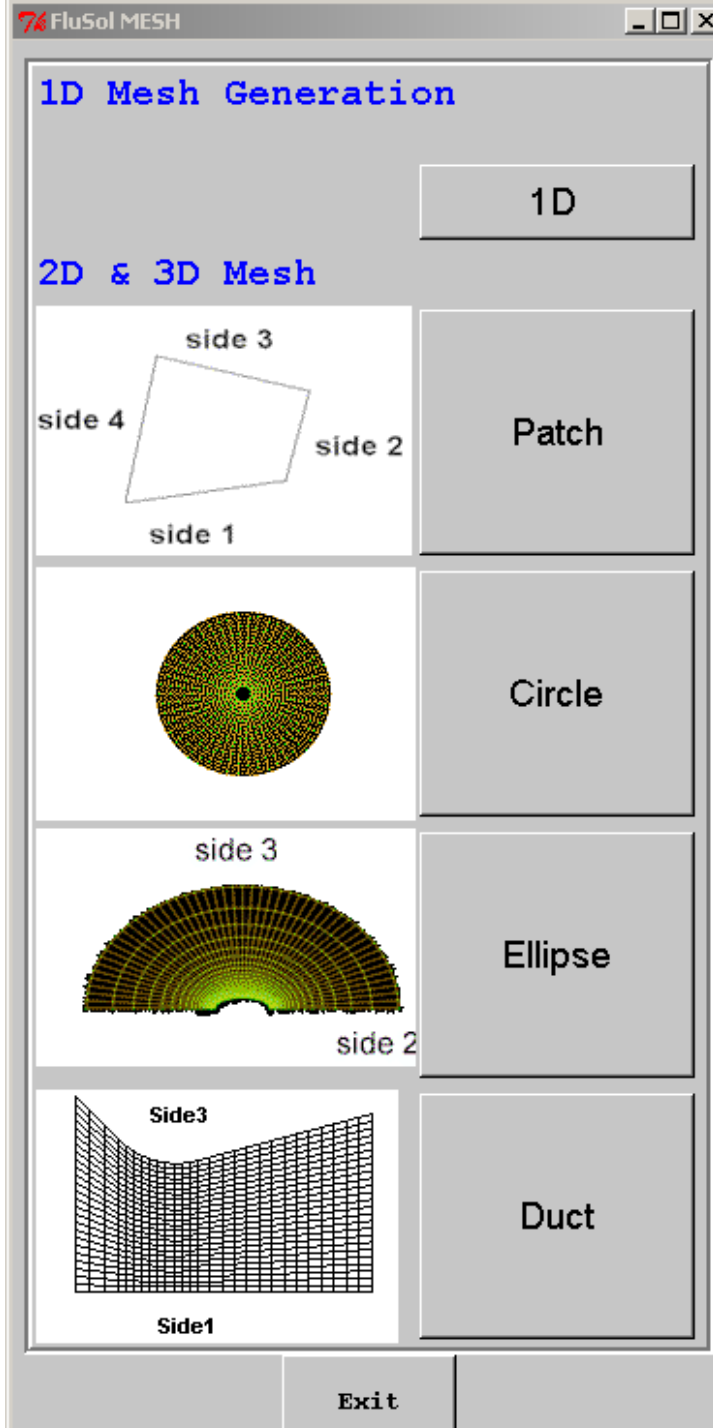
slopu (line)	0.0	slopb (line)	0.0
radius (slopu)	0.0	radius (slopb)	0.0
Parabolic power (slopu):	0.0	Parabolic power (slopb):	0.0
X-Axis length (axu):	0.0	X-Axis length (axb):	0.0
Y-Axis length (ayu):	0.0	Y-Axis length (ayb):	0.0
strux	0	strlx	0
dxumin	0.1	dxlmin	0.1
residue	0.0001	stretch	0
factor	0.0	dymin:	0.0
<input checked="" type="checkbox"/> Create wings		wing:	4
thick	0.05	nwing:	2

Node coordinates node: quad 4 ▼

elex	0	eley	0	
Node 1	X1:	0.0	Y1:	0.0
Node 2	X2:	0.0	Y2:	0.0
Node 3	X3:	0.0	Y3:	0.0
Node 4	X4:	0.0	Y4:	0.0

Assembly all .blk files
into single .cbk file

Save mesh as .blk file



File

Circle Picture

Circle Mesh Generation

Plot mesh

Assembly blks

Set:

0

Write(*.blk)

View file

Close

rinner	0.0	router	0.0
xcenter	0.0	ycenter	0.0
idegree	360	kdegree	-180
ihalf	0	residue	1e-005
istretch	0	dymin	0.0

Face Parameters (Boundary Conditions)

wall:

farfield :

boundary condition :

Axisymmetric line:

output :

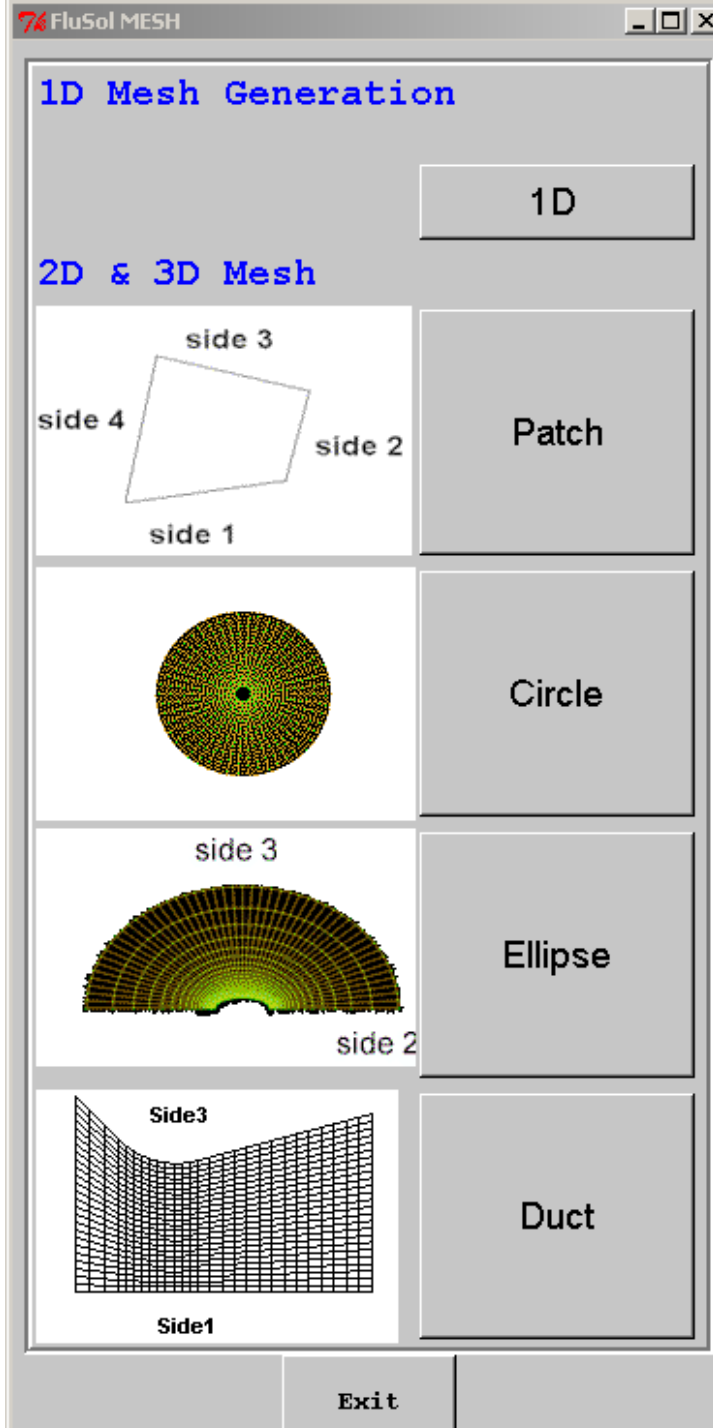
Number of Elements

elex :

0

eley:

0



File

Ellipse

Picture-1

Picture-2

Ellipse Mesh Generation

Plot mesh

Assembly blks

set:

0

Write *.blk

Preview

Close

xcenter:

0.0

ycenter:

0.0

idegree :

360

kdegree :

-180

ratio :

0.0

ihalf :

0

residue :

1e-005

istretch :

0

factor :

1.05

Face Parameters (Boundary Conditions)

wall :

farfield :

boundary condition :

axisymmetry line :

output :

