

## Project 70



# Reduction of nvPM Emissions from Aero-Engine Fuel Injectors

**Georgia Institute of Technology & Honeywell. Inc**

PI: Wenting Sun

PM: Roxanna Moores

Cost Share Partner(s): Honeywell International, Inc.

## Objective:

- Characterize the formation and oxidation of non-volatile particulate matter (nvPM)
- Optimize the design of gas turbine fuel injector to reduce nvPM

## Project Benefits:

- Improve the understanding of nvPM formation/oxidation
- Develop numerical models to guide new fuel injector design.
- Enable cleaner aircraft engines compliant with the ICAO CAEP/11 nvPM LTO standard

## Research Approach:

- Experiments on high pressure combustor with three liquid fuel injectors
- Variety of optical diagnostics (PAH/OH PLIF, LII) at practical engine conditions
- Numerical simulations to understand underlying nvPM formation mechanisms

## Major Accomplishments (to date):

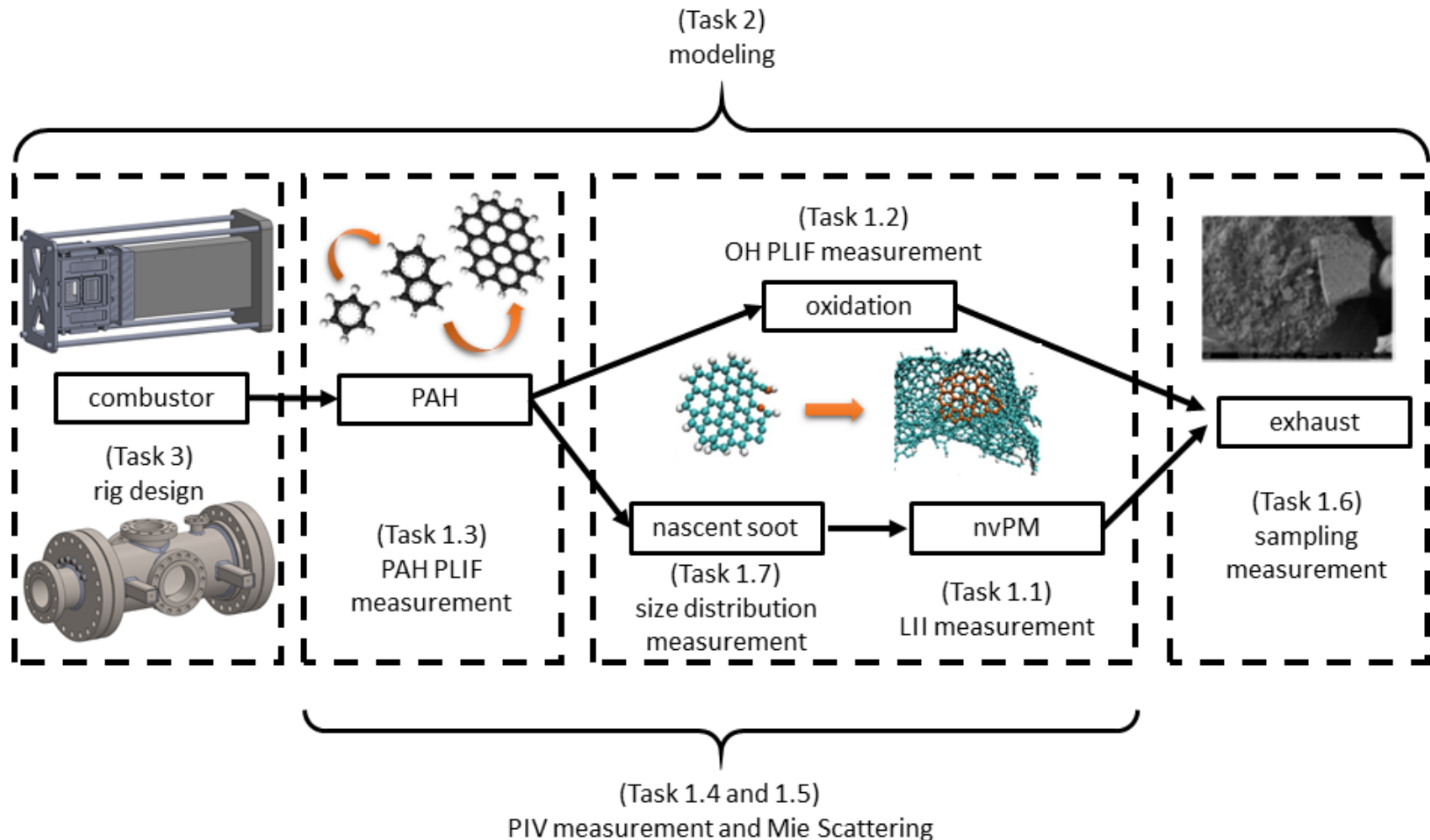
- Designed a unique high pressure system
- Designed a combustor with three fuel injectors
- Shakedown of optical diagnostics

