# Life After School

An exploration for OIAC by

Shwe Myat Myo Oo

# Introduction

# Timeline

**2012**

International School Yangon (ISY)

IGCSE (5A* 2A)
IB Diploma

**2012-2016**

Georgia Tech

Bachelor of Science in Mechanical Engineering (B.S.M.E)

Certificate in Entrepreneurship

**2017-2019**

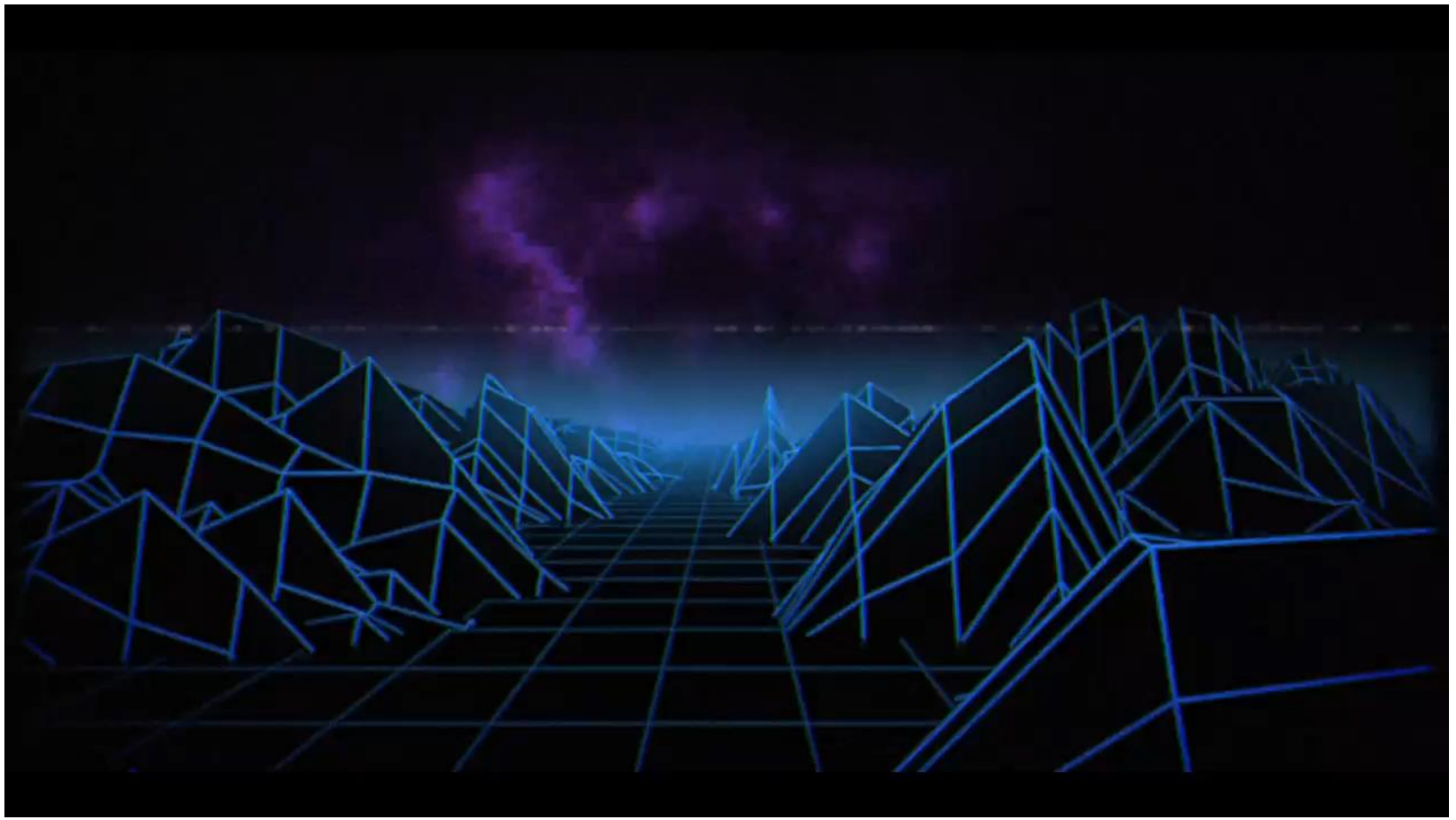
Lead Engineer, Technical Development Division

**2019-2021**

Northeastern University

Master of Science in Energy Systems (MS-ES)