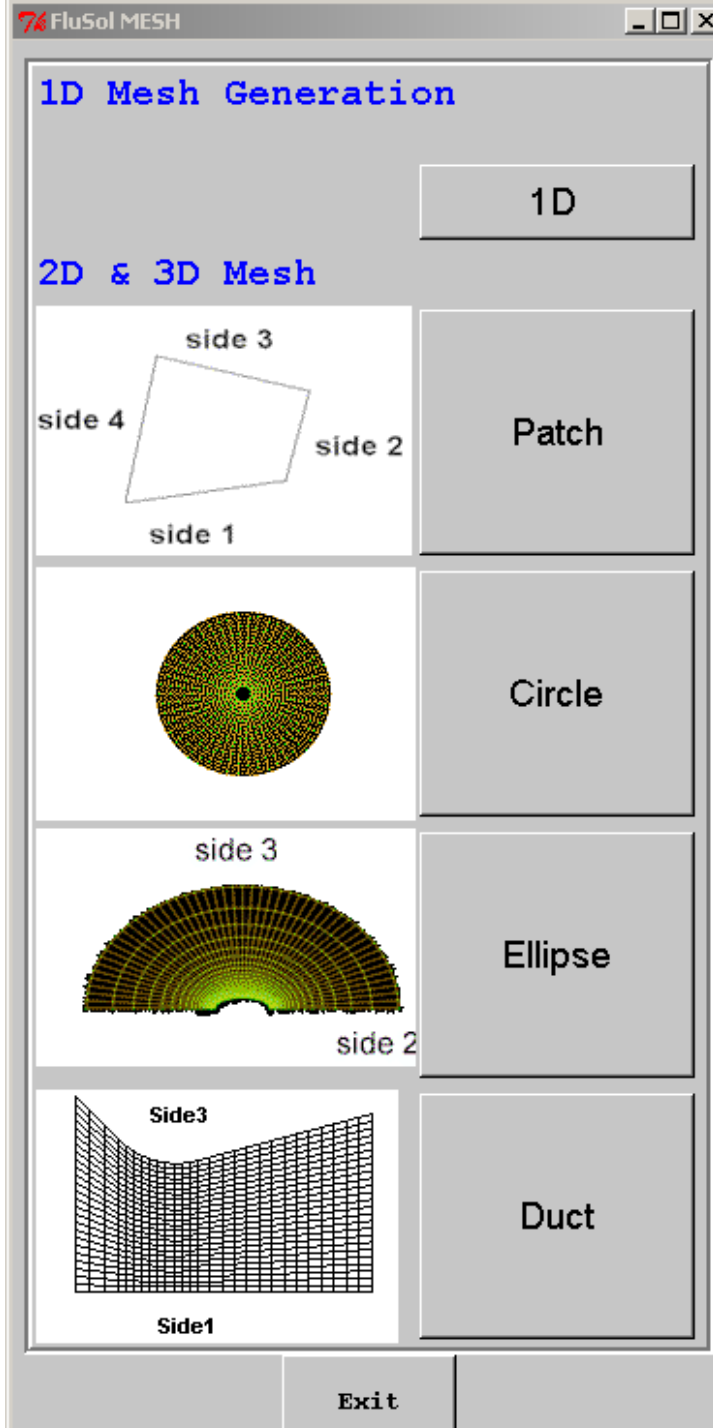
Number of Elements

elex :

0

eley :

0



File

Duct Initial & Boundary conditions

Duct Mesh Generation

View building block mesh

Assembly building blocks

Region Number:

0

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)**Lower Curve (Side 1)**

ITYU: Side 3 curve type

0 Straight line



ITYB: Side 1 curve type

0 Straight line



Slope (slopu):

0.0

Slope (slopb):

0.0

Radius (slopu):

0.0

Radius (slopb):

0.0

Parabolic power (slopu):

0.0

Parabolic power (slopb):

0.0

Tolerance to merge two nodes:

0.0001

dymin: r power between side 1 & 3:

0.0

Node coordinates

Elements in x-direction:

0

Y-direction:

0

Arcbottom:

-1

Arcupper:

1

xbottom:

0.0

ybottom:

0.0

xupper:

0.0

yupper:

0.0



Mesh Generation

FluSol

Solver



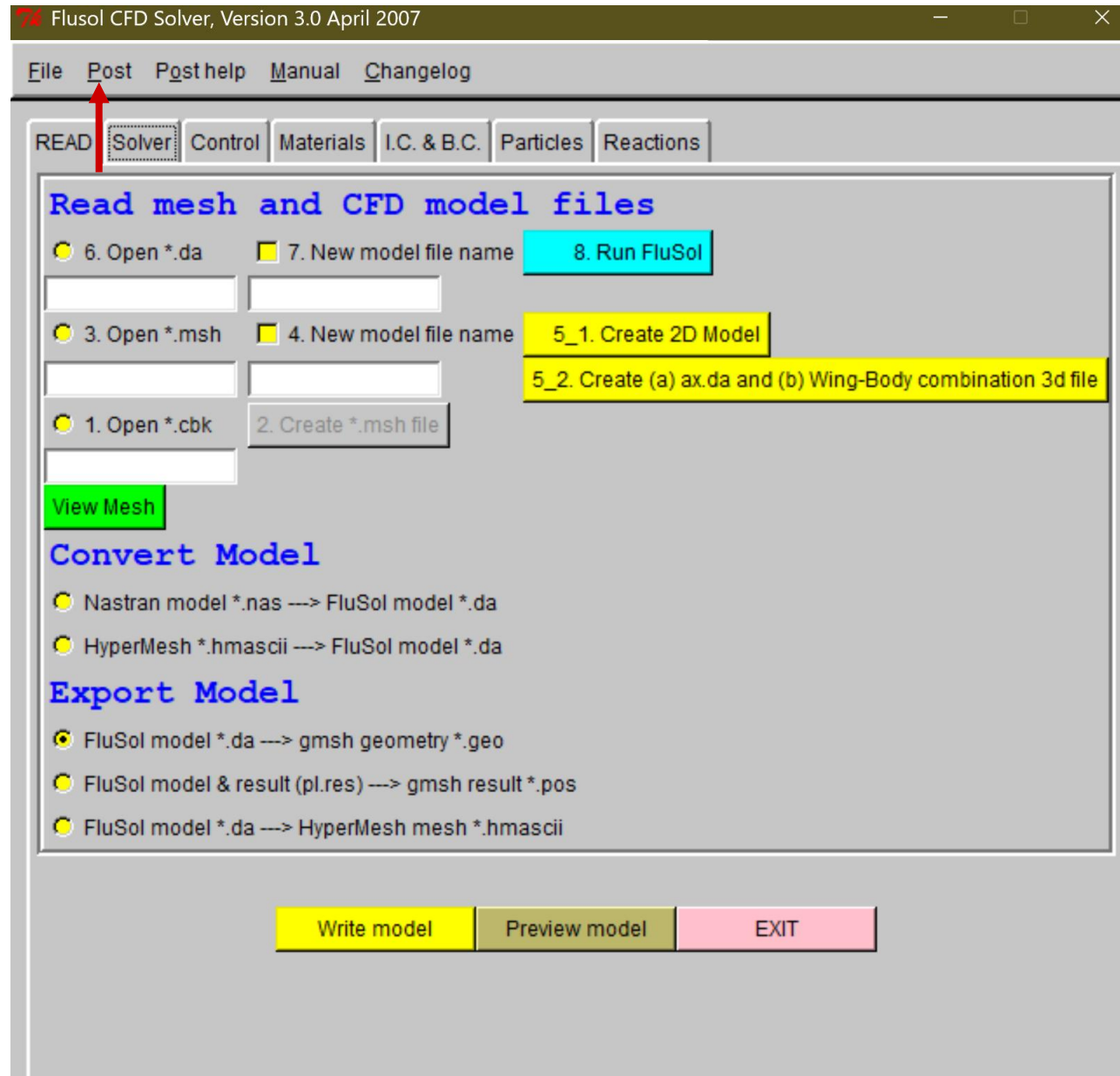
Post-Processing

Exit



Procedure to generate CFD model

1. Click the “1. Open *.cbk” file
2. Click “Create *.msh” button to create .msh file
3. Click “3. open *.msh” button to open .msh file
4. Click “4 New model file name” to give a .da filename
5. Click “5_2” button to create ax.da file and wing-body 3d file
6. Click “6 Open *.da” button to open .da 3D file. **Jump to step 8.**
7. **Only for *.da file is a 2D file.** Click “7. New model file name” to give a file name to contain the 3d wing body combination CFD .da file.
8. “Run Flusol”



File Post Versions Manual Author Changelog

READ Solver Control Materials I.C. & B.C. Particles Reactions

Solver Block

☐ Title description

Solver	Compressible Flow	▼
Dimension	2D	▼
Arti	pressure	▼
Memory	store in ram	▼
Convert	none	▼
File	flu	

☐ Conical Flow

☐ Adapt=off

☒ Adapt= on

☐ Restart= 0 or 1

☐ Ishape =0 or 1

☐ Save boundary normal

☐ Save shape functions

☒ Inviscid flow calculation

☐ Viscous flow calculation

☐ Lift

☐ Wall

☐ Wing

☐ Ele

☐ Node

☐ Upwind

☐ Grid

Change to AX for
sweeping around
axis to generate 3d
wing body mesh

READ Solver Control Materials I.C. & B.C. Particles Reactions



Execution Control Parameters

iter	1500
nprint	1500
npow	1
residue	0.0001
alpha	1.0
dtime	0.0
fmach	1.0
refl	1.0
refu	1.0
redn	1.0
repr	0.714285
reft	1.0
rarea	1.0
nfar	phaeton element outside ▼

File Post Versions Manual Author Changelog

READ

Solver

Control


Materials

I.C. & B.C.

Particles

Reactions

Material Property Block



gam	1.4
cv	717.0
cfi	0.95
visc	2e-005
conduct	0.0171
tc1	1.458e-006
tc2	110.4
dupr	1.0
dlow	0.0
q1st	1.0
q2nd	0.0
scalar	1.0

File Post Versions Manual Author Changelog

READ Solver Control Materials I.C. & B.C. Particles Reactions

Initial and Boundary Conditions

- ☐ *element type
- ☐ *mesh
- ☐ *sweep
- ☐ *chemical
- ☐ *plane
- ☐ *bvlr
- ☒ *initial conditions
- ☐ *face of boundary conditions
- ☐ *boundary conditions conditions
- ☐ *output control cards
- ☐ *ckinitial conditions
- ☐ *ckbcd conditions
- ☐ *particle initial conditions
- ☐ *trace particles

File Post Versions Manual Author Changelog

READ

Solver

Control

Materials

I.C. & B.C.

