

# NexGen Fire Test Burner Update

Presented to: IAMFTWG, Köln, Germany

By: Robert I. Ochs

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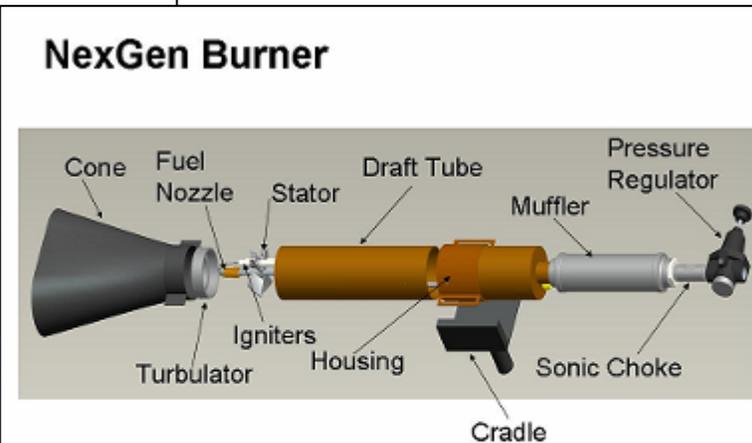
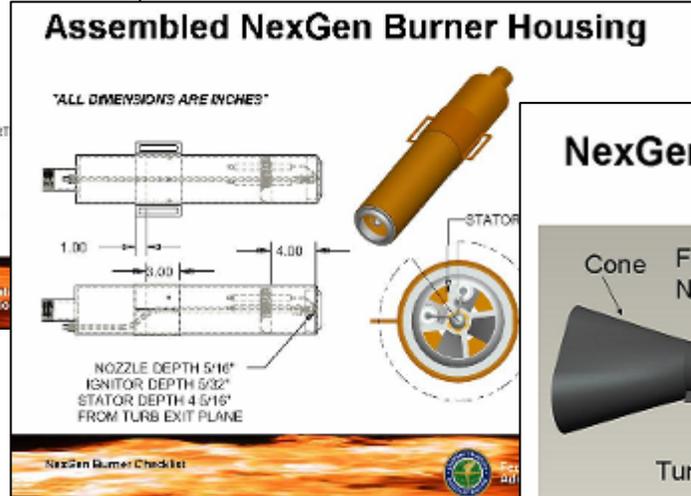
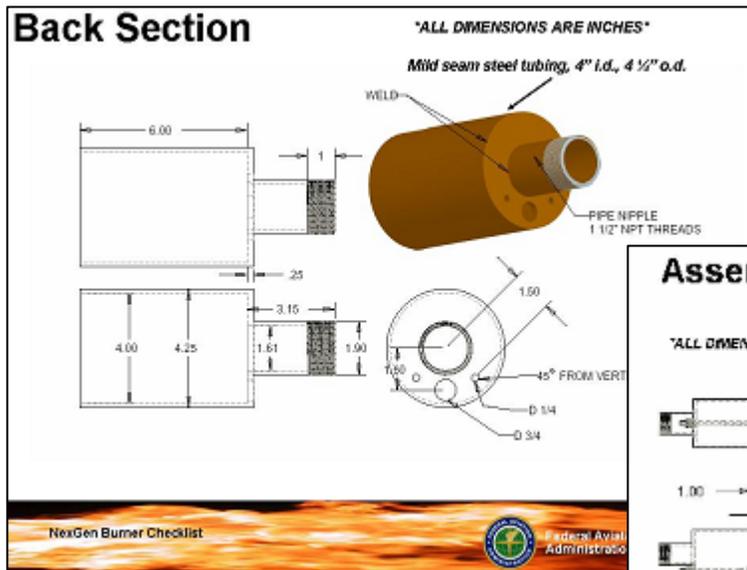


