

# Upper Plenum Single Non-Isothermal Jet Description

## Objective of the Third Problem:

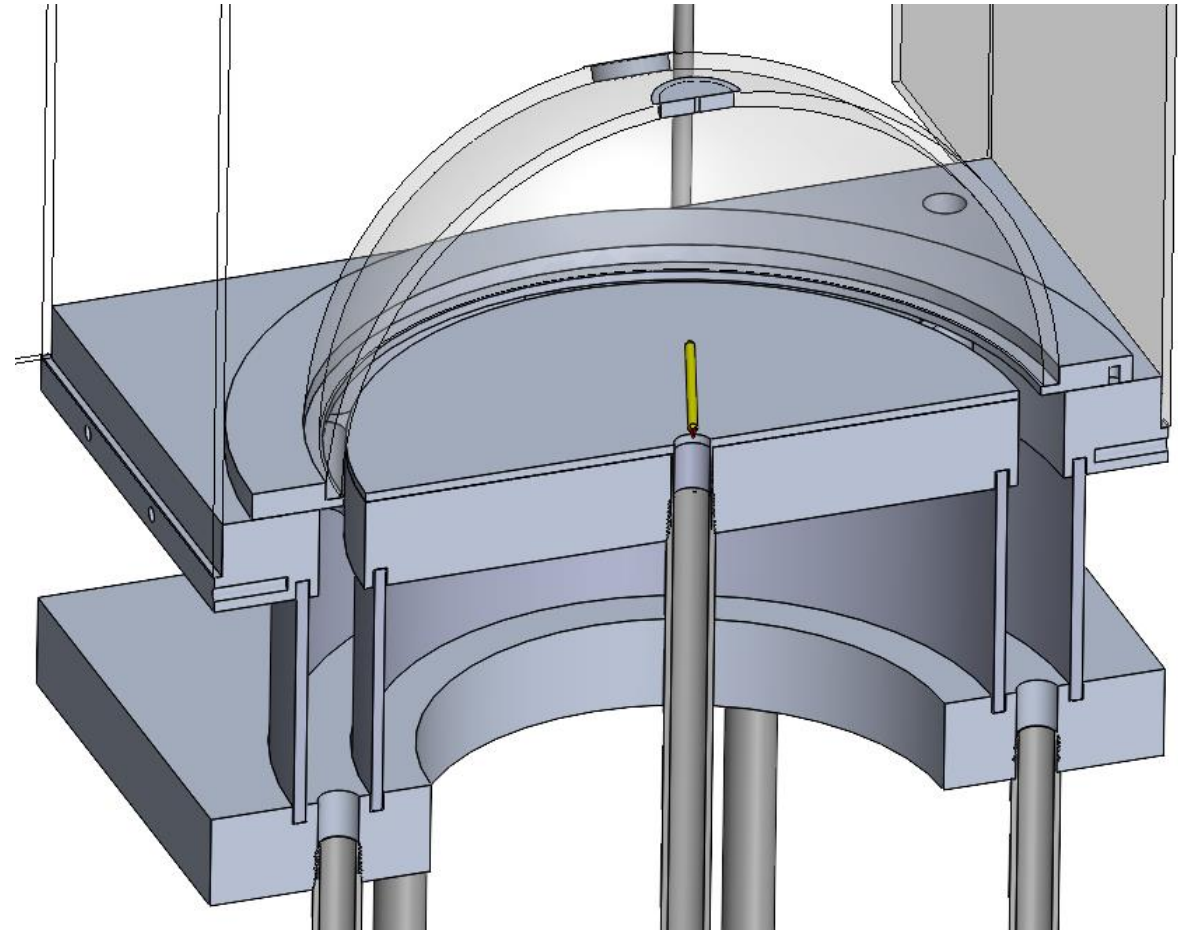
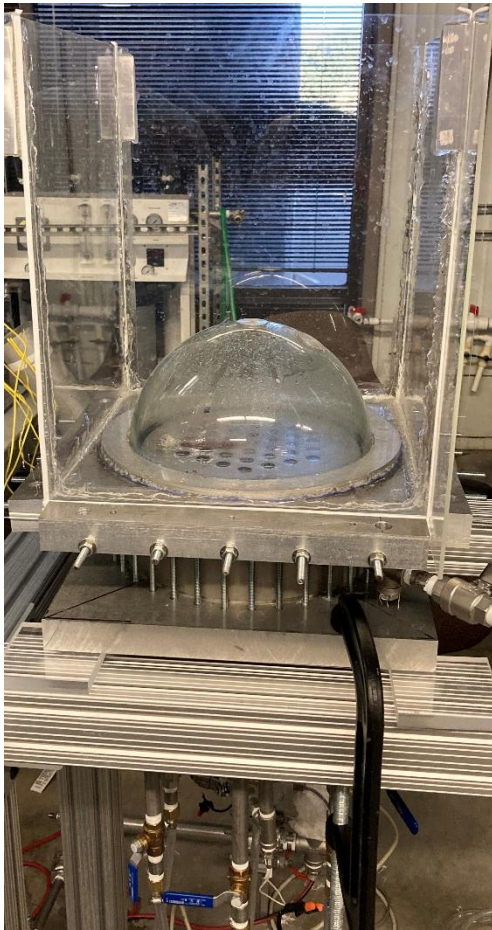
Measurement and characterization of flow fields and temperature distributions of a single jet within the Upper Plenum with conjugate heat transfer. Furthering previous research on isothermal and non-isothermal single jet benchmark experiments, a newly constructed scaled facility will be employed to analyze the characteristics of momentum and buoyancy driven flows in the hemispherical upper plenum.