# Some Memorable GT Moments



# GT Solar Racing



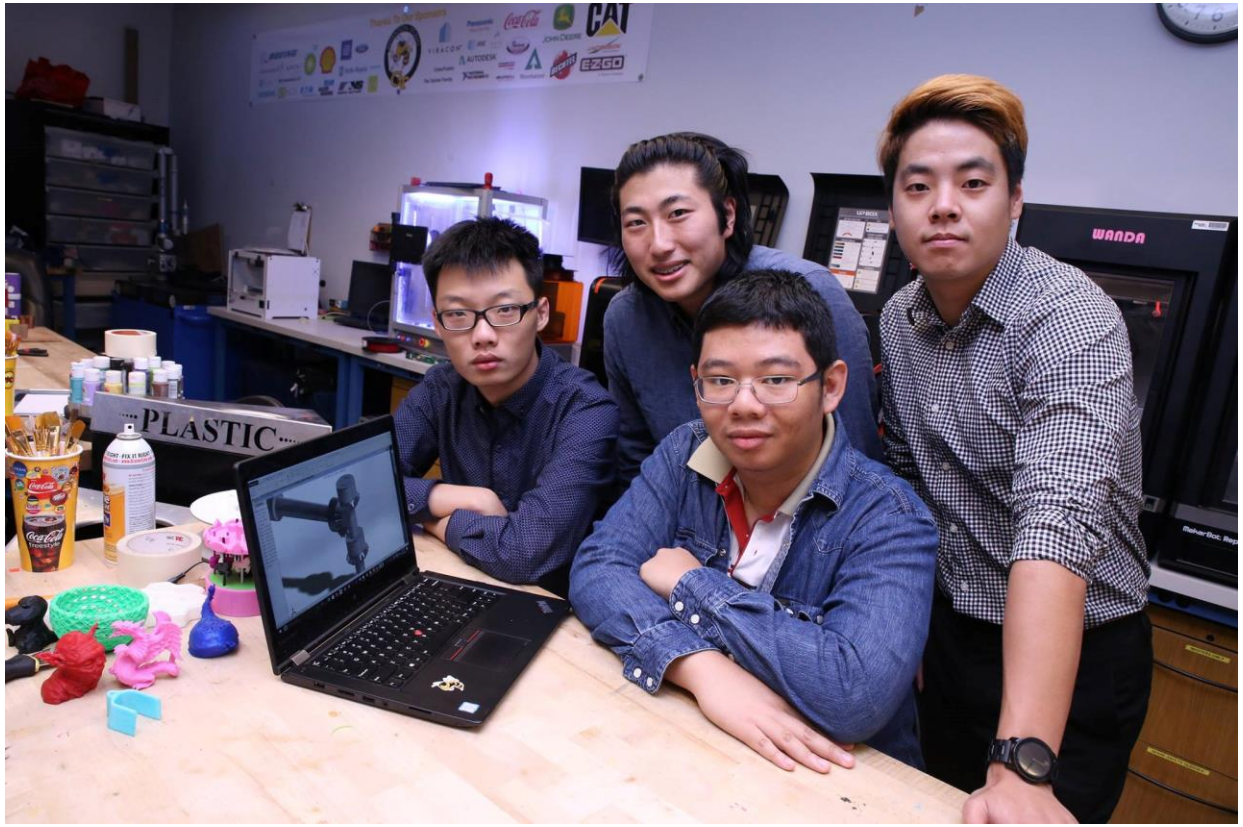
# Georgia Tech EcoCAR 3

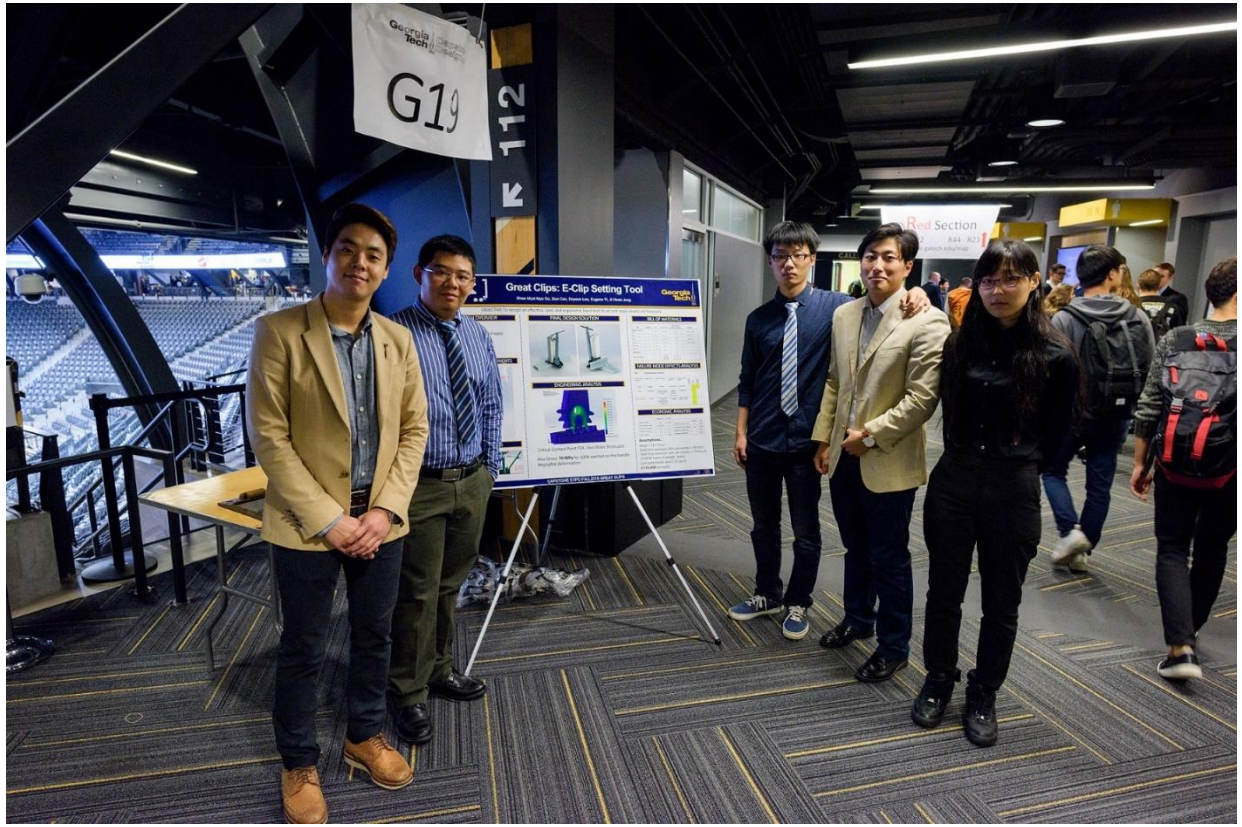


EcoCAR3
Advanced Vehicle Technology Competition

U.S. DEPARTMENT OF ENERGY GM MathWorks Argonne


# Georgia Tech Capstone Design

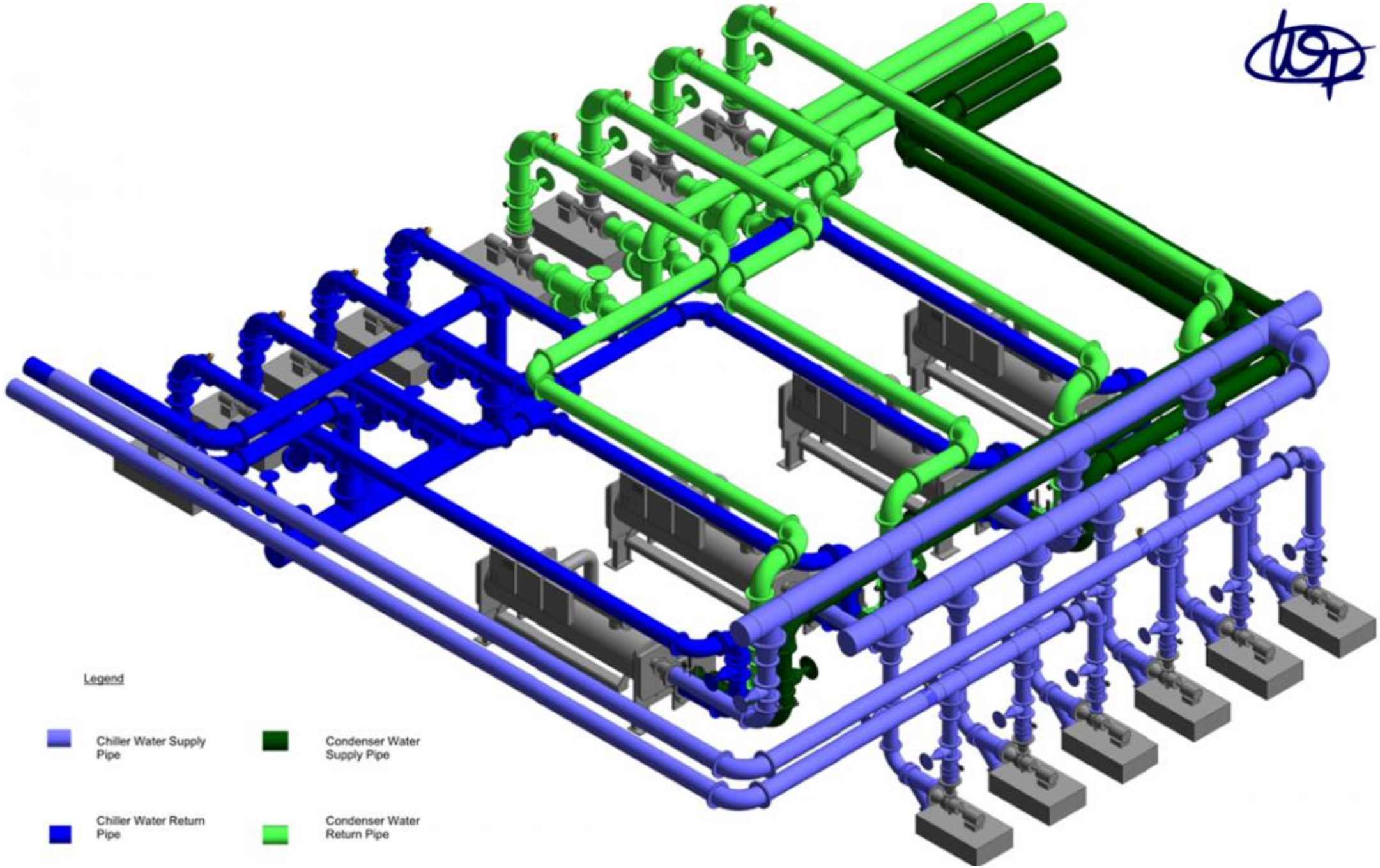



http://www.me.gatech.edu/featured_ME_Grabs_Capstone_Spotlight


Georgia Institute of Technology
Georgia Tech Capstone Design Expo
Best Overall Project
Mechanical Engineering
Georgia Tech Capstone Design Expo
Date 12-6 ,2016
Joseph F. & Luverene Smith Award
Pay to the Order of GREAT CLIPS (E-CLIP SETTING TOOL)
$1,000.0
Dollars
One Thousand and no/100----------
For ME Best Project
George P. Burdell
1:123456789.9870079841