Federal Aviation  
Administration



# What's New?

- FAATC recently received a NexGen burner manufactured from the plans on the fire safety website <http://www.fire.tc.faa.gov/pdf/materials/NexGenPlans.pdf>
- This is the first replica that the FAATC has seen, and will be a good chance to determine the reproducibility of the burner from the FAA's drawings



# Burner Components

**Draft Tube**



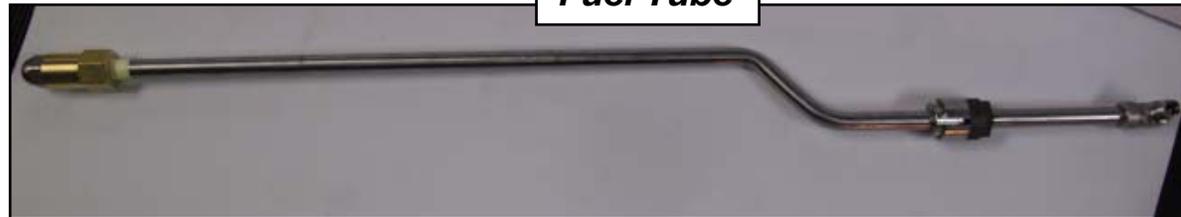
**Back Section**



**Burner Cone**



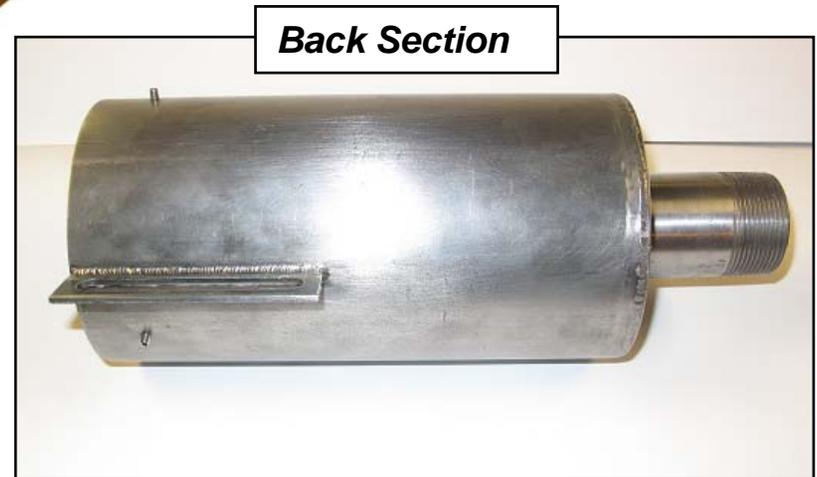
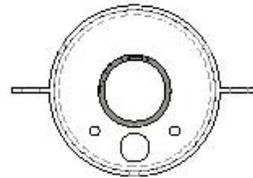
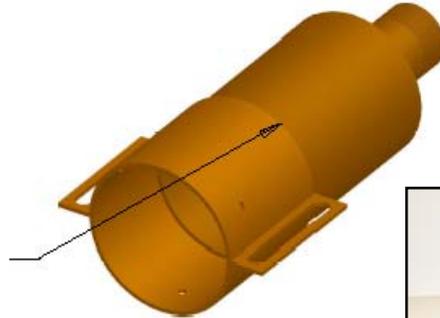
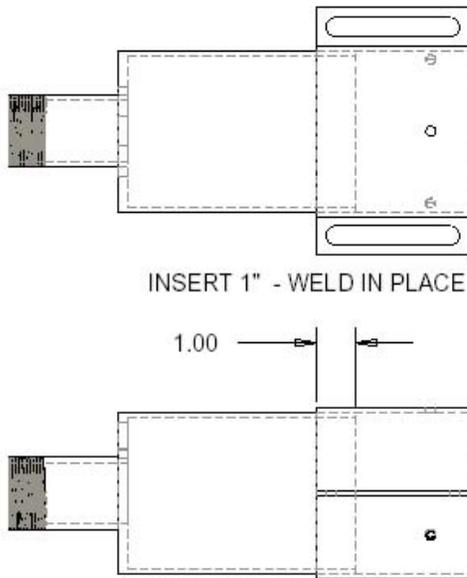
**Fuel Tube**