## Future Work / Schedule:

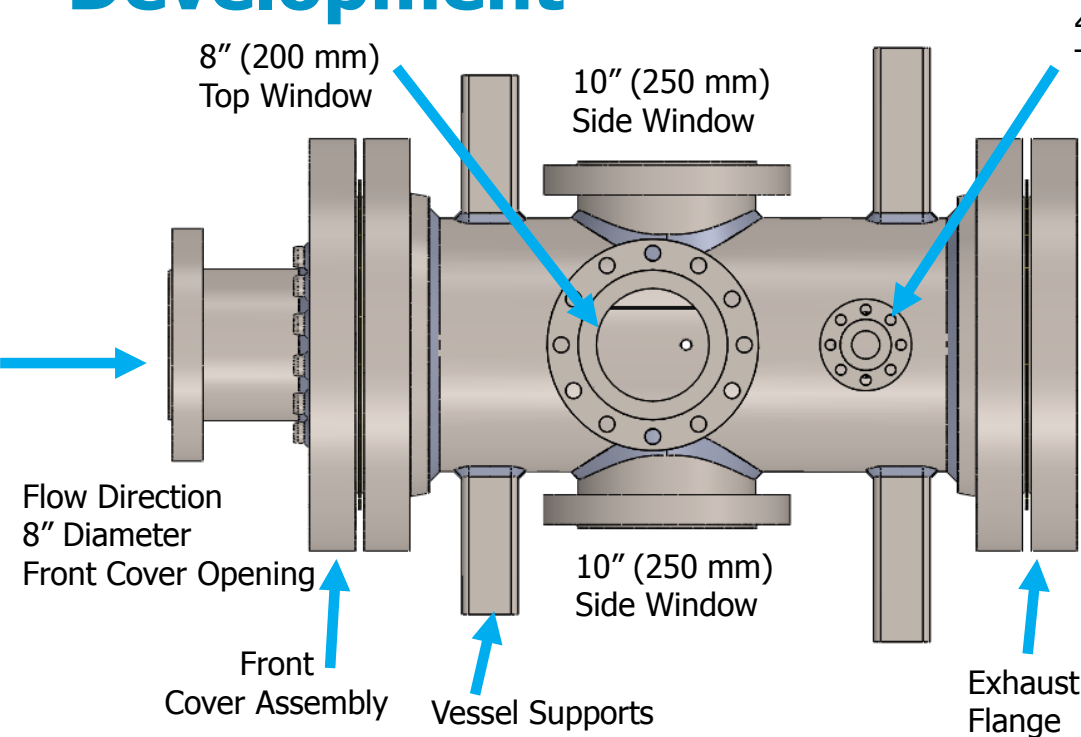
- Systematic experimental measurements
- Numerical simulation to understand nvPM formation/oxidation
- Exploration on nascent soot measurement

# Project Overview

- Tasks include new rig design and systematic characterization of nvPM
- Experiments cover entire nvPM formation region

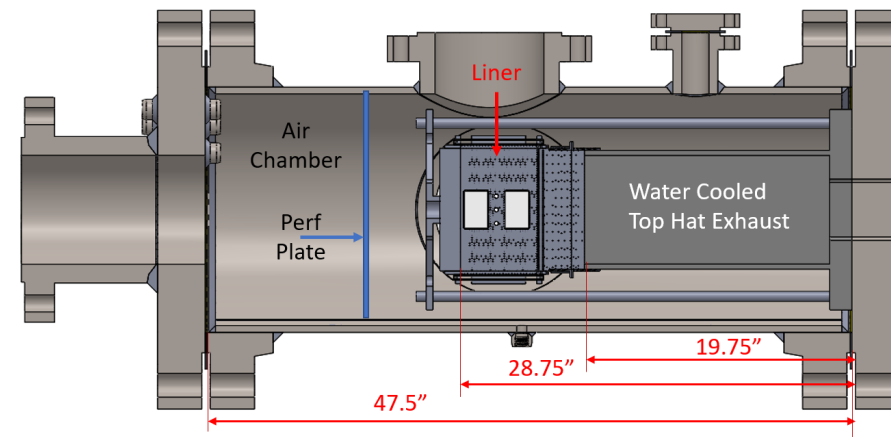
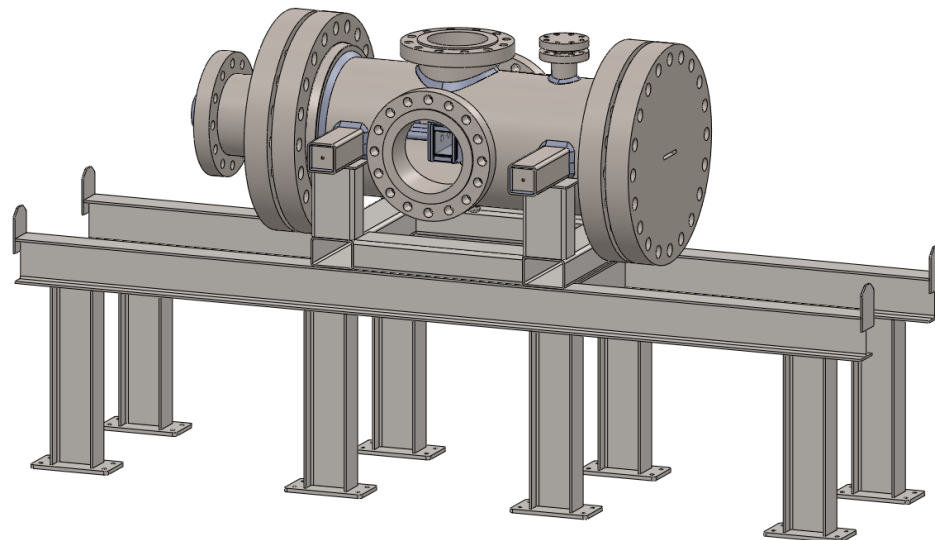