The modular nature of the facility allows for a variety of instrumentation configurations. Advanced measurement techniques will be employed to ensure accurate, high-resolution data with minimal flow disturbance. Temperature measurement will be conducted using Distributed Temperature Sensing (Optical Fibers) and Laser Induced Fluorescence. Flow field data will be obtained through the use of Particle Image Velocimetry, while heat transfer through aluminum discs mounted on the plenum surface will be measured with quick-response circular-foil heat flux transducers.

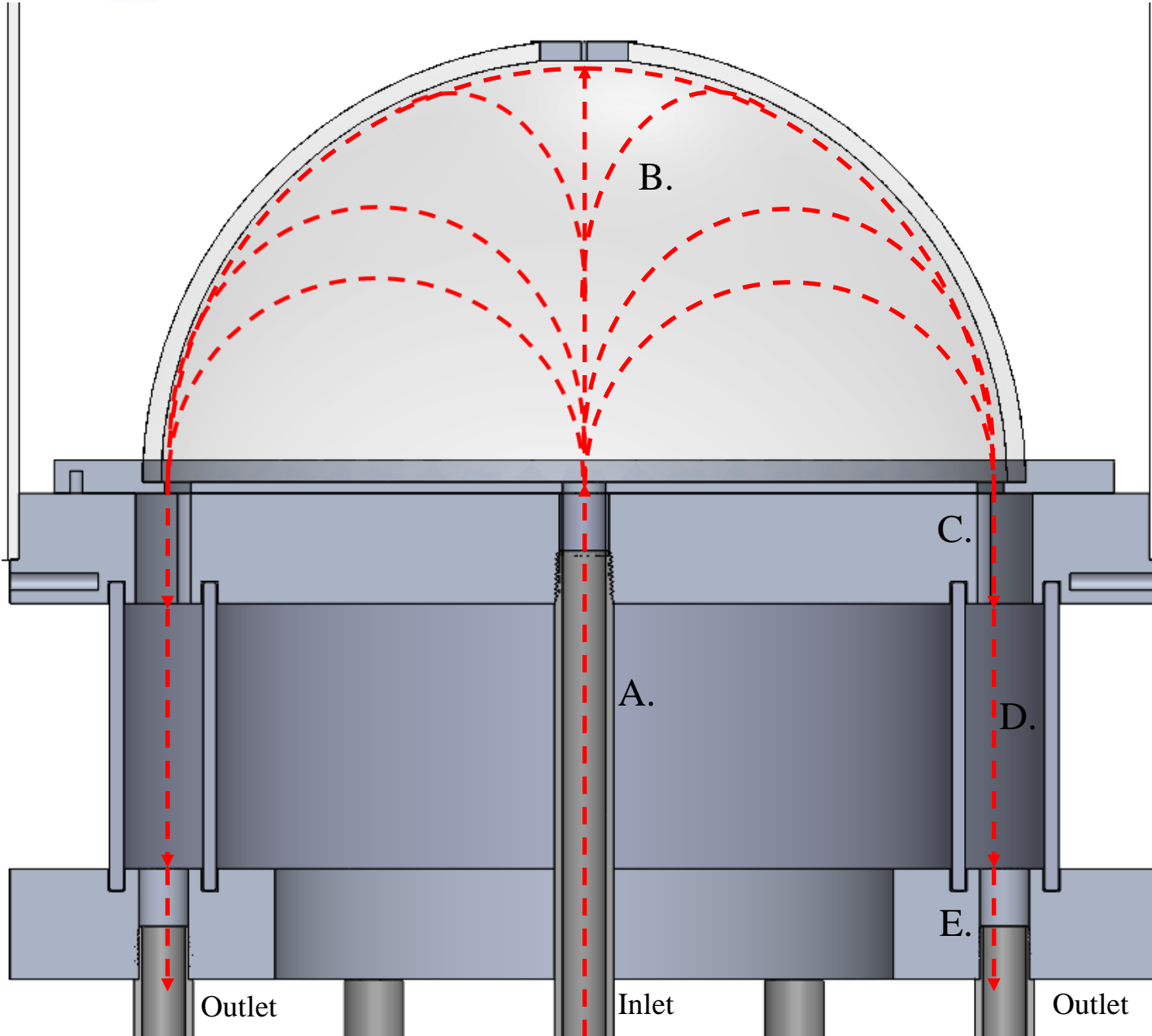
## Upper Plenum Single Non-Isothermal Jet Overview

Shakedown experiment to determine inlet conditions

- Natural circulation with inlet temperature up to 75 C
- Re based on the jet diameter = 300-800