**Turbulator and Stator**



# Closer Look at Back Section



# Fuel Nozzle

- Burner came with a Monarch 5.5 gph 80° PL nozzle, as specified in the drawings
- When received, the nozzle was bench tested for fuel flow rate as a function of fuel pressure and temperature

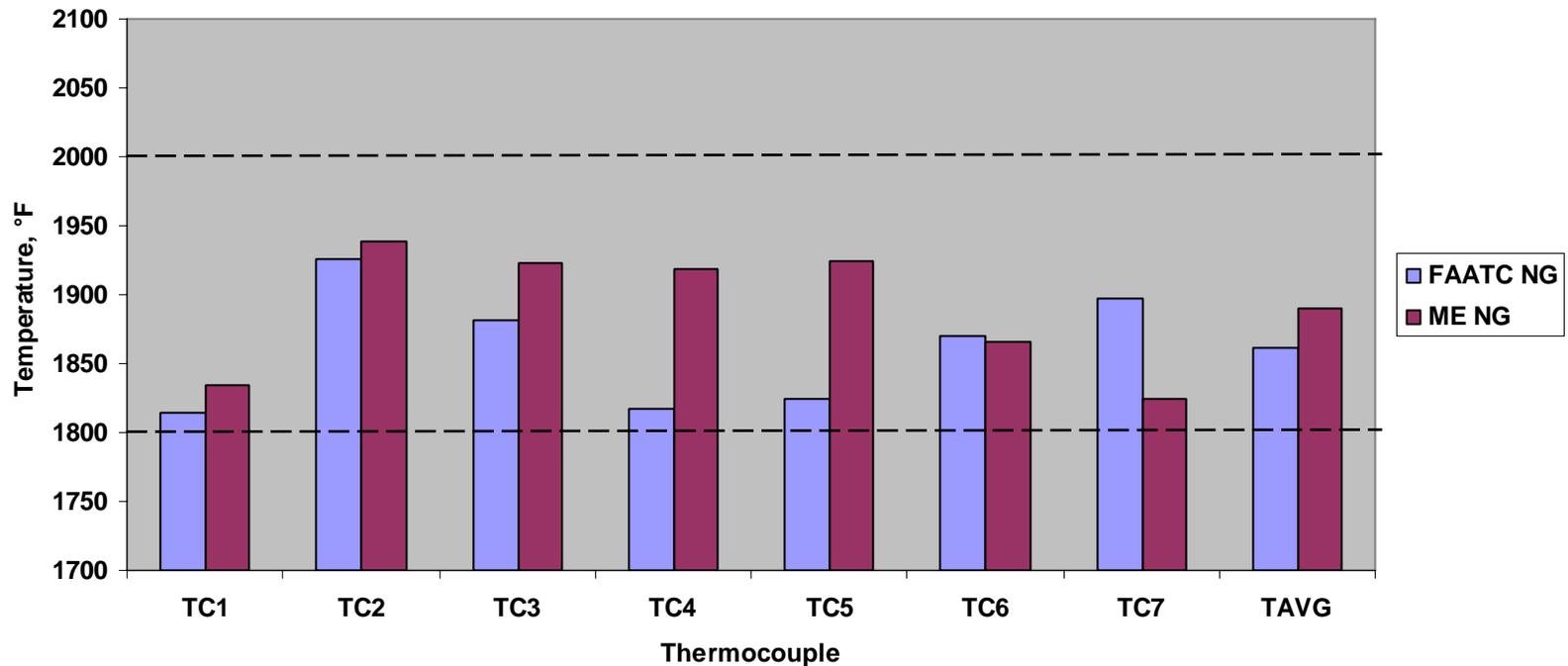
<i>Nozzle</i>	<i>Fuel Inlet</i>		<i>Volume</i>	<i>Flow Rate</i>
	<i>Temperature</i>	<i>Pressure</i>		
<i>ME NexGen</i>	43	120	335	5.3
<i>FAA NexGen</i>	45	120	380	6.0
<i>FAA Spare</i>	43	120	365	5.8