# High Pressure Experimental Platform Development



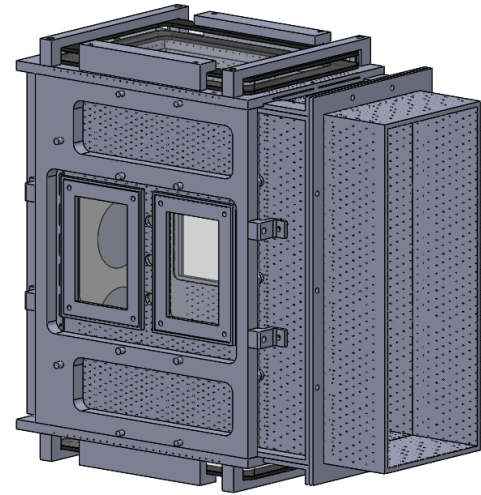
## General Specification

- 436 psig (29.6 atm) & 850 F (728 K) design basis
- Material 316 SS, designed per ASME BPVC Section VIII Div. 1
- 18 in (457 mm) Inside Diameter
- 47.25 in (1200 mm) Length
- Optical access through side and top window openings
- Total Weight: 3400 lbs (1542 kg)

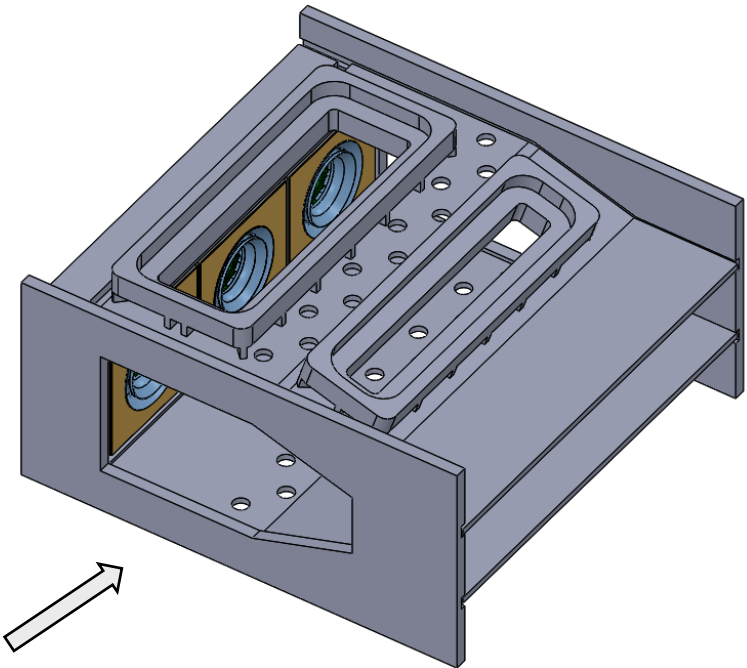