# Working Life


Legend
Chiller Water Supply Pipe
Condenser Water Supply Pipe
Chiller Water Return Pipe
Condenser Water Return Pipe

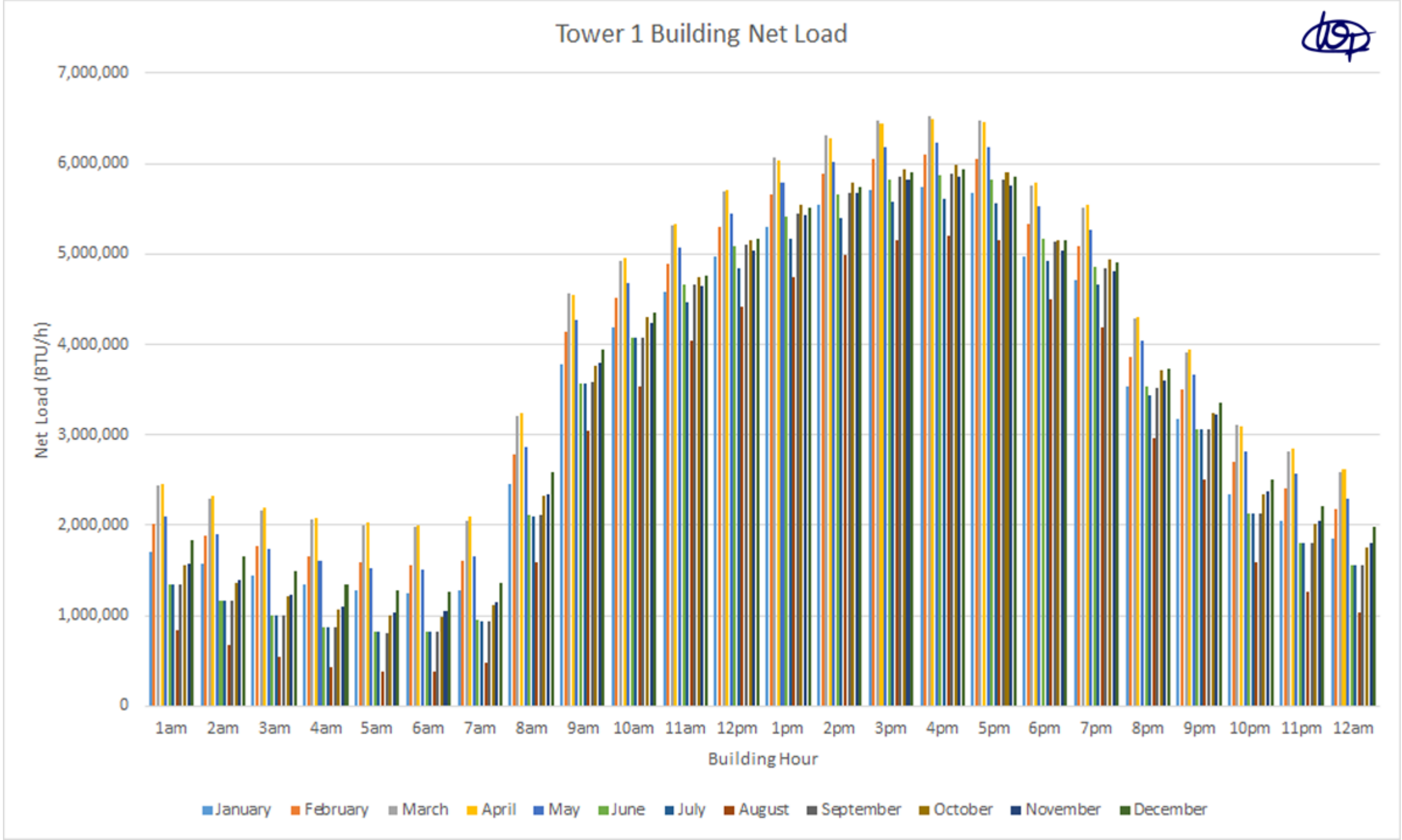

Tower 1 Building Net Load
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Net Load (BTU/h)
1am
2am
3am
4am
5am
6am
7am
8am
9am
10am
11am
12pm
1pm
2pm
3pm
4pm
5pm
6pm
7pm
8pm
9pm
10pm
11pm
12am
Building Hour
January
February
March
April
May
June
July
August
September
October
November
December

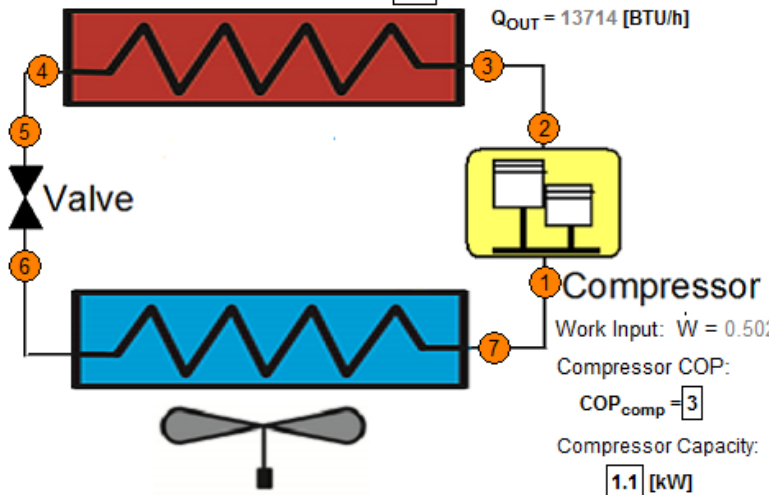
Diagram Window

# Refrigeration Cycle (R22)

Author: Shwe Myat Myo Oo

Ambient Outside Air Temp $T_{amb}$ = 110 [F]

Actual heat rejection:
$Q_{OUT}$ = 13714 [BTU/h]




Work Input: $\dot{W}$ = 0.5023 [kW]

Compressor COP:
$COP_{comp}$ = 3

Compressor Capacity:
1.1 [kW]

Conditioned space temp (refrigerant) $T_{cond}$ = 75 [F]

Cooling capacity @ 95F ambient:
12000 [BTU/h]

Actual cooling capacity:
11183 [BTU/h]

