

A vertical strip on the left side of the slide showing a close-up of a bright orange and yellow flame, likely from a sonic burner, with a dark, shadowed area at the top.

Developmental Tests Using the New Sonic Burner: A Manufacturer's Perspective

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Topics Covered

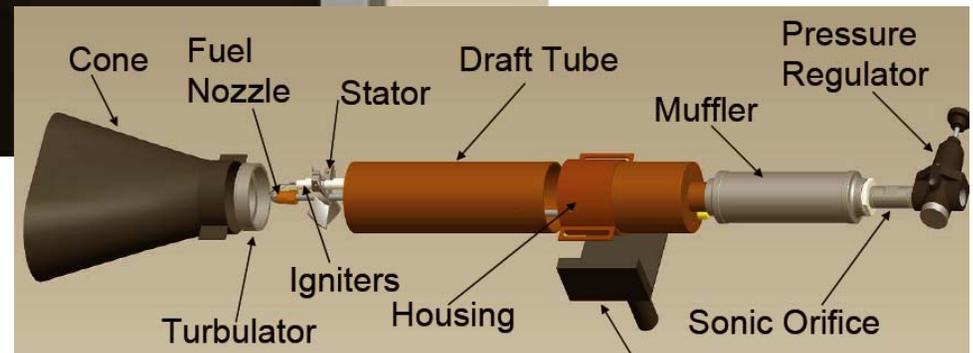
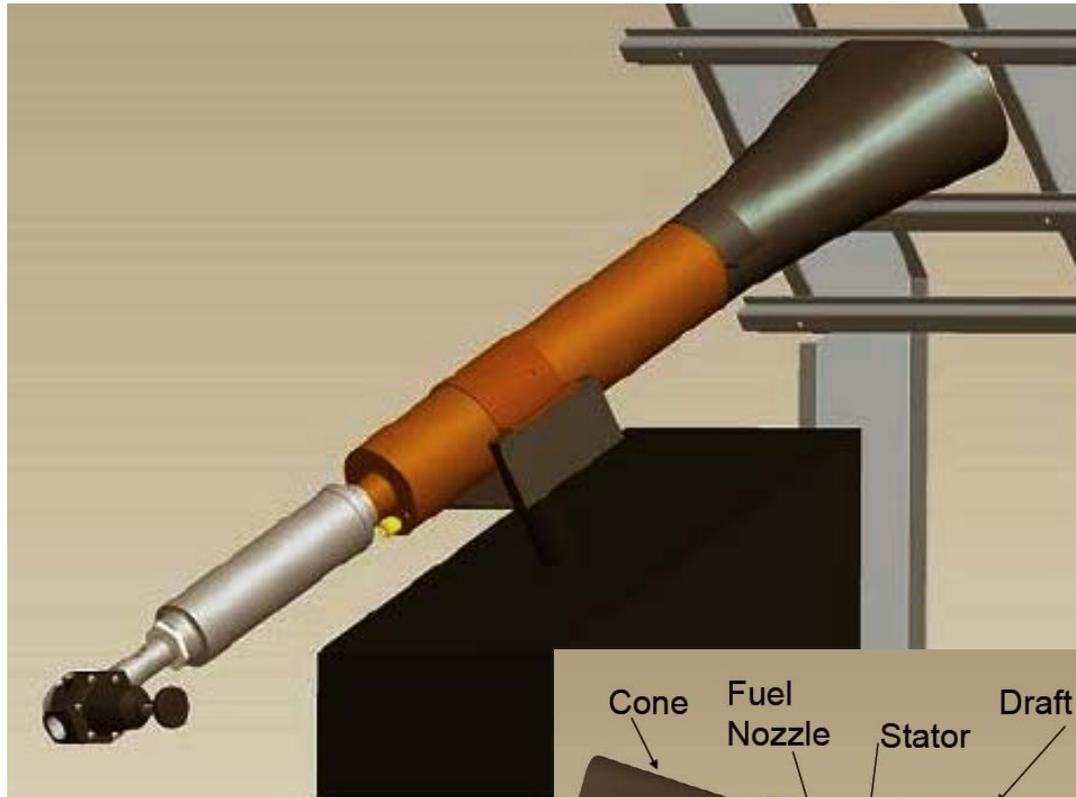
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- Sonic burner
 - Setup challenges
 - Calibration problems
- Burner tools
- Test methodology