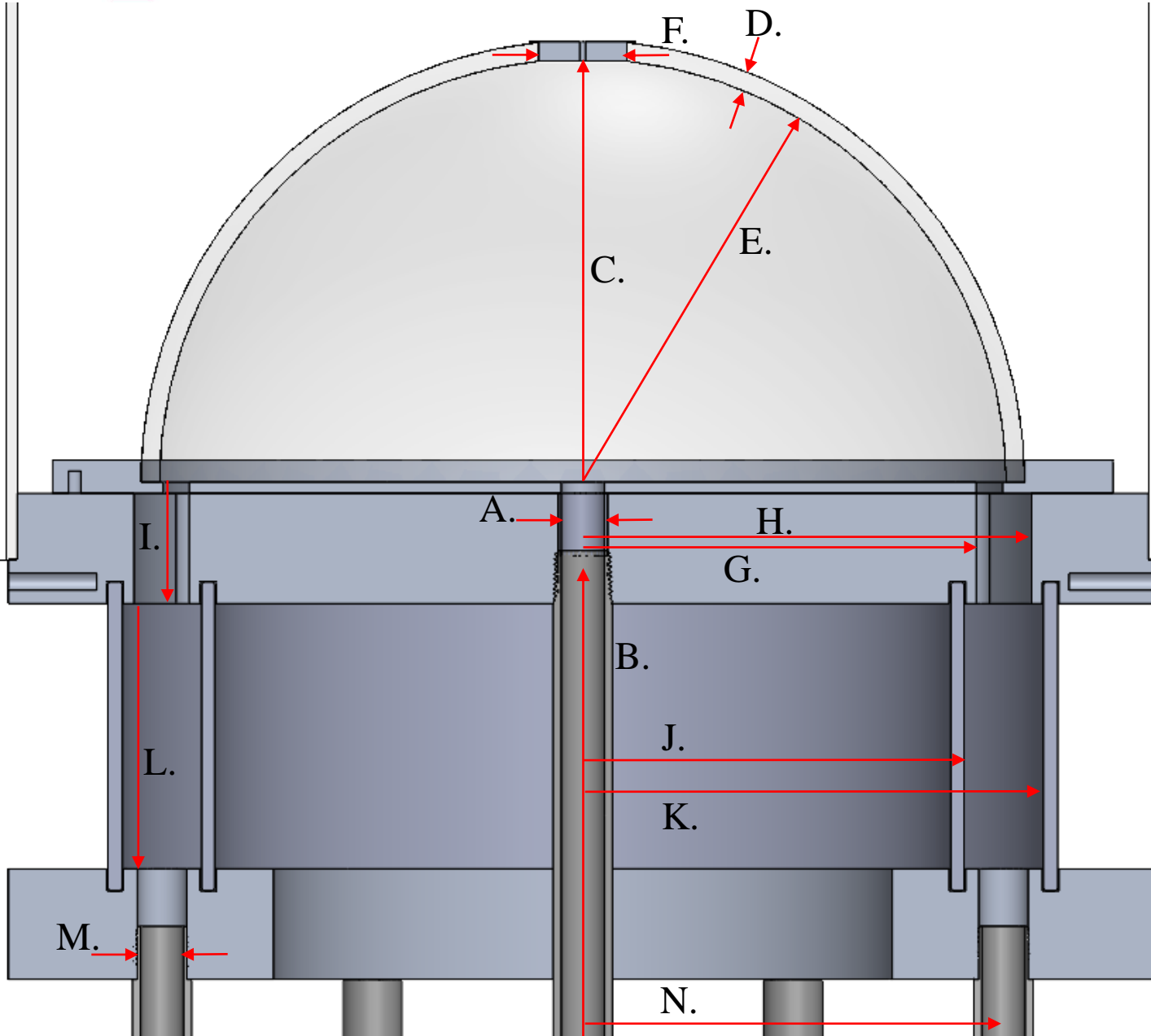


# Upper Plenum Single Non-Isothermal Jet Flow Description



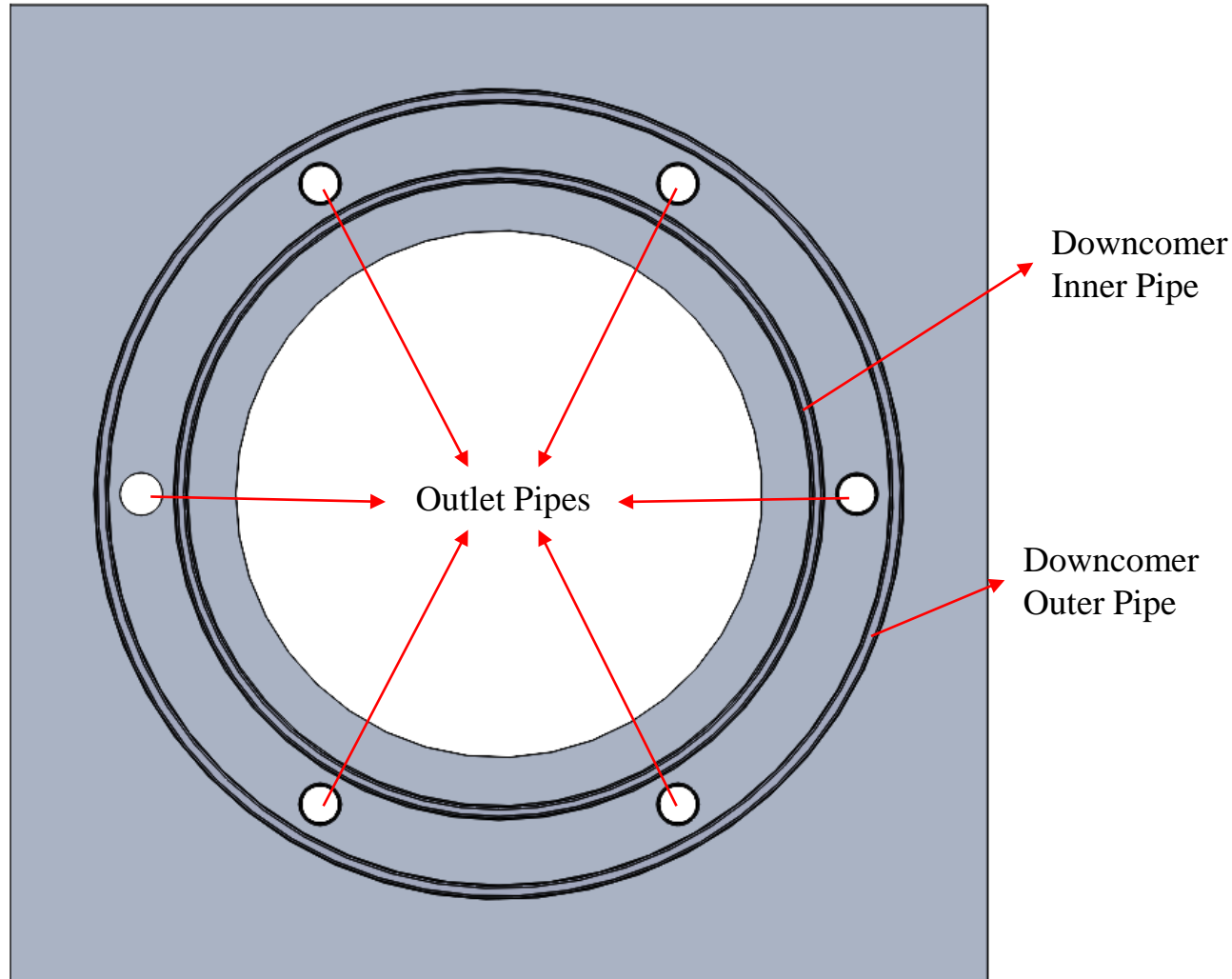
- A. Flow upward through inlet pipe
- B. Flow through hemisphere
- C. Downward flow through outlet groove
- D. Downward flow through downcomer
- E. Downcomer outlet through six pipes

# Upper Plenum Single Non-Isothermal Jet Dimensions



Part	Dimension (mm)
A. Inlet Jet Diameter	12.5
B. Inlet Jet Pipe Length	457
C. Hemisphere Height	120
D. Hemisphere Thickness	5
E. Hemisphere Inner Radius	120
F. Heat Transfer Disc Diameter	25
G. Outlet Groove Inner Radius	112.5
H. Outlet Groove Outer Radius	120
I. Outlet Groove Length	28
J. Downcomer Inner Radius	110
K. Downcomer Outer Radius	132.5
L. Downcomer Length	75
M. Downcomer Outlet Pipe Diameter (6 pipes)	12.5
N. Downcomer Outlet Pipe distance from centerline	121

## Section View: Downcomer and Outlets



- This view shows the test section from the top, hiding everything above the downcomer, the thermocouple tube, and the inlet pipe
- The walls of the downcomer are comprised of two stainless steel schedule 10 pipes of nominal sizes 8 and 10 inches
- The outlets for the downcomer are six 3/8 - inch schedule 40 pipes which route to a manifold below the test section