***Cycle Performance***

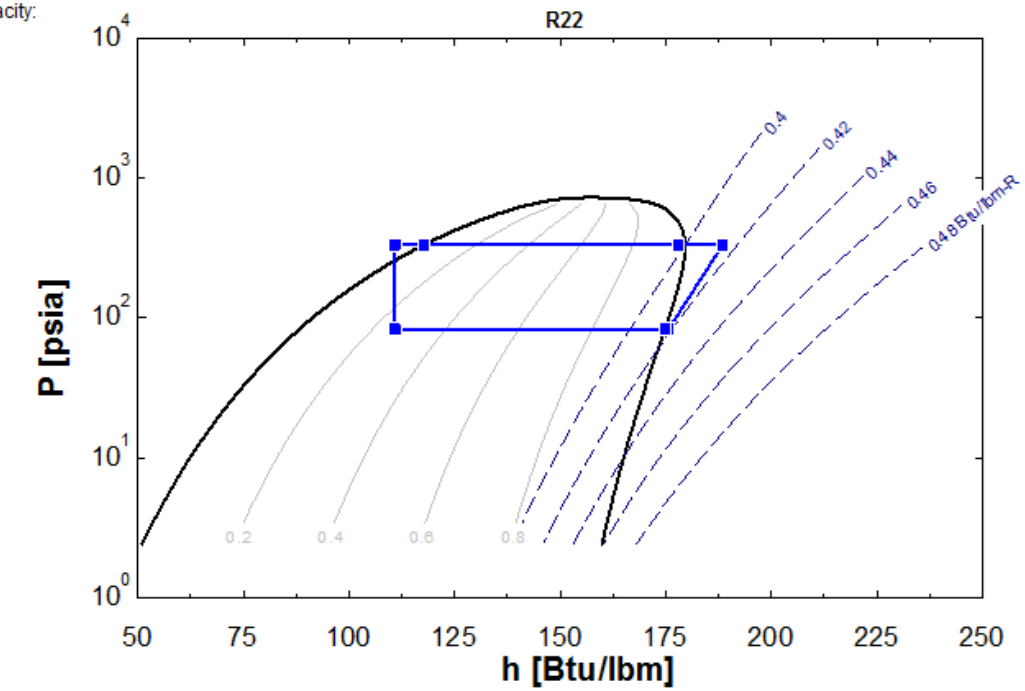
$COP_c$ = 7.001
EER = 23.89
SEER = 27.3
$\dot{m}$ = 173.4 [lbm/h]

1. Superheated Vapor
2. Superheated Vapor
3. Saturated Vapor
4. Saturated Liquid
5. Subcooled Liquid
6. 2 phase mixture
7. Saturated Vapor

## Critical Point Details

| | | |
|---|---|---|
| $T_1$ = 79.7 [F] | $P_1$ = 147 [psia] | $h_1$ = 178.4 [BTU/lbm] |
| $T_2$ = 200 [F] | $P_2$ = 352.2 [psia] | $h_2$ = 188.3 [BTU/lbm] |
| $T_3$ = 200 [F] | $P_3$ = 352.2 [psia] | $h_3$ = 169.5 [BTU/lbm] |
| $T_4$ = 140 [F] | $P_4$ = 352.2 [psia] | $h_4$ = 119.4 [BTU/lbm] |
| $T_5$ = 110 [F] | $P_5$ = 352.2 [psia] | $h_5$ = 109.2 [BTU/lbm] |
| $T_6$ = 75 [F] | $P_6$ = 147 [psia] | $h_6$ = 109.2 [BTU/lbm] |
| $T_7$ = 75 [F] | $P_7$ = 147 [psia] | $h_7$ = 177.4 [BTU/lbm] |

Standard R22 Cycle @ 95F

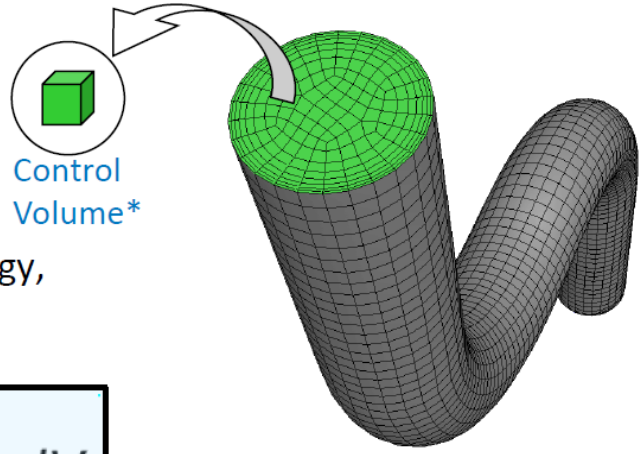


# Computational Fluid Dynamics (CFD)

## How Does CFD Work?

**ANSYS CFD solvers are based on the finite volume method**

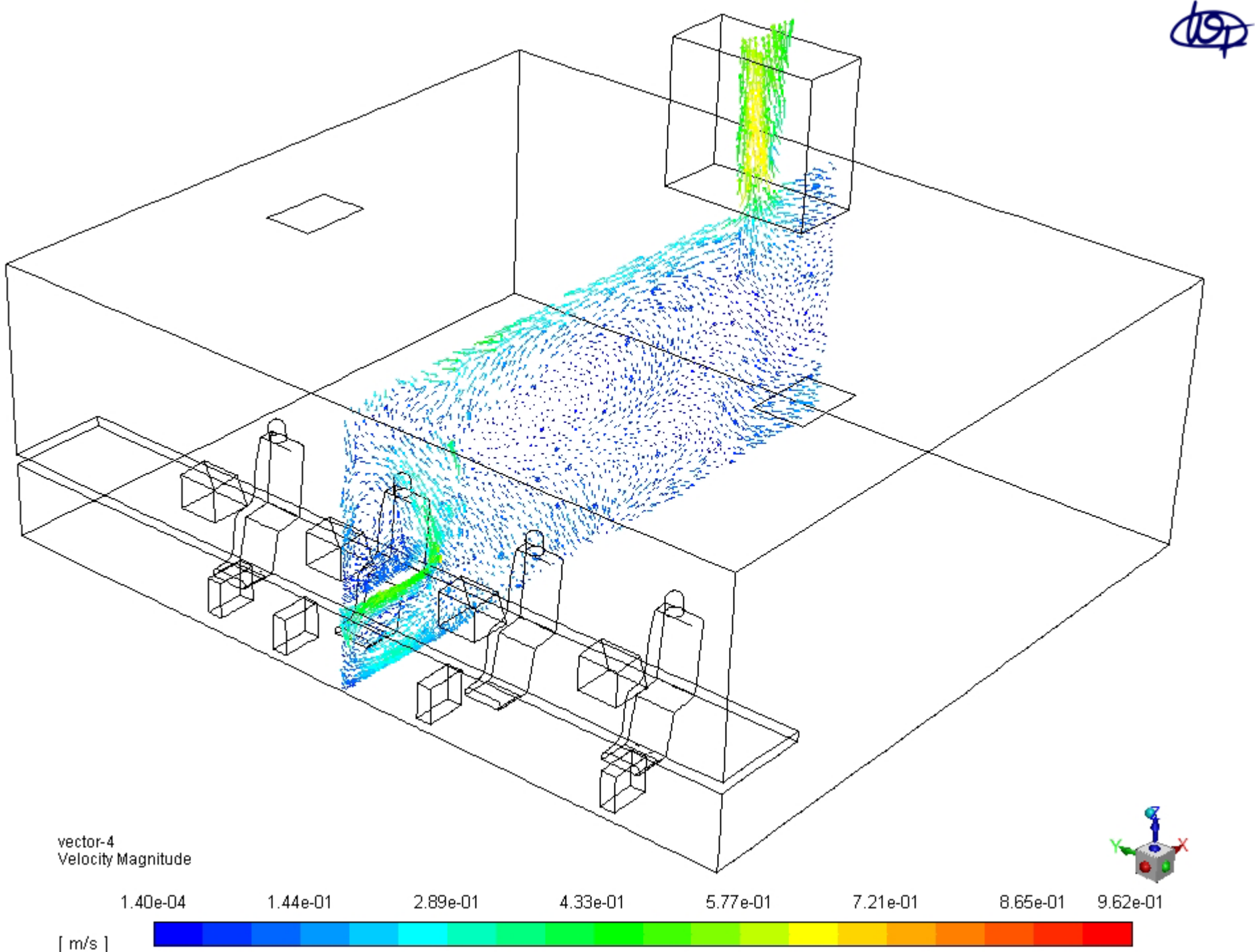
- Domain is discretized into a finite set of control volumes
- General conservation (transport) equations for mass, momentum, energy, species, etc. are solved on this set of control volumes