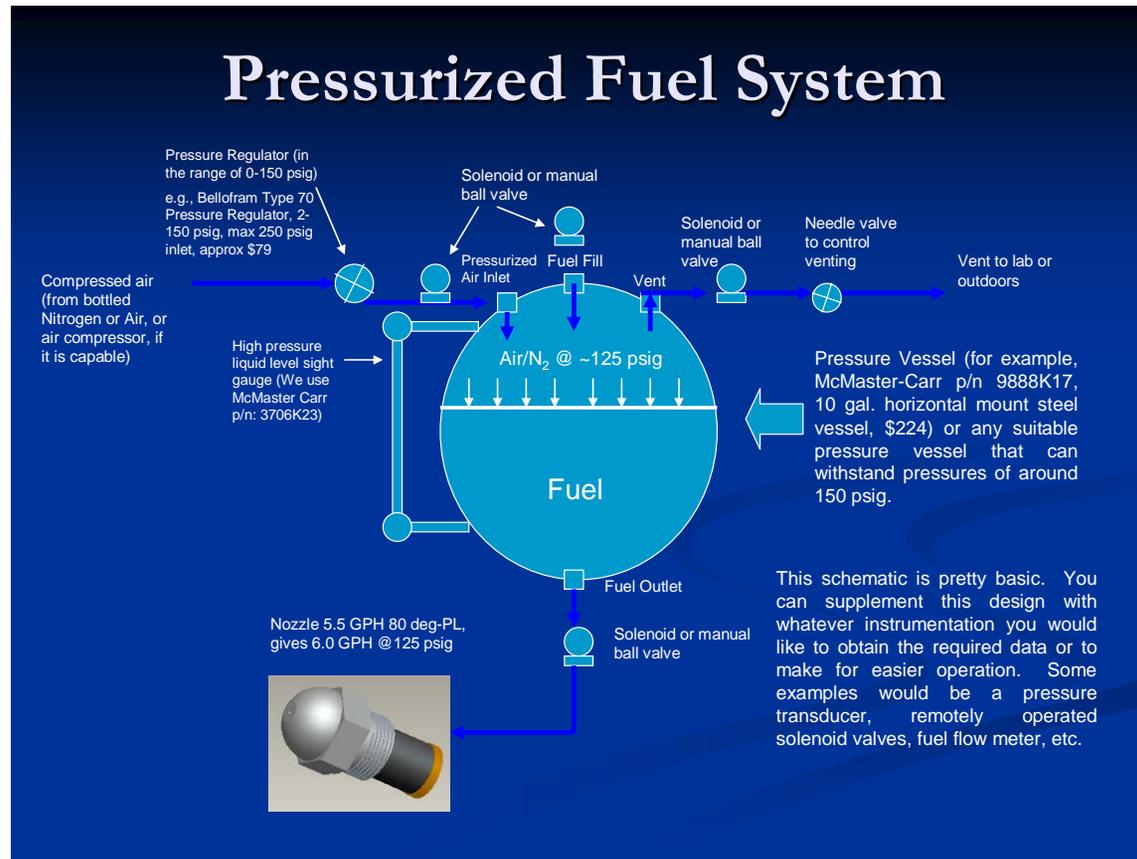
Sonic Burner

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Initial Laboratory Setup Challenges