# Comparison Tests

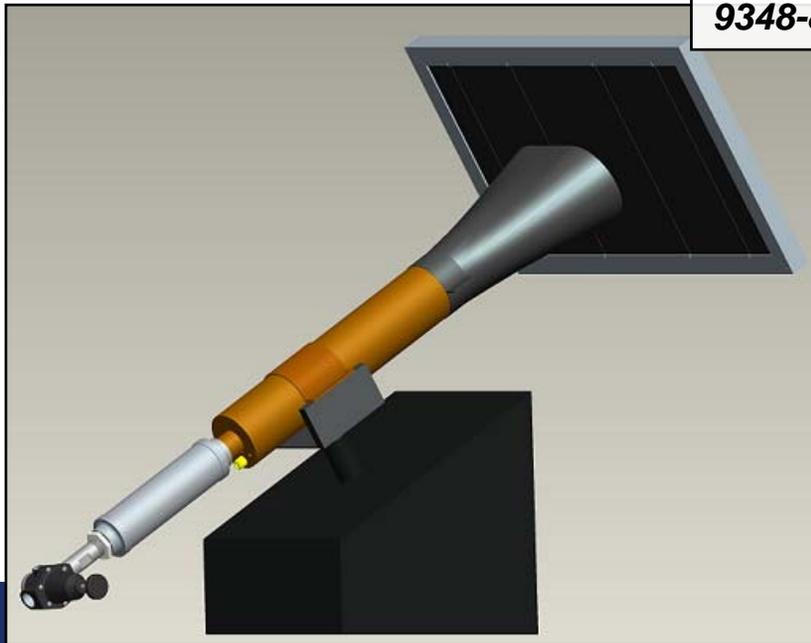
- **New NexGen burner was tested against an FAATC-built NexGen burner**
  - FAA NexGen had machined stator and turbulator from Marlin Engineering