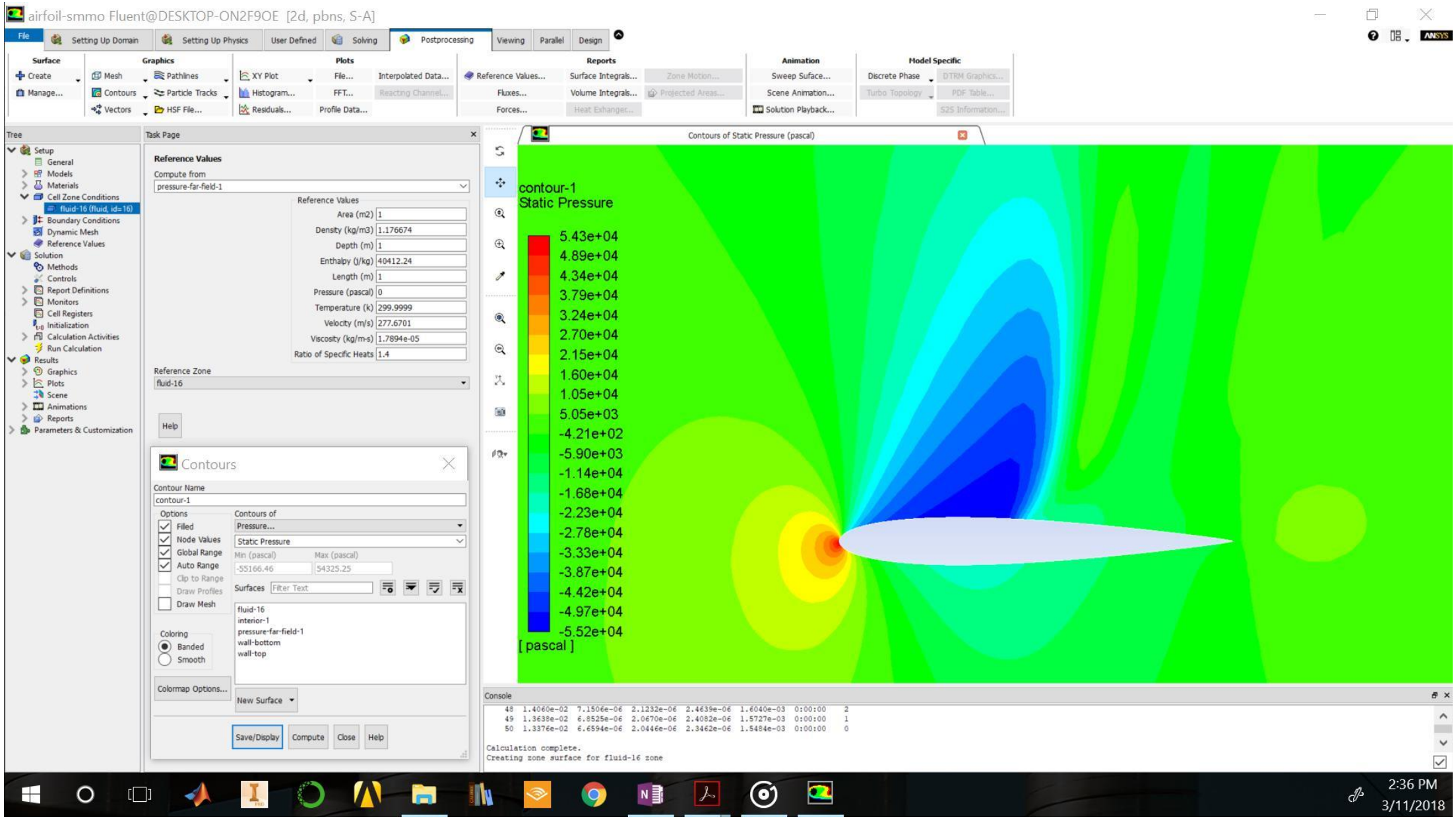


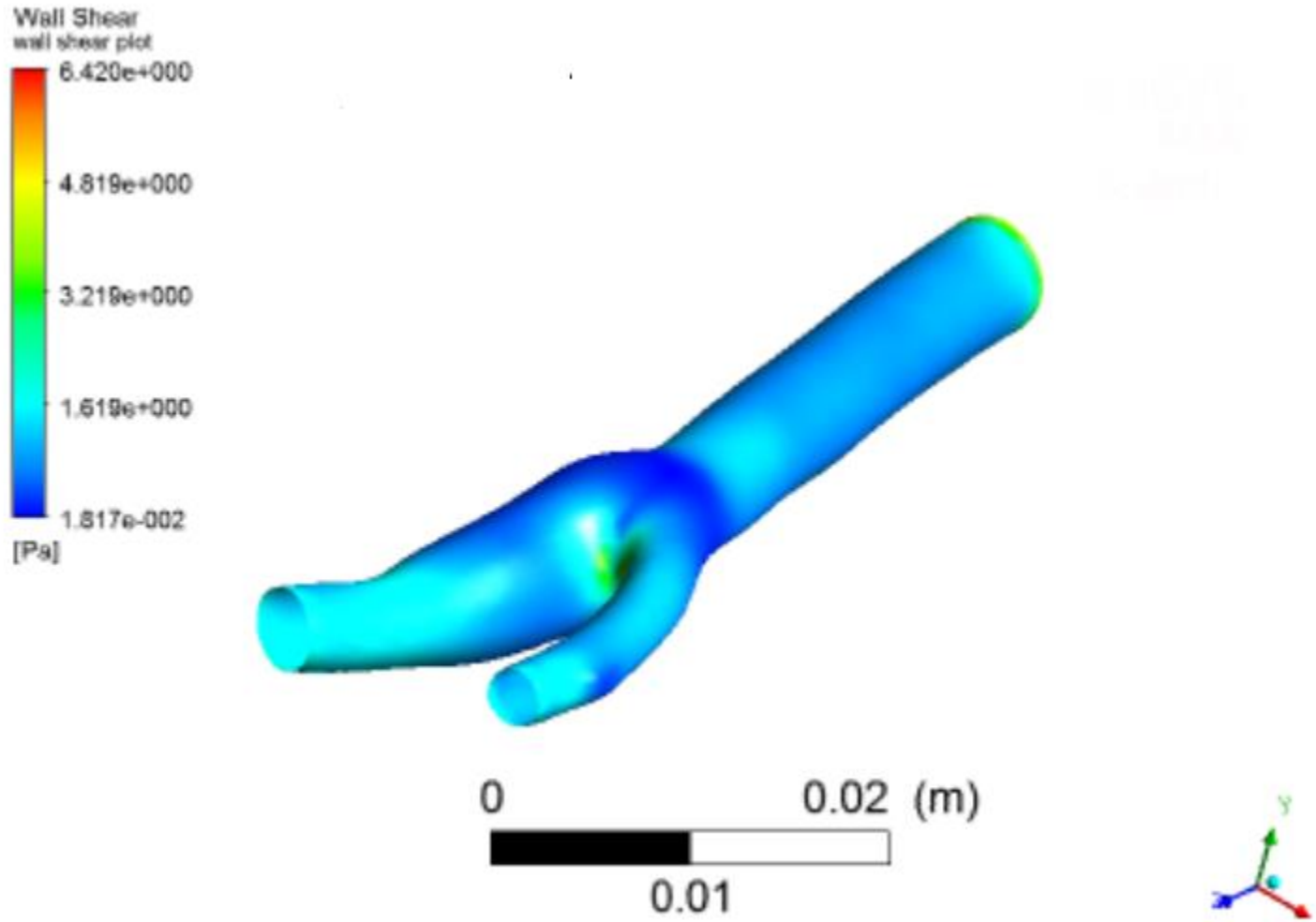

$$\underbrace{\frac{\partial}{\partial t}\int_V \rho\phi\, dV}_{\text{Unsteady}} + \underbrace{\oint_A \rho\phi\mathbf{V}\cdot d\mathbf{A}}_{\text{Convection}} = \underbrace{\oint_A \Gamma_\phi \nabla\phi \cdot d\mathbf{A}}_{\text{Diffusion}} + \underbrace{\int_V S_\phi\, dV}_{\text{Generation}}$$

| Equation | $\phi$ |
|---|---|
| Continuity | 1 |
| X momentum | $u$ |
| Y momentum | $v$ |
| Z momentum | $w$ |
| Energy | $h$ |