- Safety issue with building the FAA-specified pressurized fuel vessel



Initial Laboratory Setup Challenges

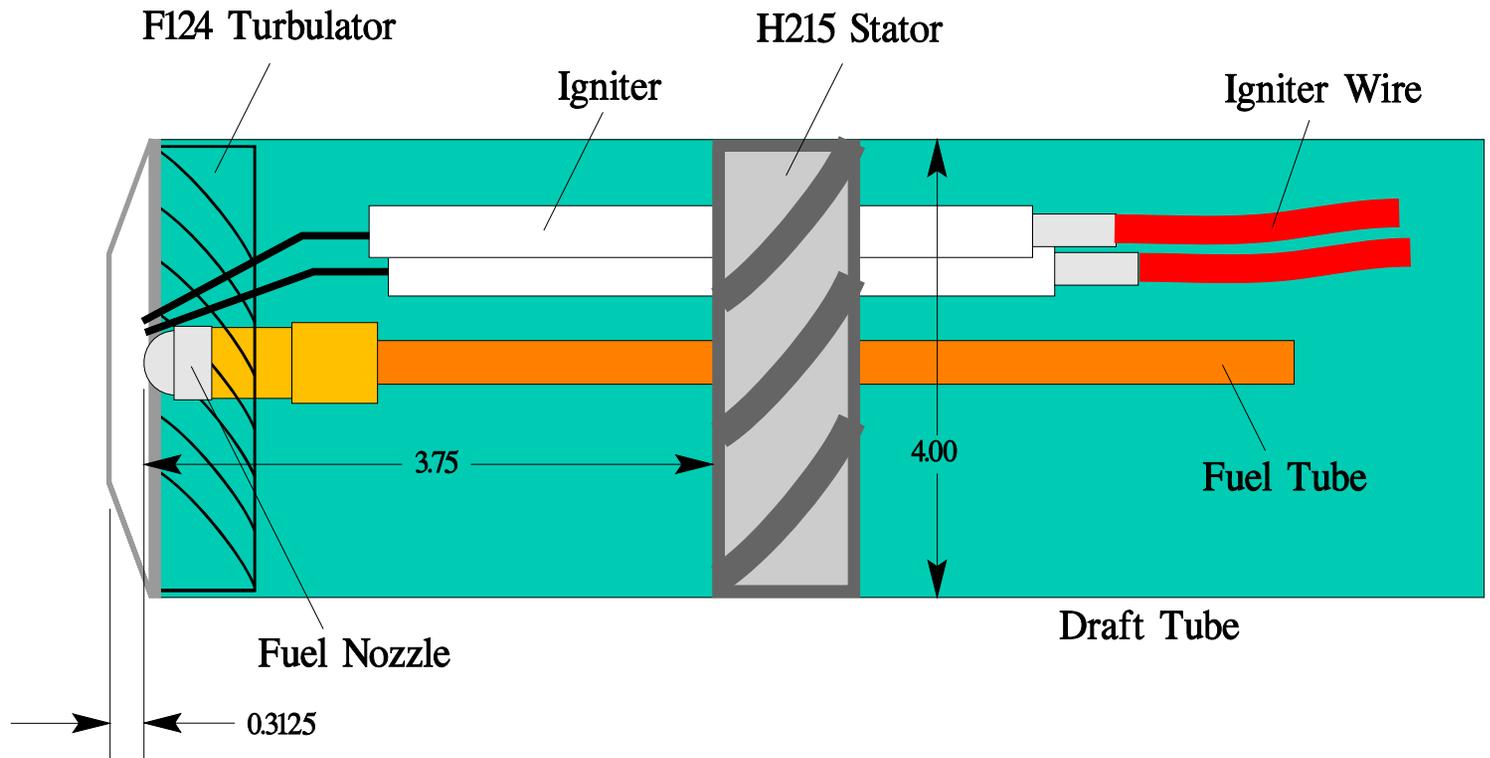
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- Pressurized fuel tanks not allowed inside laboratory confinements per EHS requirement



Additional Challenge

- Method of powering igniters had to be developed



Solutions

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- Usage of a 2006 commercially available oil burner for the purpose of fuel pressurization AND energizing of the igniters



Initial Calibration Problem Areas

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1. Fuel flow rate
 2. Fuel pressure
- Answer to our problems: standardize fuel temperature



Fuel Lines

Fuel Cooling Ice Bath

Final Fuel Settings

- After standardizing the fuel temperature we were able to:
 - Achieve the proper fuel flow rate at the FAA specified fuel pressure within tolerance of the rule
 - Reduce the variation from lab-to-lab that existed because of the various fuel types used throughout industry: Jet A, JP-8, etc.