Particles

Reactions

Two Phase Flow

☐ Particle = euler ☐ Particle = largrangian

Collision

stick



dref

5e-006

denp

4008.0

cms

1380.0

clk

1028.0

cky

1028.0

ckz

1028.0

File Post Versions Manual Author Changelog

READ

Solver

Control

Materials

I.C. & B.C.

Particles

Reactions

Chemical Reaction Flow

☒ Multiple Species Gas

☐ endu

☐ difusion

Read transdat

c:\esdc

Read thermdat

c:\esdc

File Post Versions Manual Author Changelog

Open *.da file
Open *.msh file
New
Save as *.da file
Save as *.msh file

Exit

Materials

I.C. & B.C.

Particles

Reactions

al Reaction Flow

species Gas

☐ difusion

Read transdat

c:\esdc

Read thermdat

c:\esdc

File Post Versions Manual Author Changelog

Post processings

REA

Solver

Control

Materials

I.C. & B.C.

Particles

Reactions

Chemical Reaction Flow

☒ Multiple Species Gas

☐ endu

☐ difusion

Read transdat

c:\esdc

Read thermdat

c:\esdc

File Post Versions Manual Author Changelog

FluSol Version ▶

✓ 3.0
3.1

READ

Solver

Control

Material

B.C.

Particles

Reactions

Chemical Reaction Flow

☒ Multiple Species Gas

☐ endu

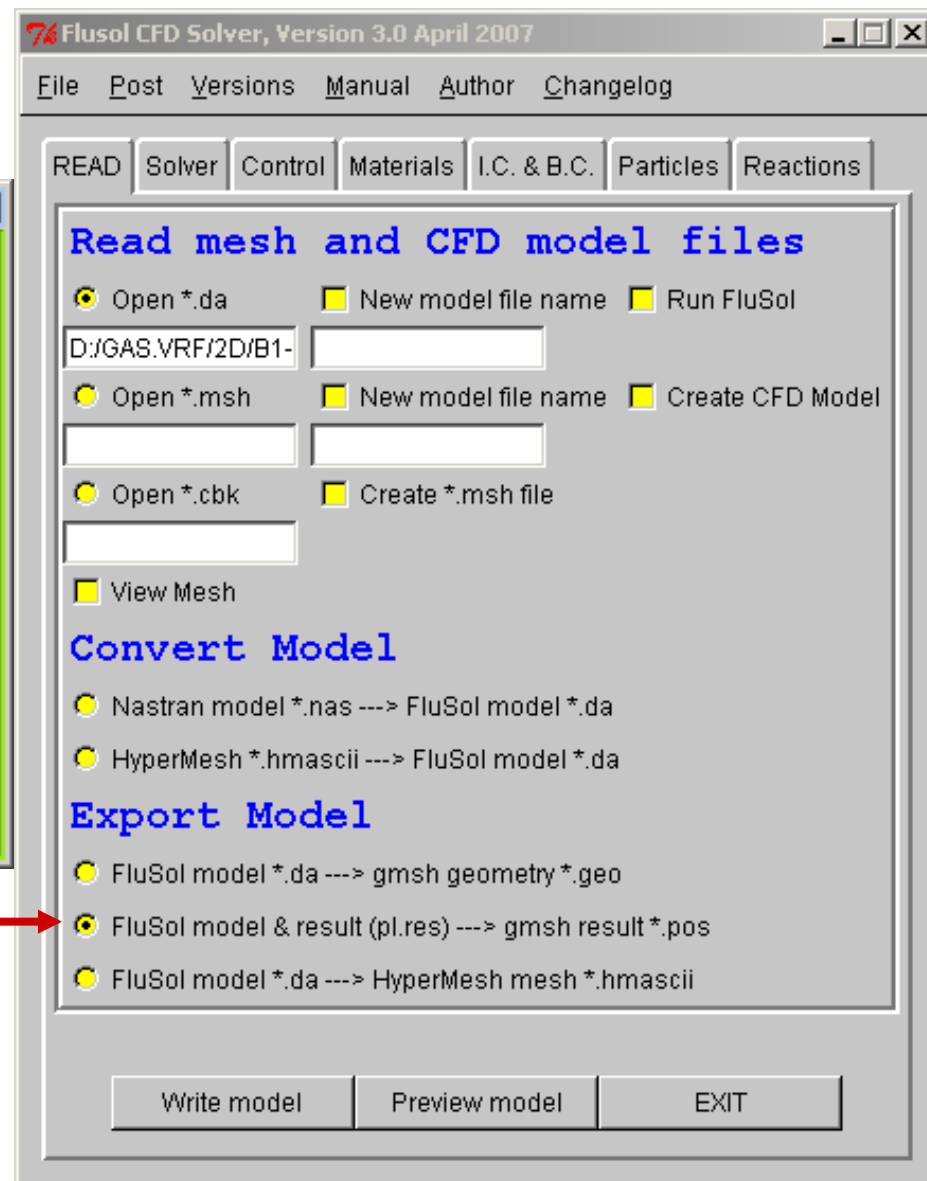
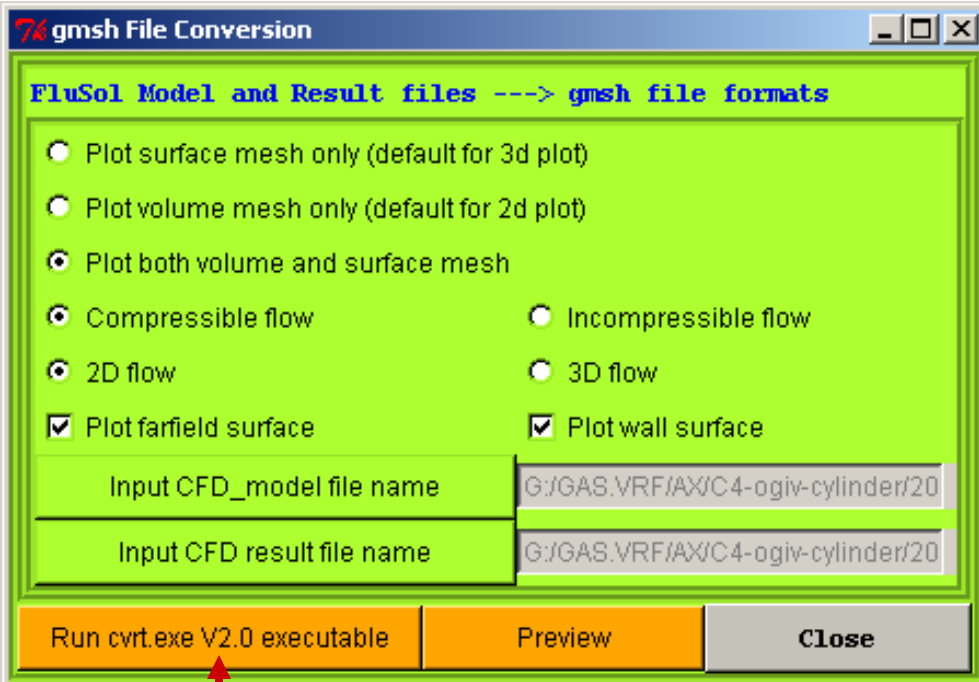
☐ difusion