# Combustor Design

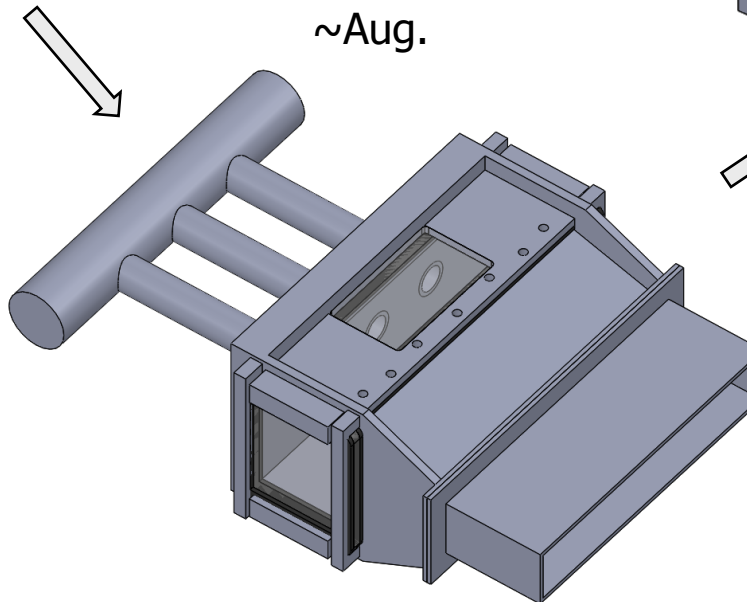
1st version  
~Jul.



final version  
~Oct.



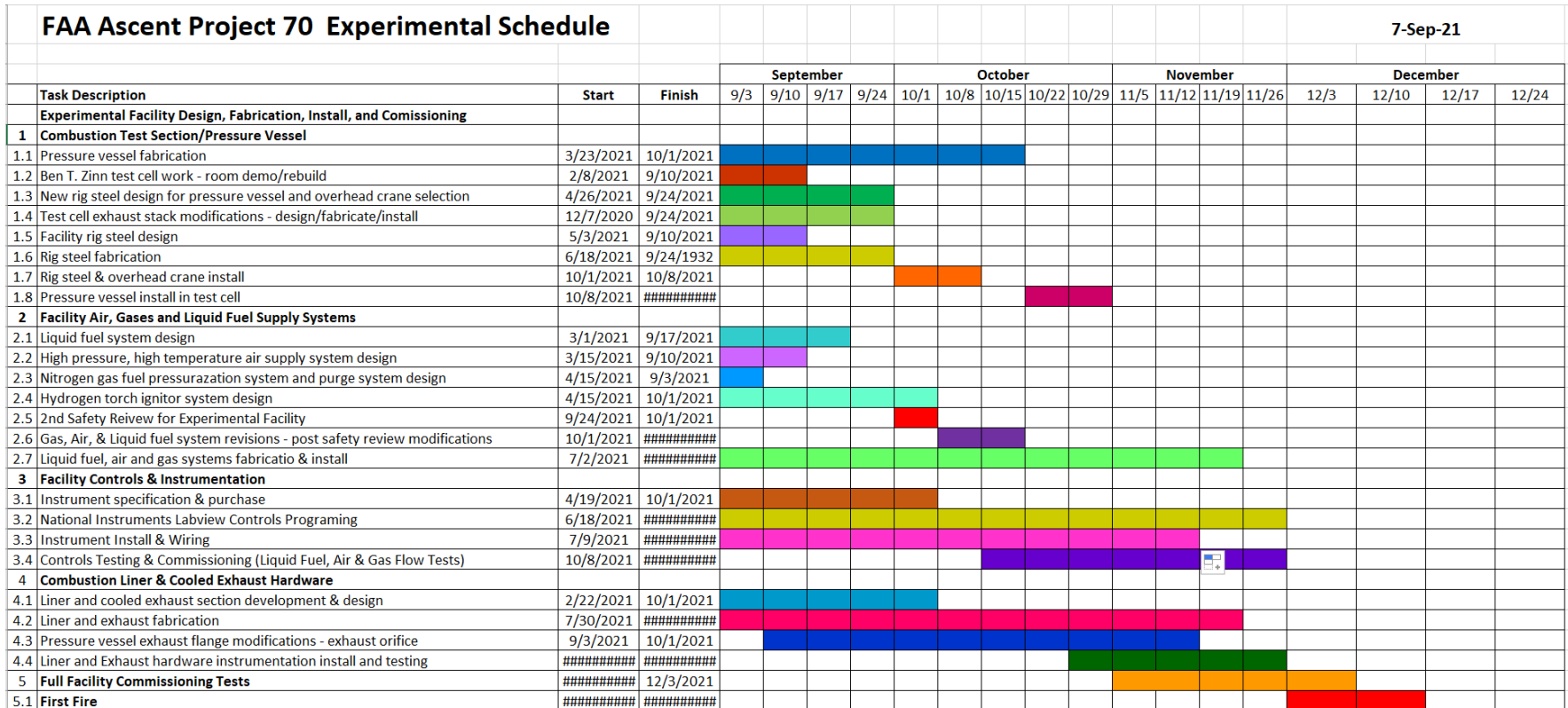
2nd version  
~Aug.



# Summary and Schedule

- High pressure experimental platform is designed and commissioning
- Combustor design is complete and under fabrication

## Project Gantt Chart



First combustion expt. scheduled in Dec.