Burnthrough Test Variation

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- Despite the agreement on fuel and air properties, excess variation still existed when burnthrough test results on common materials were compared.
 - Was the blanket sample holder a cause for variation?
 - If not, could the fuel nozzle be the cause for variation?

Blanket Holder Comparison Tests

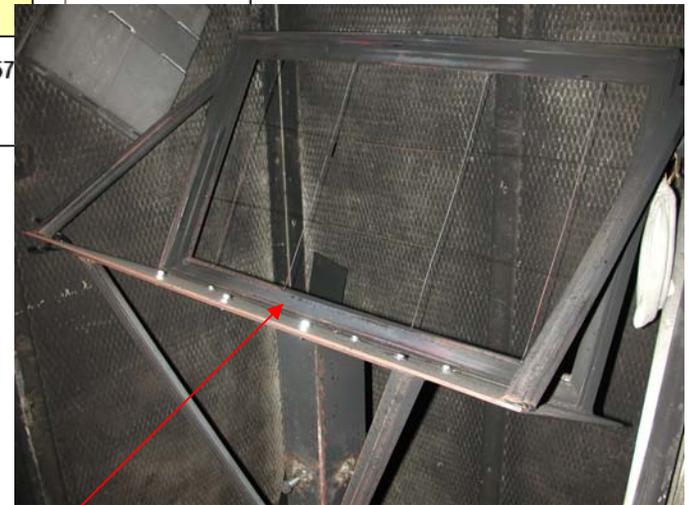
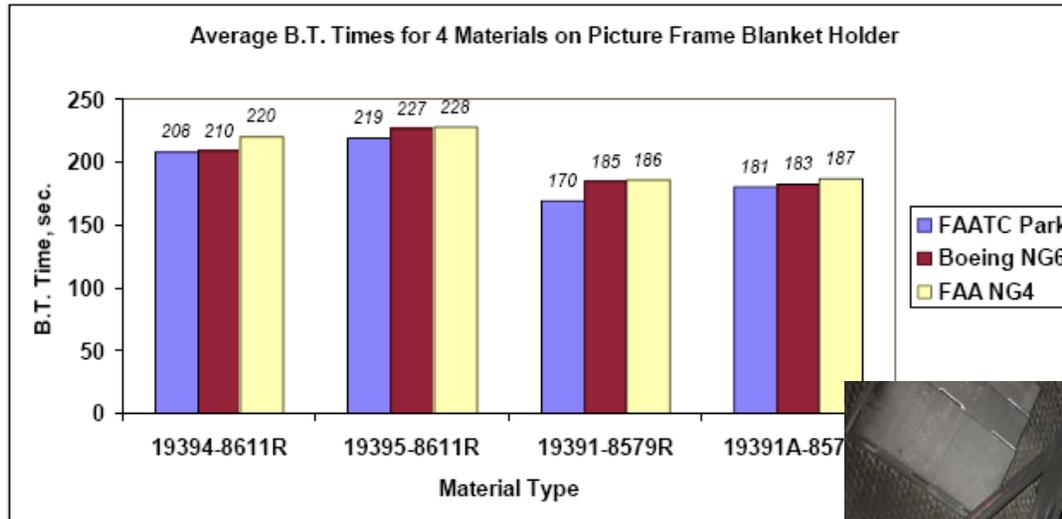
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- Causes of differences:
 - Thickness of construction material
 - Fixture warping over time