Measured Flame Temperature

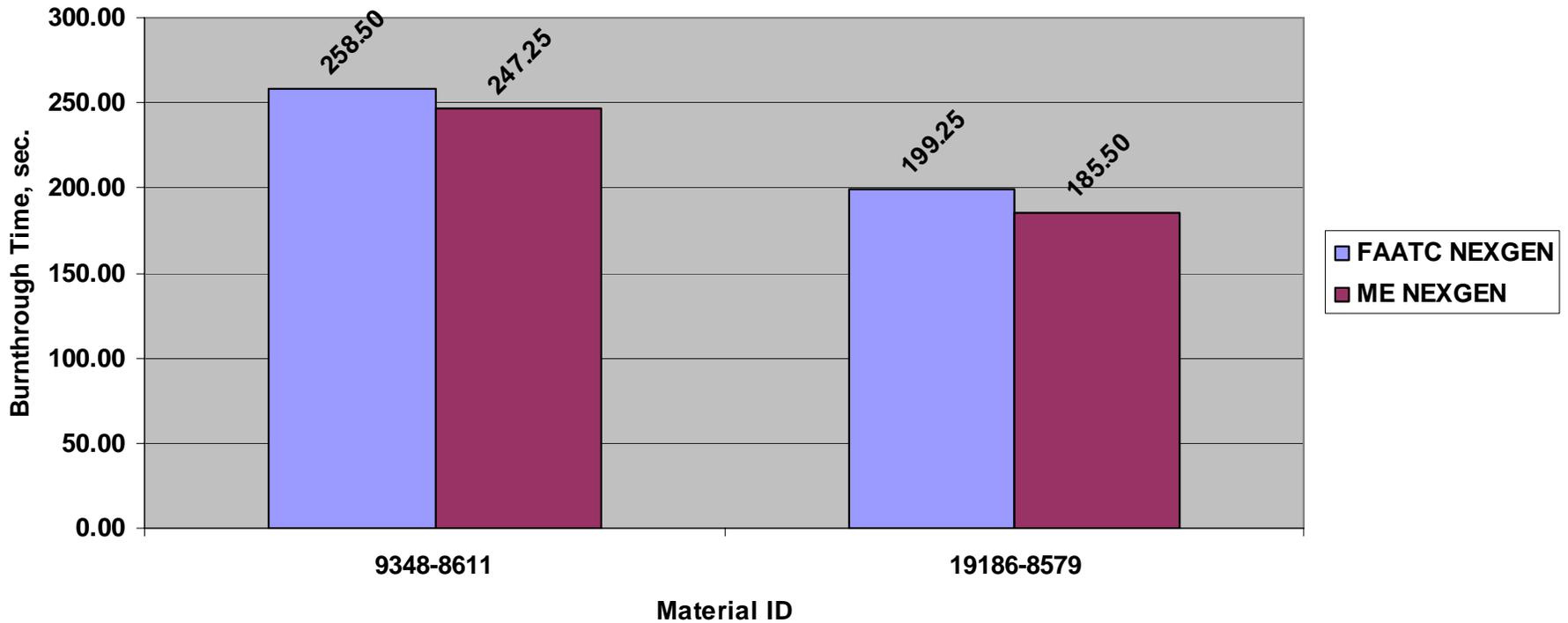




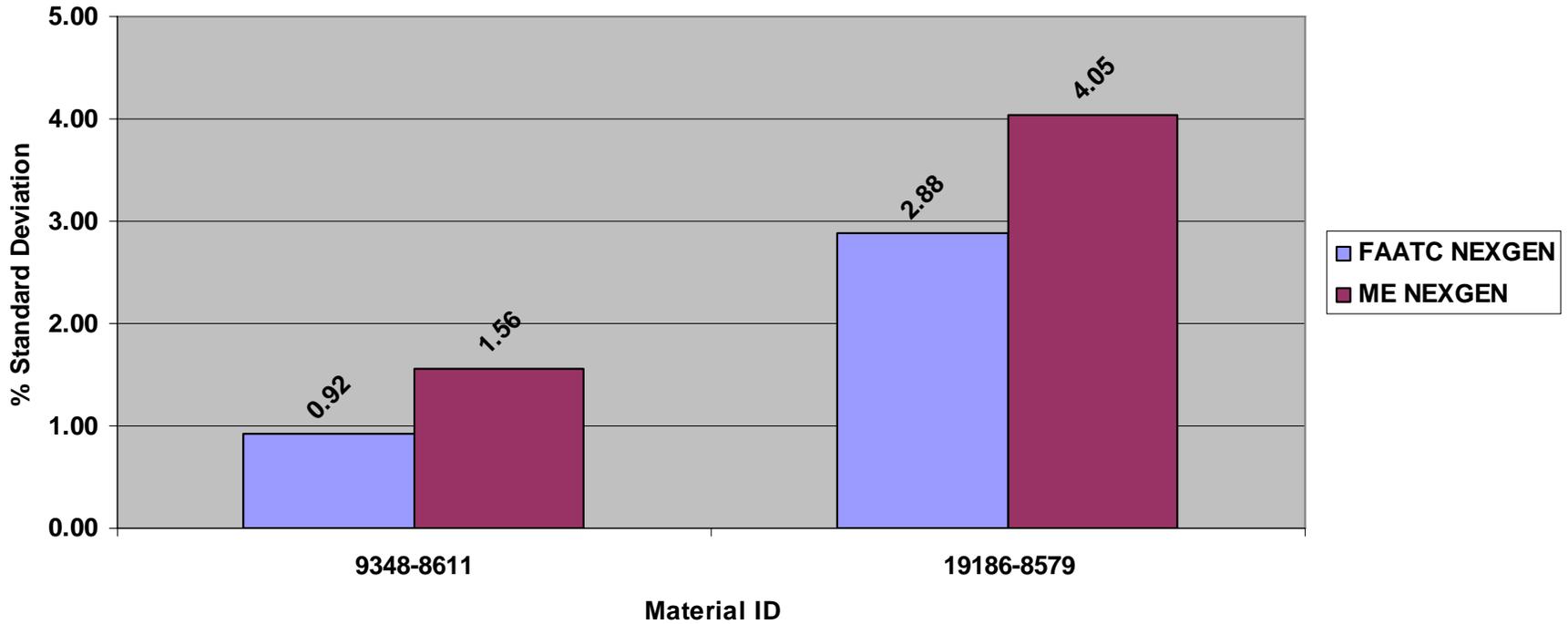
**Materials Tested on Picture Frame:**  
**TexTech Industries Polyacrylonitrile**  
**19186-8579R: 9 oz/yd<sup>2</sup>**  
**9348-8611R: 16 oz/yd<sup>2</sup>**