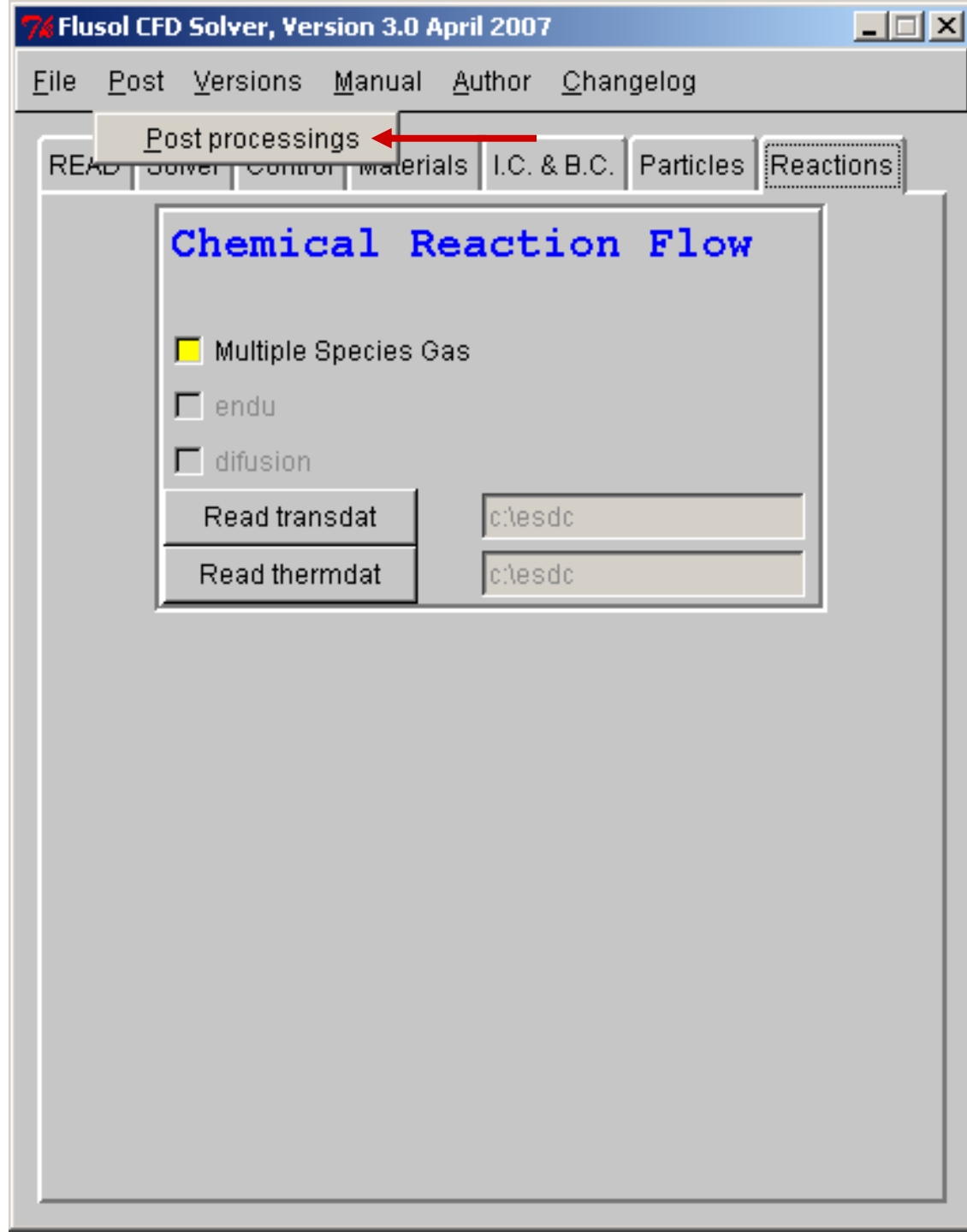
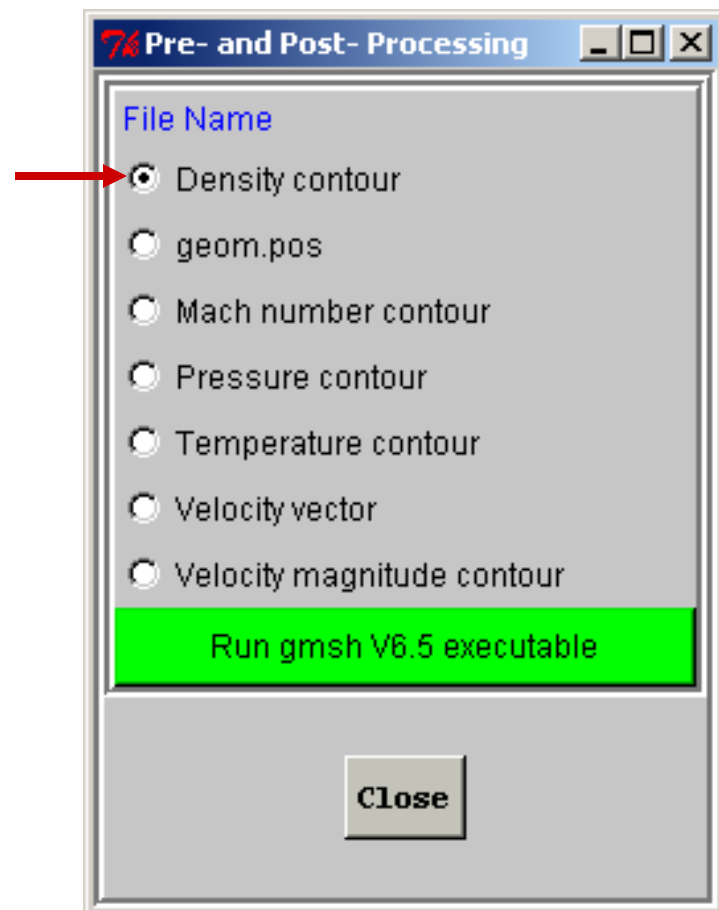
Read transdat

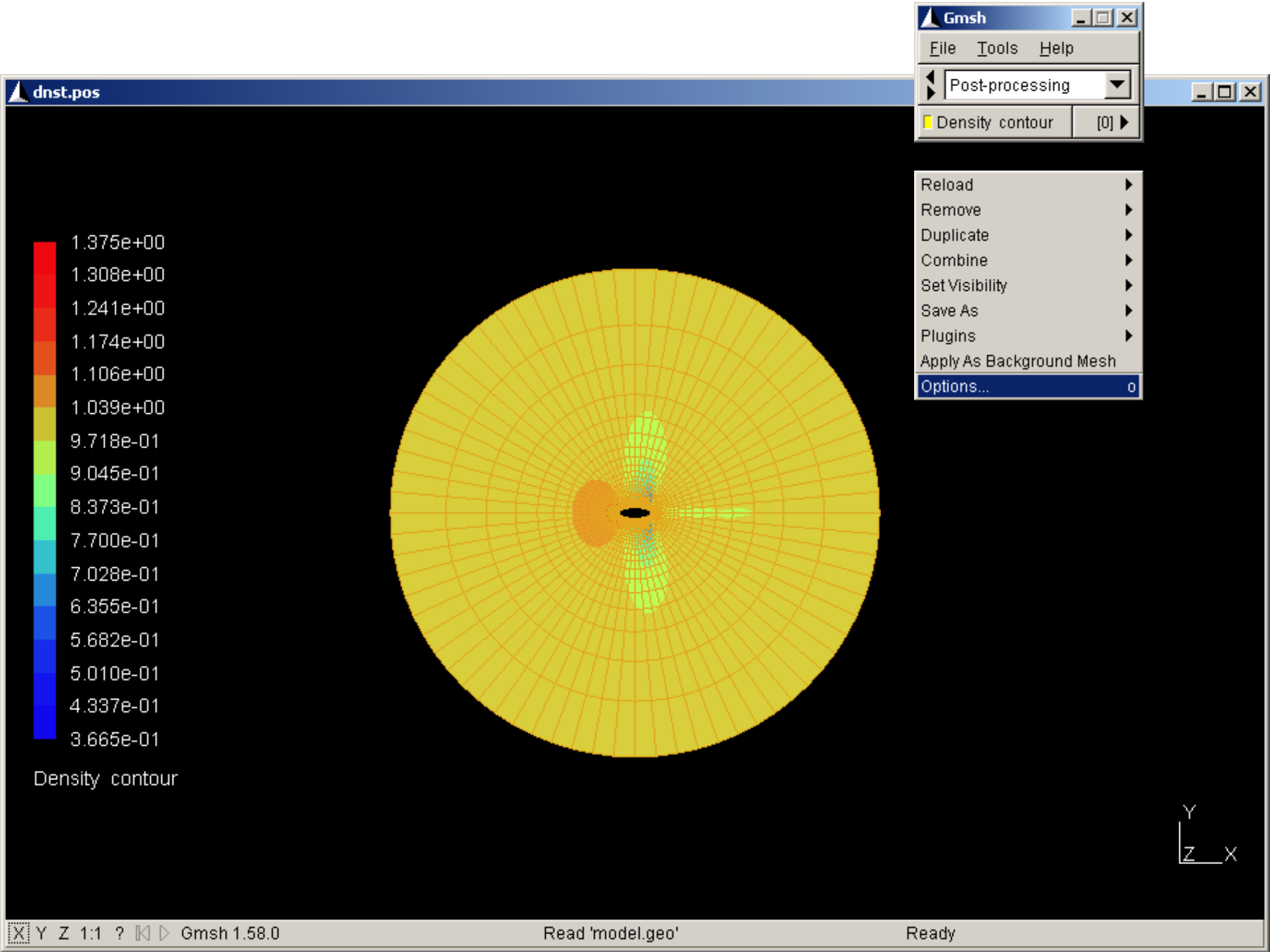
c:\esdc

Read thermdat

c:\esdc









Options - Mesh



- General
- Geometry
- Mesh**
- Solver
- Post-processing
- View [0]

- General
- Visibility
- Cut plane
- Aspect
- Light
- Color

- ☐ Nodes
- ☒ Line elements
- ☐ Surface element edges
- ☐ Surface element faces
- ☐ Volume element edges
- ☐ Volume element faces
- ☐ Node numbers
- ☐ Line element numbers
- ☐ Surface element numbers
- ☐ Volume element numbers