Final Validation

- Round robin validation of consistency

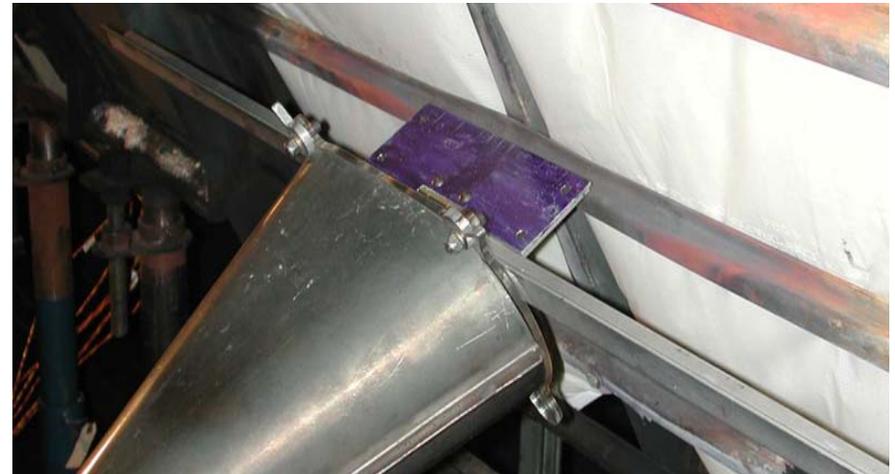
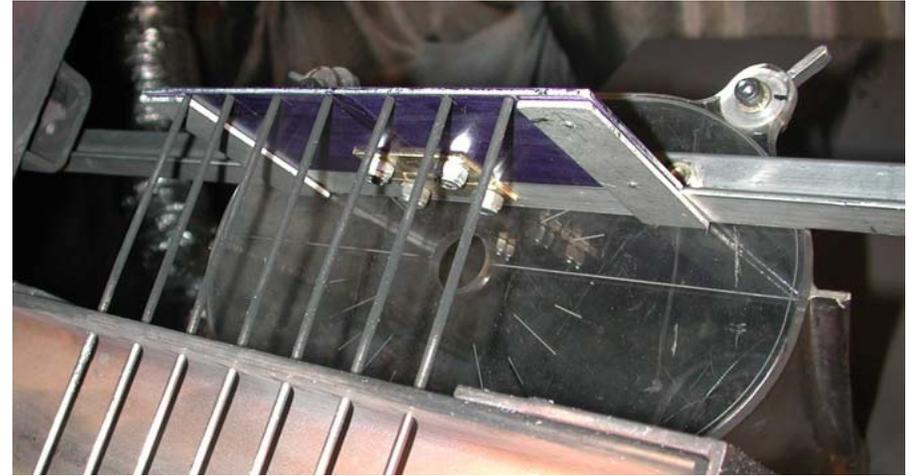


Picture Frame Sample Holder

Burner and Test Apparatus Adjustment and Dimensioning Tools

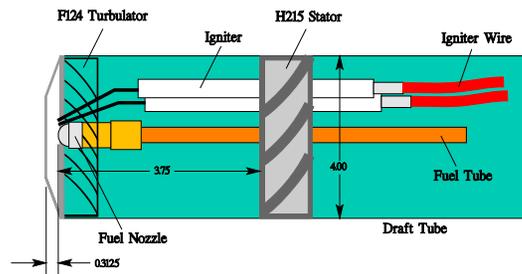
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- Test apparatus adjustment tools
 - Thermocouple rake/sample holder position tool
 - One tool to adjust thermocouple rake and test specimen holding fixture/burner cone orientation



Tools To Verify Draft Tube Internal Parameters

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Thermal Acoustic Insulation materials Burnthrough Test Method

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- Procedural items
 - Vent hood airflow adjustment and verification
 - Calorimeter cooling water temp and flow rate
 - Data system verification and initialization
 - Condition test specimens

Perform Burnthrough Test

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- Monitor for specimen breakthrough
 - Two minute warm-up
 - Move burner to test specimen
 - Start data acquisition, start timer, start video
 - Record fuel/air settings
 - Record backside calorimeter output