- Partial differential equations are discretized into a system of algebraic equations
- All algebraic equations are then solved numerically to render the solution field


vector-4
Velocity Magnitude
1.40e-04
1.44e-01
2.89e-01
4.33e-01
5.77e-01
7.21e-01
8.65e-01
9.62e-01
[ m/s ]
Z
Y
X


airfoil-smmo Fluent@DESKTOP-ON2F9OE [2d, pbns, S-A]
File
Setting Up Domain
Setting Up Physics
User Defined
Solving
Postprocessing
Viewing
Parallel
Design
Surface
Create
Manage...
Graphics
Mesh
Contours
Vectors
Pathlines
Particle Tracks
HSF File...
Plots
XY Plot
Histogram...
Residuals...
File...
FFT...
Profile Data...
Interpolated Data...
Reacting Channel...
Reports
Reference Values...
Fluxes...
Forces...
Surface Integrals...
Volume Integrals...
Heat Exchanger...
Zone Motion...
Projected Areas...
Animation
Sweep Suface...
Scene Animation...
Solution Playback...
Model Specific
Discrete Phase
Turbo Topology
DTRM Graphics...
PDF Table...
S2S Information...
Tree
Setup
General
Models
Materials
Cell Zone Conditions
fluid-16 (fluid, id=16)
Boundary Conditions
Dynamic Mesh
Reference Values
Solution
Methods
Controls
Report Definitions
Monitors
Cell Registers
Initialization
Calculation Activities
Run Calculation
Results
Graphics
Plots
Scene
Animations
Reports
Parameters & Customization
Task Page
Reference Values
Compute from
pressure-far-field-1
Reference Values
Area (m2) 1
Density (kg/m3) 1.176674
Depth (m) 1
Enthalpy (j/kg) 40412.24
Length (m) 1
Pressure (pascal) 0
Temperature (k) 299.9999
Velocity (m/s) 277.6701
Viscosity (kg/m-s) 1.7894e-05
Ratio of Specific Heats 1.4
Reference Zone
fluid-16
Help
Contours
Contour Name
contour-1
Options
Filled
Node Values
Global Range
Auto Range
Clip to Range
Draw Profiles
Draw Mesh
Coloring
Banded
Smooth
Colormap Options...
Contours of
Pressure...
Static Pressure
Min (pascal) -55166.46
Max (pascal) 54325.25
Surfaces
Filter Text
fluid-16
interior-1
pressure-far-field-1
wall-bottom
wall-top
New Surface
Save/Display
Compute
Close
Help
Contours of Static Pressure (pascal)
contour-1
Static Pressure
5.43e+04
4.89e+04
4.34e+04
3.79e+04
3.24e+04
2.70e+04
2.15e+04
1.60e+04
1.05e+04
5.05e+03
-4.21e+02
-5.90e+03
-1.14e+04
-1.68e+04
-2.23e+04
-2.78e+04
-3.33e+04
-3.87e+04
-4.42e+04
-4.97e+04
-5.52e+04
[ pascal ]
Console
48 1.4060e-02 7.1506e-06 2.1232e-06 2.4639e-06 1.6040e-03 0:00:00 2
49 1.3638e-02 6.8525e-06 2.0670e-06 2.4082e-06 1.5727e-03 0:00:00 1
50 1.3376e-02 6.6594e-06 2.0446e-06 2.3462e-06 1.5484e-03 0:00:00 0
Calculation complete.
Creating zone surface for fluid-16 zone
2:36 PM
3/11/2018


Wall Shear
wall shear plot
6.420e+000
4.819e+000
3.219e+000
1.619e+000
1.817e-002
[Pa]
0
0.02 (m)
0.01

# What About You? What Are Your Options?

- Domestic
  - Local universities
  - Look for travel/scholarship/post-grad opportunities
- International
  - Take SAT + IELTS/TOEFL + A-Levels or similar (US route)
  - Take A-Levels + IELTS/TOEFL + specific reqs (entrance, interview, etc) (UK route)
  - Other nations
- Other opportunities?

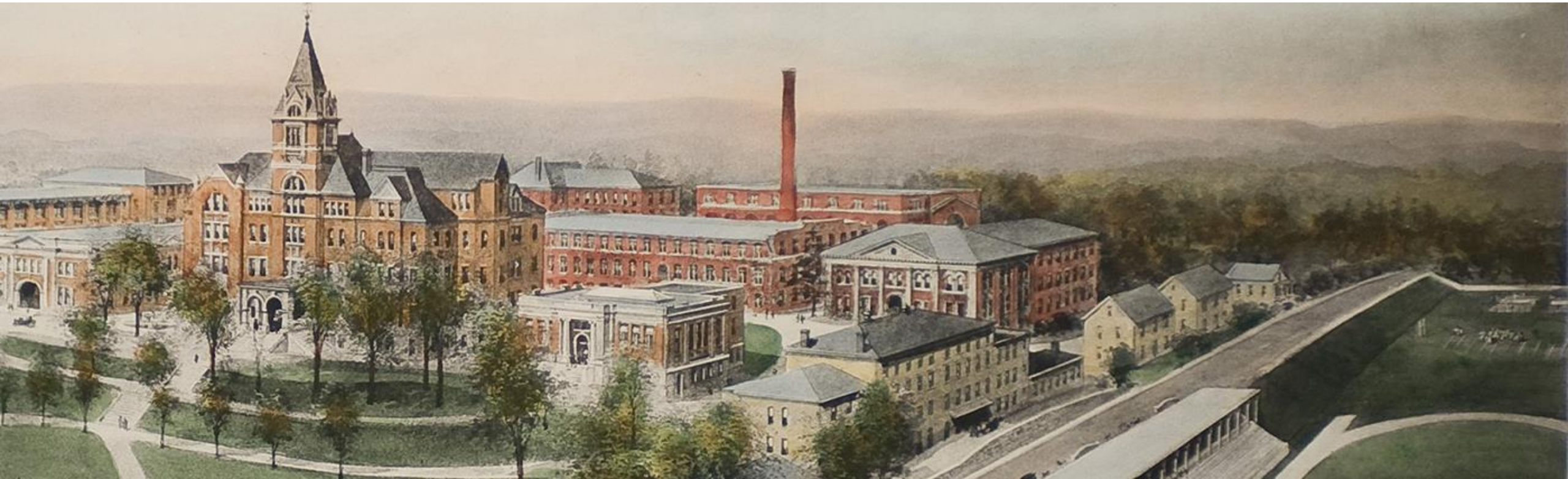
# General Advice

“Plans are nothing; planning is everything.”