Tetrahedra quality range

Element size range

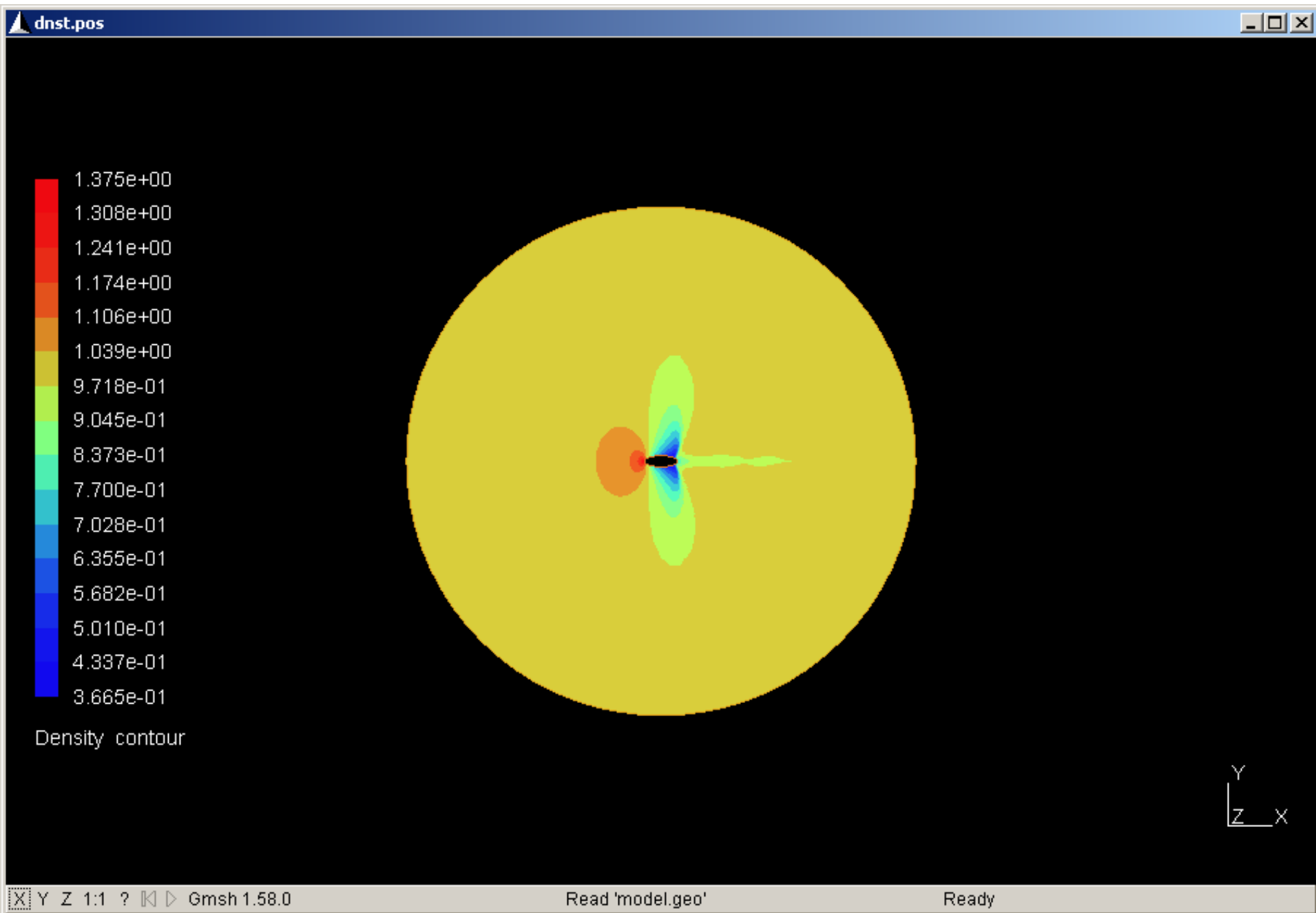
Normals

Tangents

Apply

Save

Cancel





Mesh Generation

FluSol

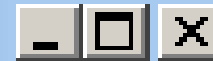
Solver



Post-Processing

Exit

Pre- and Post- Processing

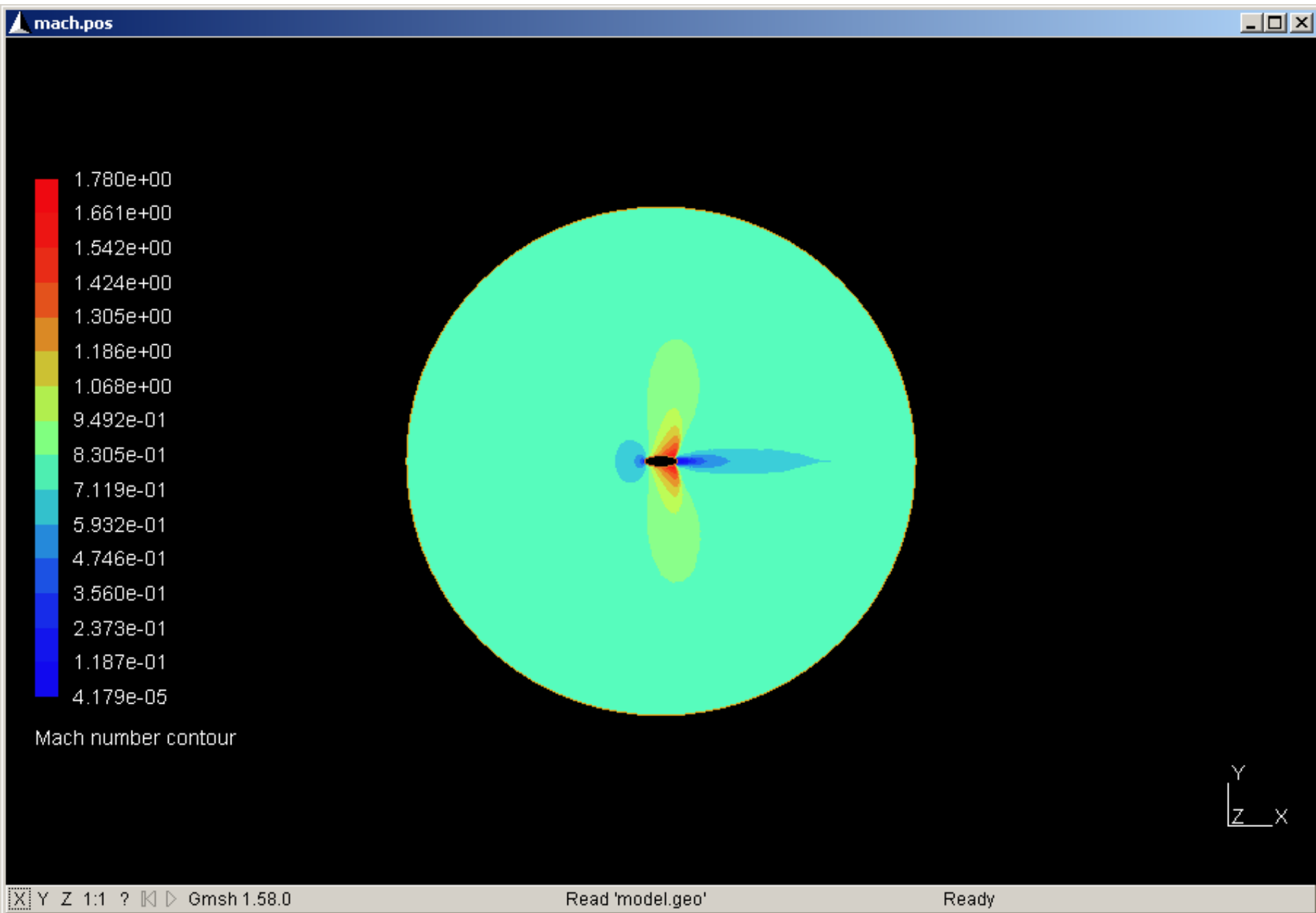


File Name

- ☐ Density contour
- ☐ geom.pos
- ☒ Mach number contour
- ☐ Pressure contour
- ☐ Temperature contour
- ☐ Velocity vector
- ☐ Velocity magnitude contour

Run gmsh V6.5 executable

Close



Example: Generate mesh for Mach 1.98 flow past a 33-1/3 ogiv-cylinder.

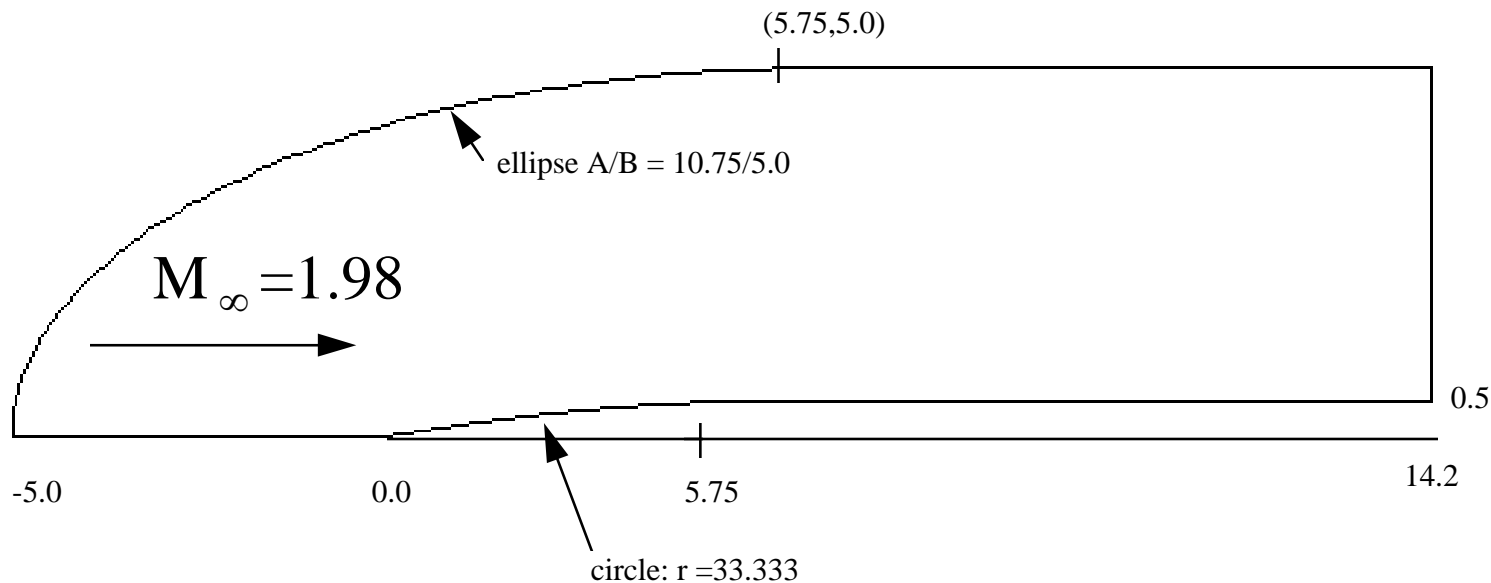
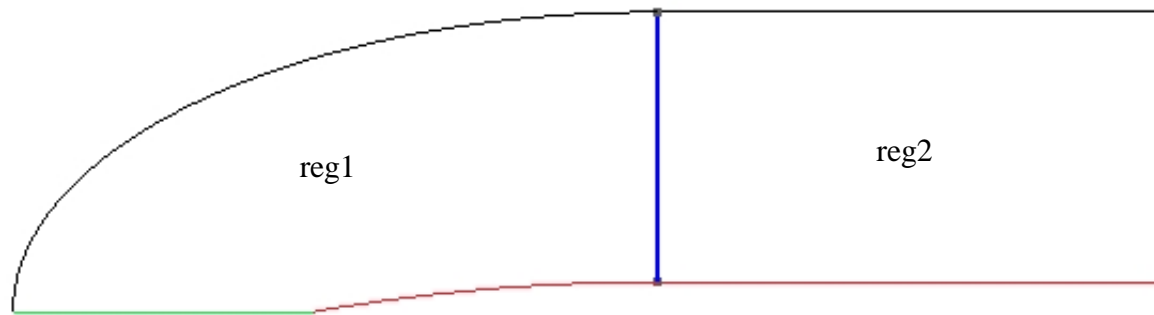
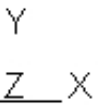


Figure C4.1 Computational domain for Mach 1.98 flow past a 33-1/3 ogiv cylinder with $Re = 0.5 \times 10^6$.