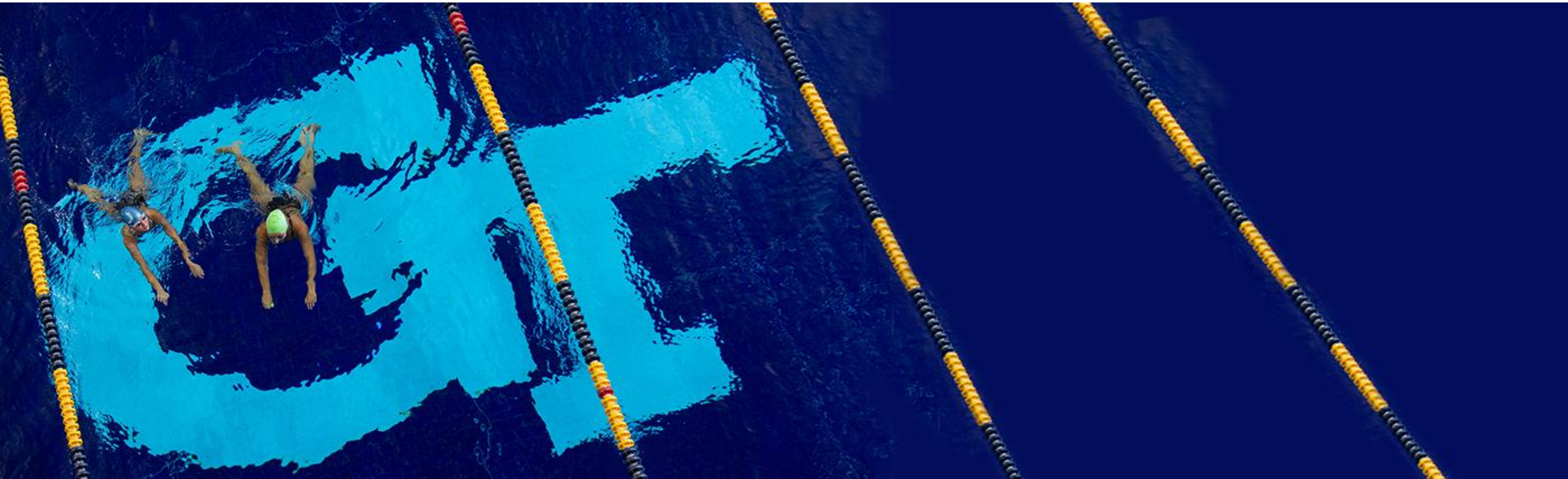
- Dwight D. Eisenhower

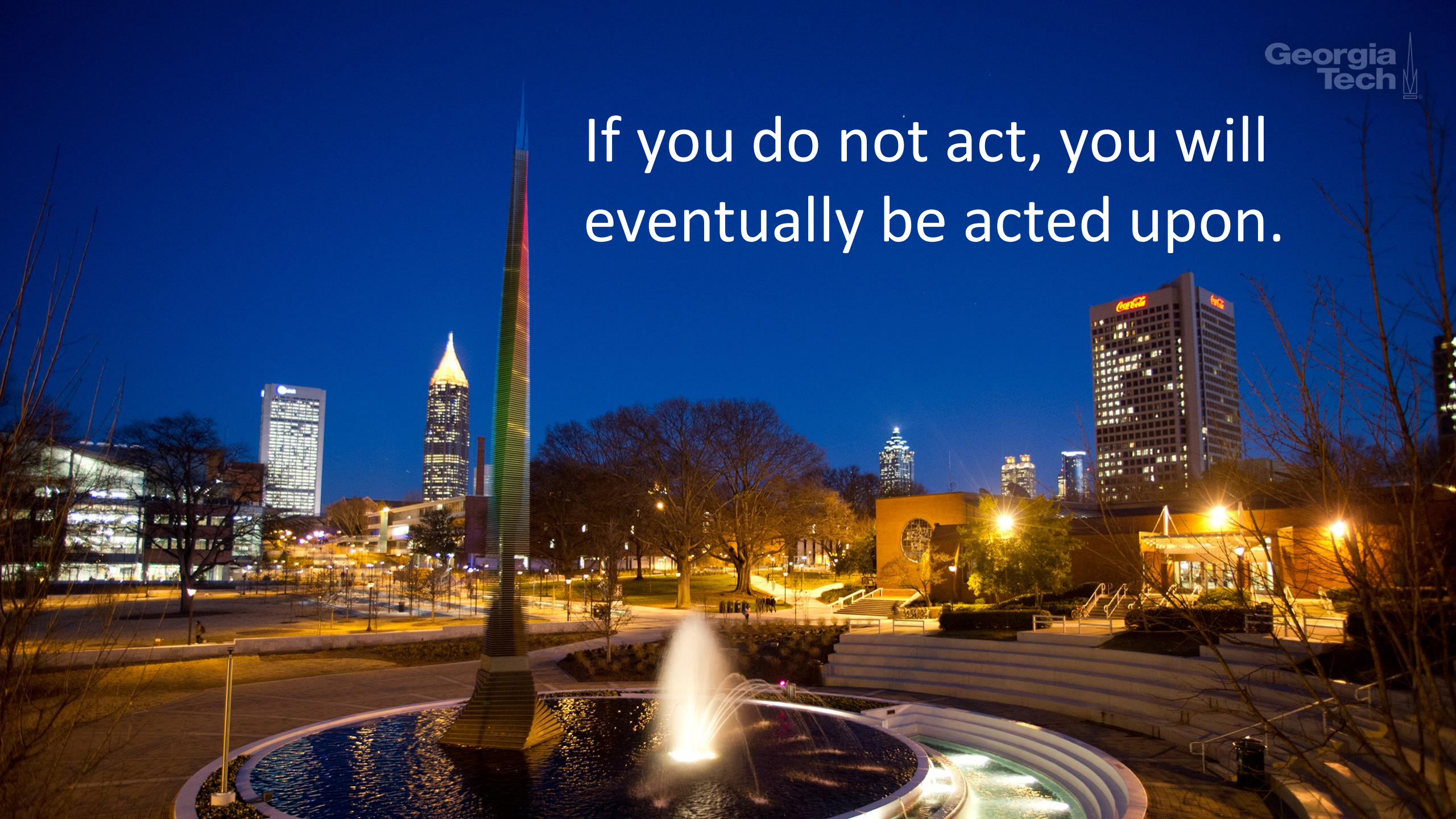
# Focus on your present!

# Find your personal cure to homesickness.



- Always reflect, change, and grow
- Work on creativity, flexibility, and resilience



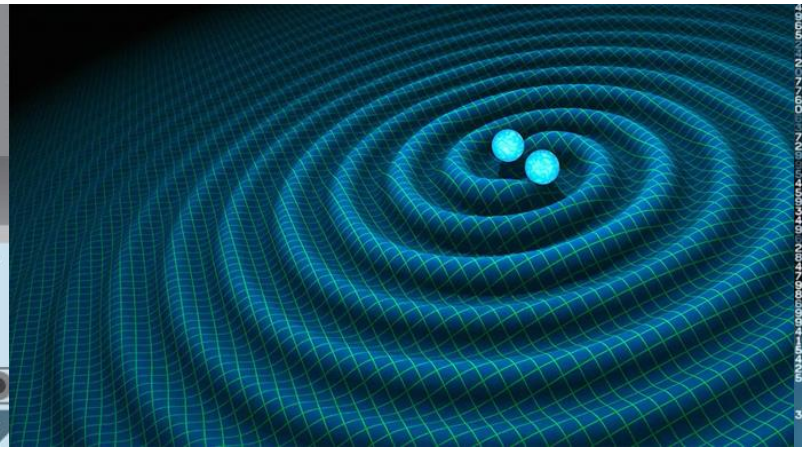

If you do not act, you will eventually be acted upon.


# STEM-One Path Out of Many

# The STEM Mindset (Evidence-Based Thinking)

- Scientific method
- Hypothesis and assumption questioning
- Experiment design
- Algorithmic thinking
- Bias avoidance

# There is no better time in history to study STEM.

# STEM is Everywhere

Health

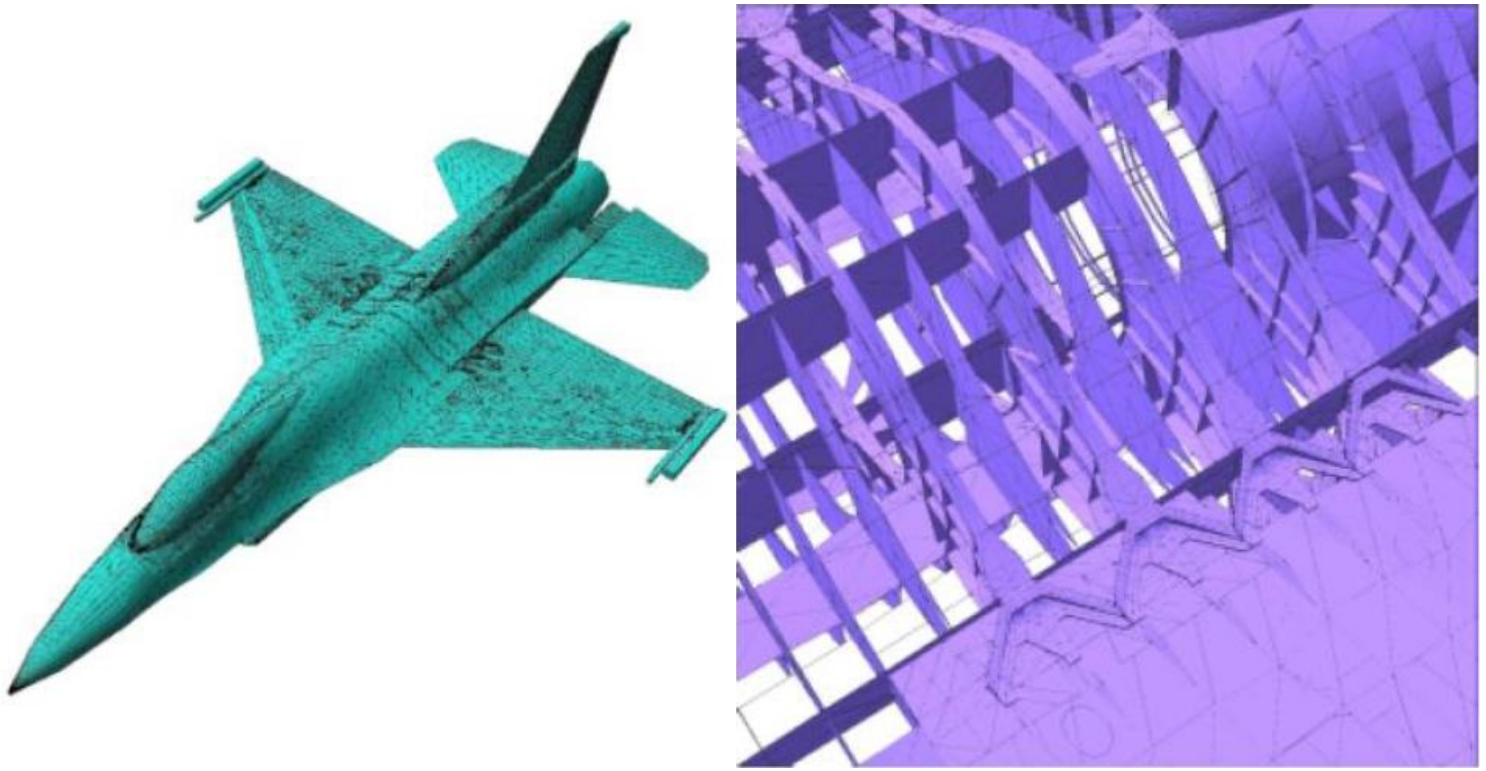
Mobility

Communications

Living Standards

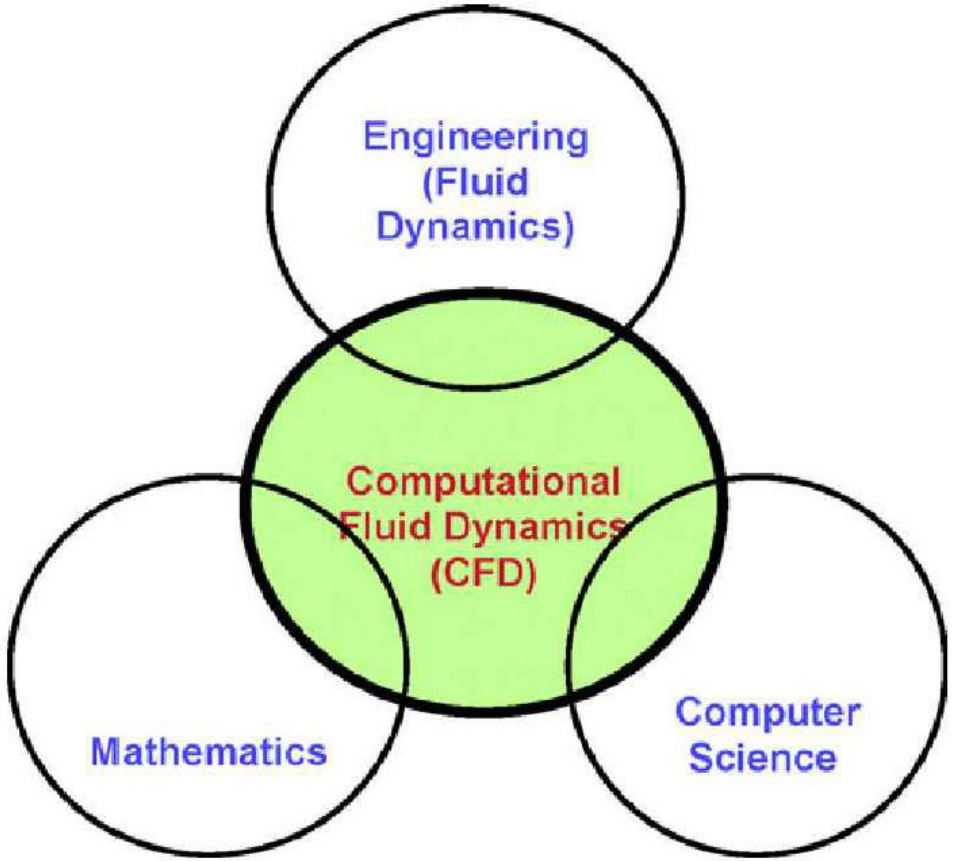
Industry

# Analysis Tools have Evolved



Complete Structural Analysis of a F-16

# Convergence of Fields/Disciplines




https://ramblinrekt.com/2018/01/28/computation-in-engineering-cfd/

http://www.news.gatech.edu/2015/03/24/snake-robots-learn-turn-following-lead-real-sidewinders

# A Closing Statement on STEM


www.phdcomics.com/tv

# Ask Me Anything! (AMA)

www.ramblinrekt.com

https://www.linkedin.com/in/shwe-myat-myo-oo-8b1a72125/