Divide domain into two regions.



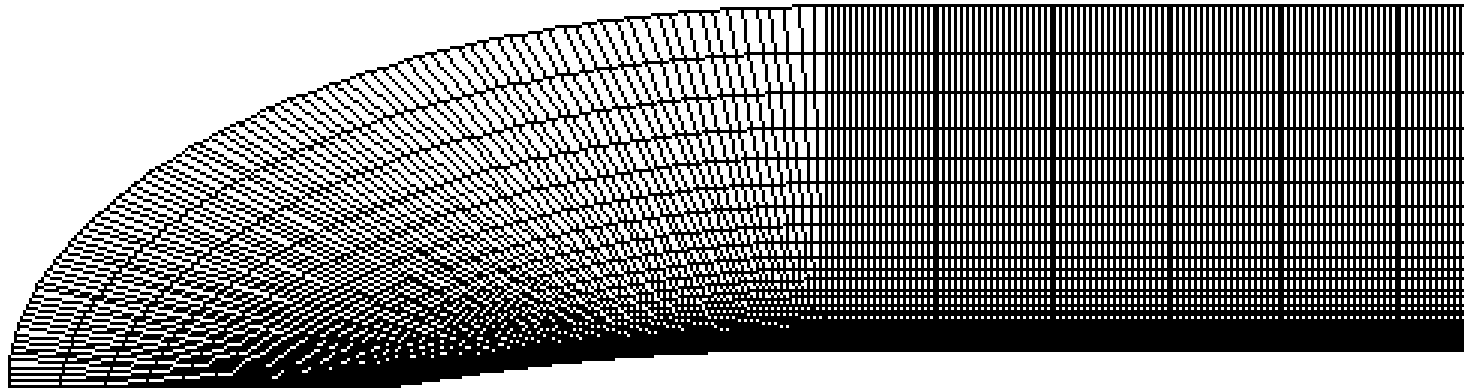
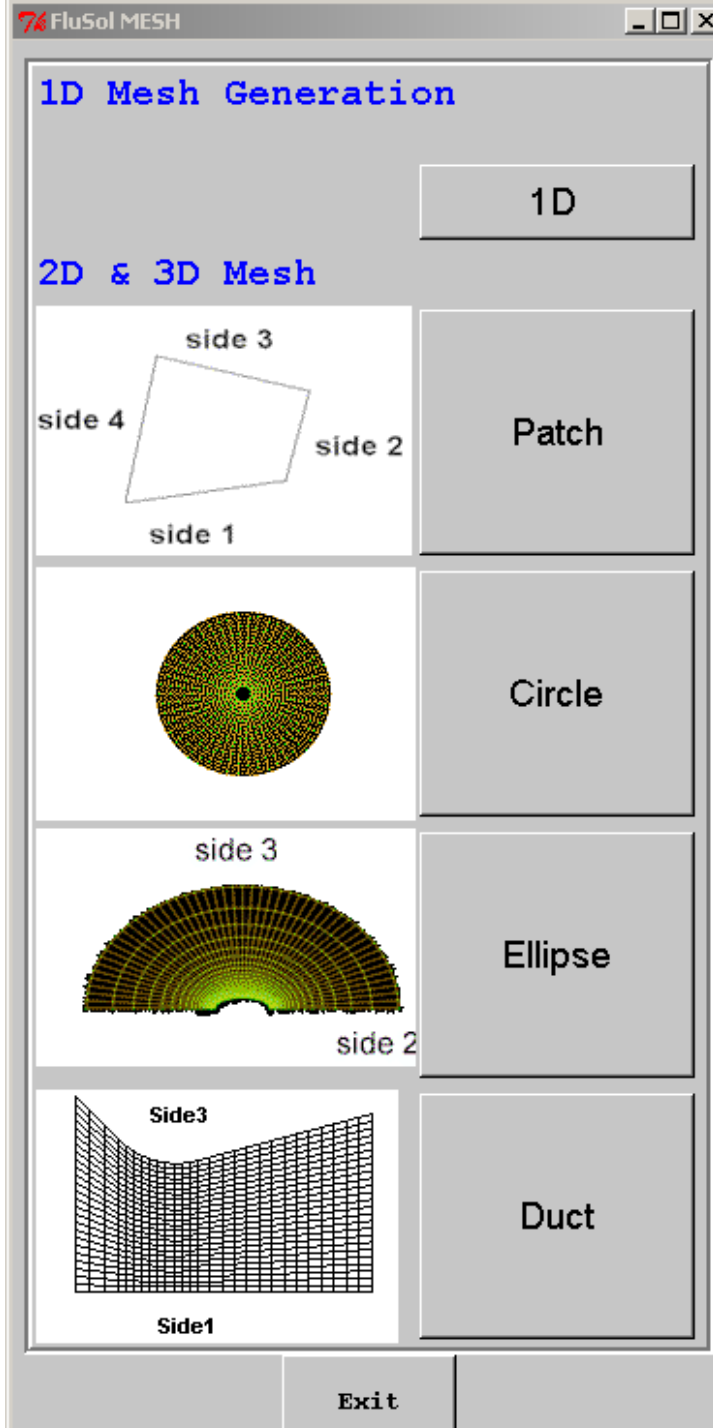


Figure C4.2 Finite element mesh for flow past an ogiv-cylinder.



File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

1

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

3 Elliptic arc

ityb

1 Circular arc

slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

elex

90

eley

50

Node 1

X1:

0.0

Y1:

0.0

Node 2

X2:

5.75

Y2:

0.5

Node 3

X3:

5.75

Y3:

5.0

Node 4

X4:

-5.0

Y4:

0.0

File

Patch Initial & Boundary conditions



Initial & Boundary Conditions

Wall face numbers (ex. 2,4):

1

Farfield face numbers (1,3):

3

Axis-symmetry line face numbers:

4

Set boundary condition on face numbers

4 vy 0.0

Set variable output on face:

File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

1

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

3 Elliptic arc

ityb

1 Circular arc

slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

elex

90

eley

50

Node 1

X1:

0.0

Y1:

0.0

Node 2

X2:

5.75

Y2:

0.5

Node 3

X3:

5.75

Y3:

5.0

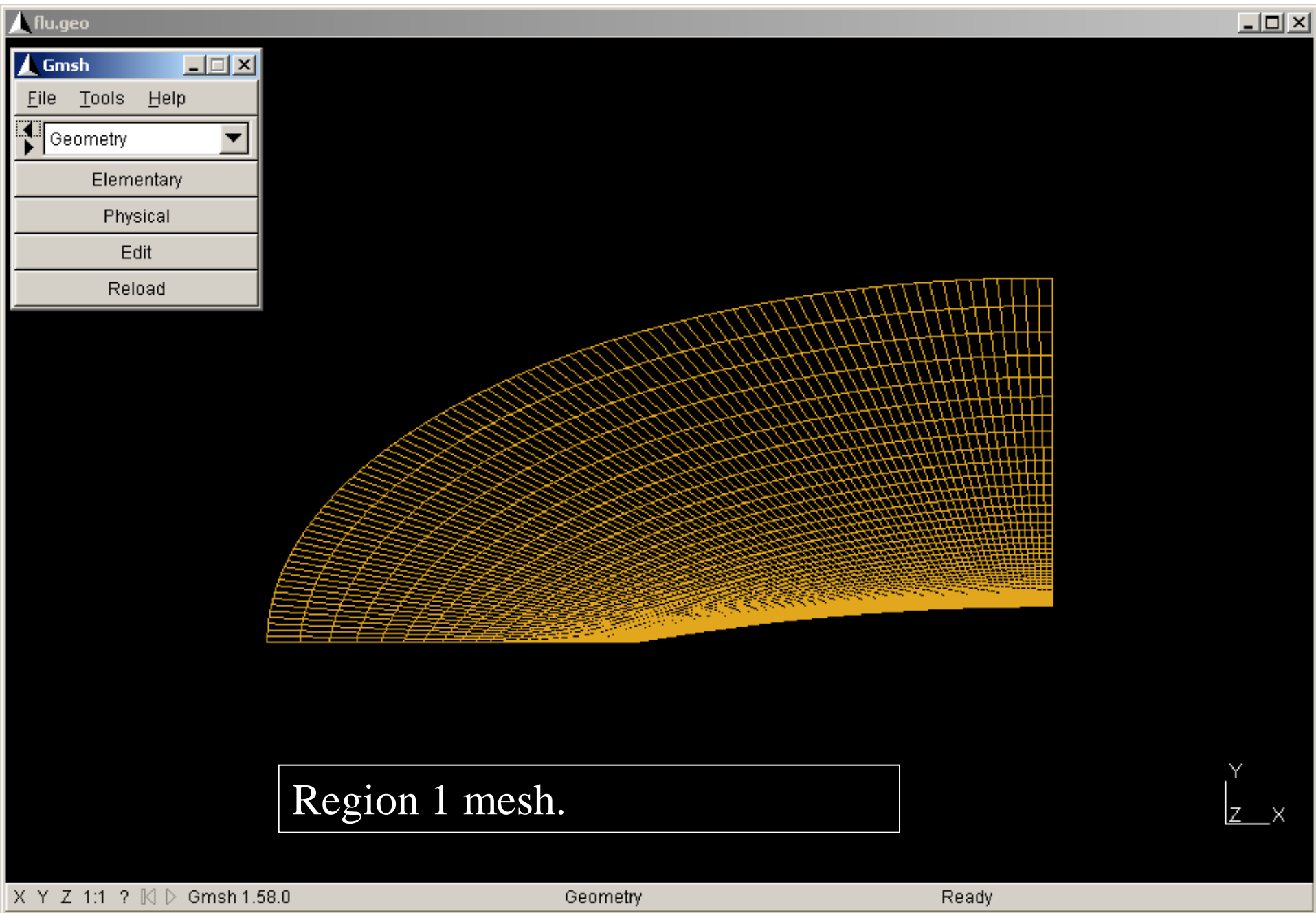
Node 4

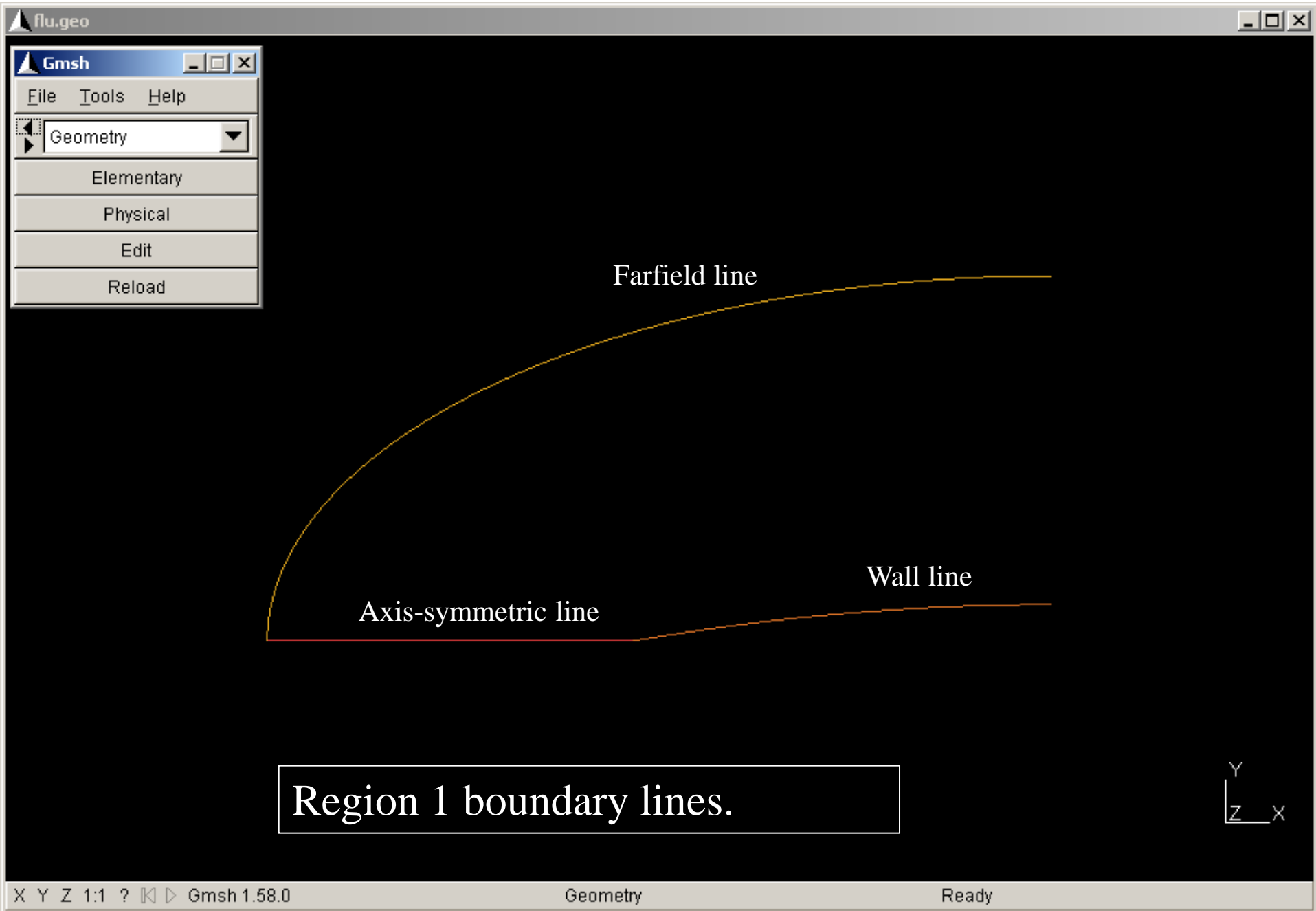
X4:

-5.0

Y4:

0.0





File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

1

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

3 Elliptic arc



ityb

1 Circular arc



slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

elex

90

eley

50

Node 1

X1:

0.0

Y1:

0.0

Node 2

X2:

5.75

Y2:

0.5

Node 3

X3:

5.75

Y3:

5.0

Node 4

X4:

-5.0

Y4:

0.0

Save in:

 2008-04-07






⌵

⬅️





 ▾

- 
My Recent Documents
- 
Desktop
- 
My Documents
- 
My Computer
- 
My Network Places

 reg1

File name: ⌵

Save as type: ⌵

Save

Cancel

File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

2

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

0 Straight line



ityb

0 Straight line



slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

elex

110

eley

50

Node 1

X1:

5.75

Y1:

0.5

Node 2

X2:

14.2

Y2:

0.5

Node 3

X3:

14.2

Y3:

5.0

Node 4

X4:

5.75

Y4:

5.0

File

Patch Initial & Boundary conditions



Initial & Boundary Conditions

Wall face numbers (ex. 2,4):

1

Farfield face numbers (1,3):

2 3

Axis-symmetry line face numbers:

Set boundary condition on face numbers

Set variable output on face:

File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

2

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

0 Straight line ▼

ityb

0 Straight line ▼

slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

ellex

110

eley

50

Node 1

X1:

5.75

Y1:

0.5

Node 2

X2:

14.2

Y2:

0.5

Node 3

X3:

14.2

Y3:

5.0

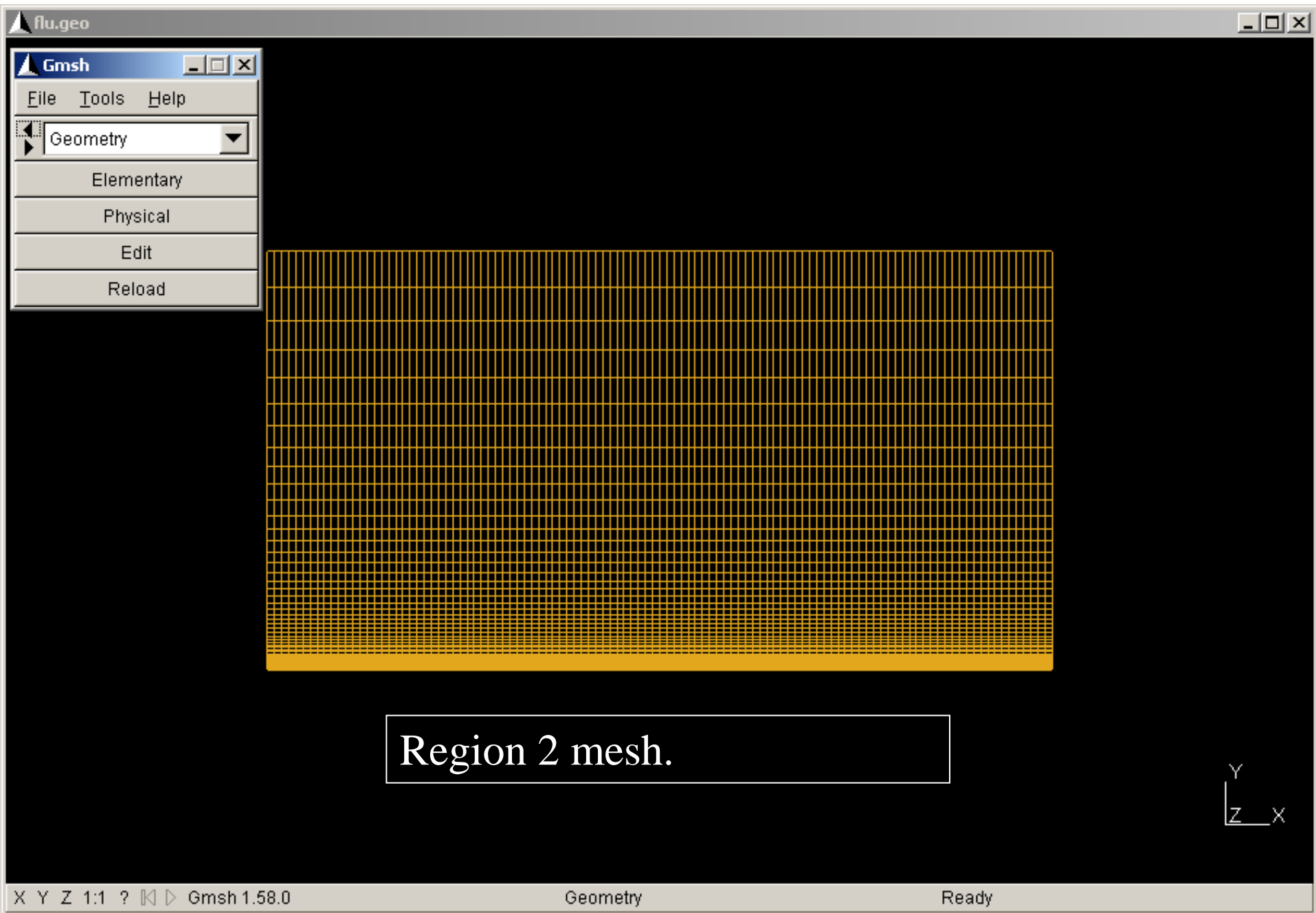
Node 4

X4:

5.75

Y4:

5.0



File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

2

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

0 Straight line



ityb

0 Straight line



slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

elcx

110

eley

50

Node 1

X1:

5.75

Y1:

0.5

Node 2

X2:

14.2

Y2:

0.5

Node 3

X3:

14.2

Y3:

5.0

Node 4

X4:

5.75






Y4:

5.0

Save in:

 2008-04-07

←   

- 
My Recent Documents
- 
Desktop
- 
My Documents
- 
My Computer
- 
My Network Places

 reg1

File name:

Save as type:

Save

Cancel

File

Patch Initial & Boundary conditions

Patch Mesh Generation

View mesh

Assembly blocks

Region Number:

2

Write Mesh

Preview Mesh

Close

Upper Curve (Side 3)

Lower Curve (Side 1)

ityu

0 Straight line

ityb

0 Straight line

slopu (line)

0.0

slopb (line)

33.3333

radius (slopu)

0.0

radius (slopb)

33.3333

Parabolic power (slopu):

0.0

Parabolic power (slopb):

33.3333

X-Axis length (axu):

10.75

X-Axis length (axb):

0.0

Y-Axis length (ayu):

5.0

Y-Axis length (ayb):

0.0

strux

0

strlx

0

dxumin

0.1

dxlmin

0.1

residue

0.0001

stretch

1

factor

0.0

dymin:

0.005

☒ Create wings

Total number of wings:

4

thick

0.05

Shape of wing section:

2

Node coordinates

elex

110

eley

50

Node 1

X1:

5.75

Y1:

0.5

Node 2

X2:

14.2

Y2:

0.5

Node 3

X3:

14.2

Y3:

5.0

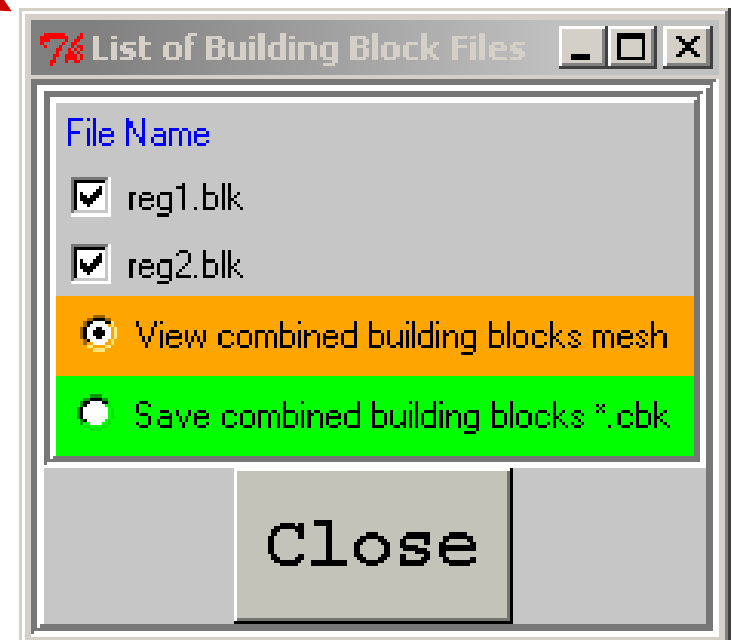
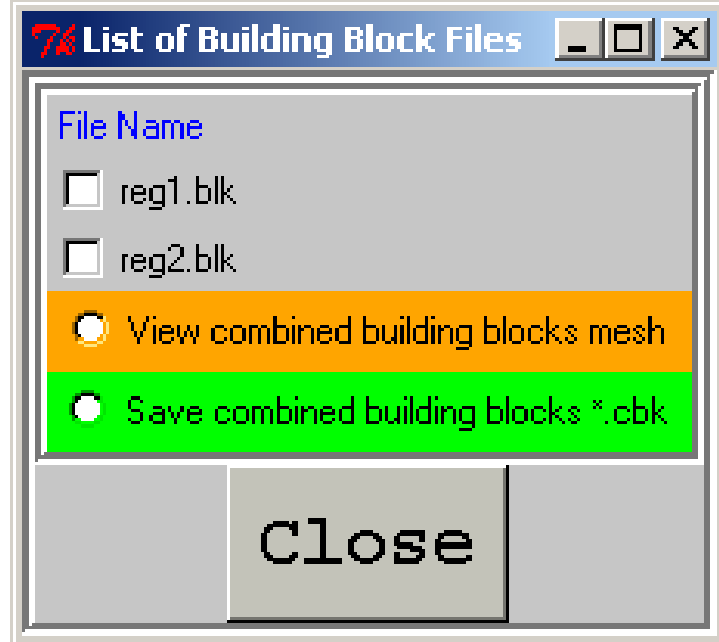
Node 4

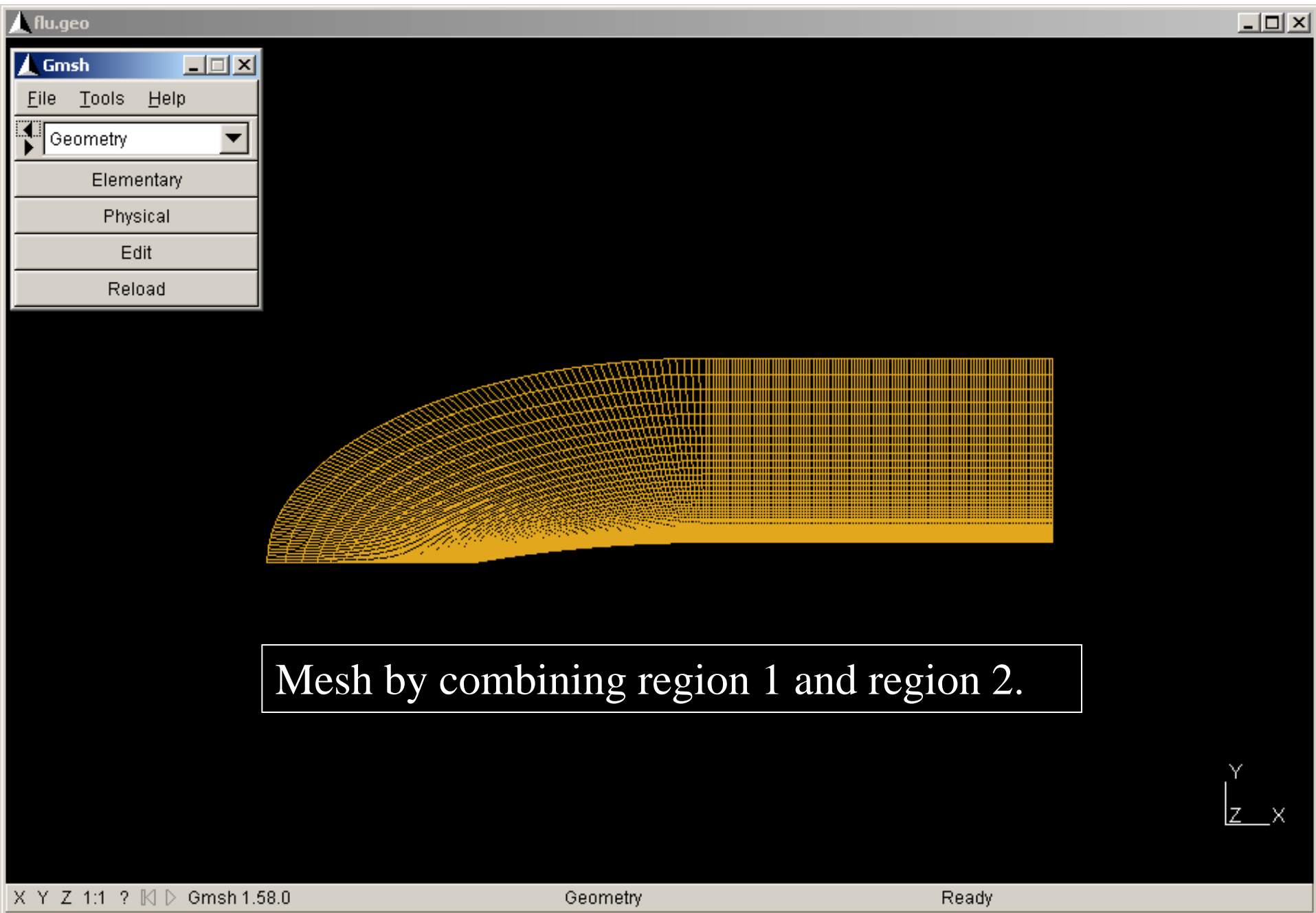
X4:

5.75

Y4:

5.0





farfield

wall

Boundary lines definitions:

1. Axis-symmetric line
2. Farfield lines
3. Wall lines