## Measured Burnthrough Times Average of 4 Tests



### % Standard Deviation Average of 4 Tests



# Summary of Testing

- **The ME NexGen burner was built according to the specifications with only minor discrepancies**
- **The ME nozzle did not deliver the minimum 5.7 gph, so a spare FAA nozzle was installed**
- **The ME burner had an average flame temperature about 30°F higher than the FAA burner**
- **The ME burner had slightly quicker burnthrough times, on average about 12 seconds**
- **The ME burner can be considered an acceptable NexGen burner for certification testing**

- **CNC-machined precision stators do not fit rolled tubing**
- **Flexible Cylinder Hone**
  - McMaster-Carr p/n 4424A38
  - Used to smooth out inner walls of draft tube for better fit



# FAA Flow Visualization Laboratory

**Particle Seeder**

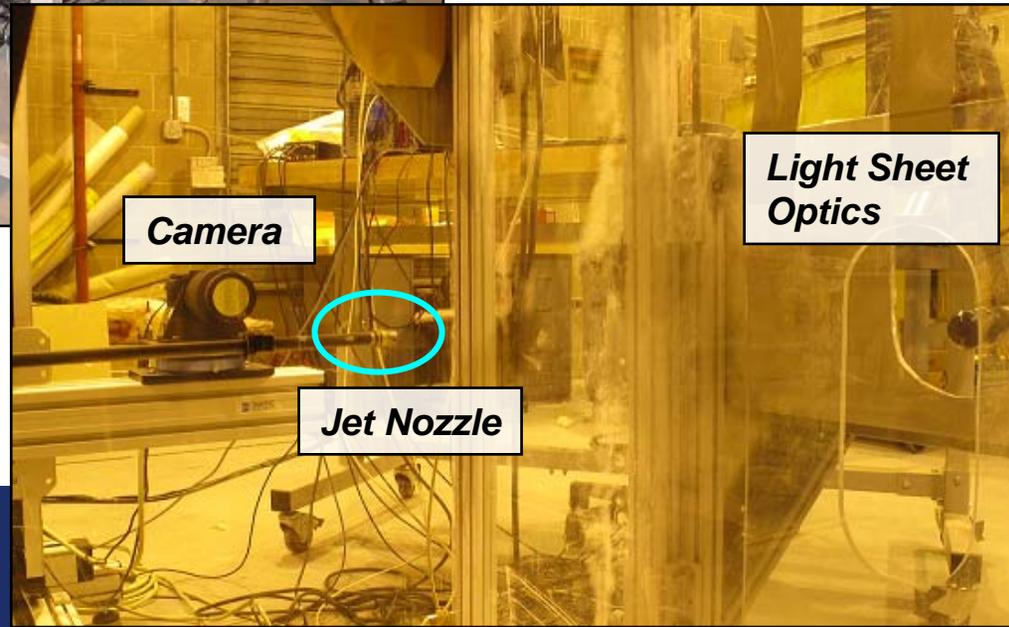
**Enclosure**

**Automated Traverse**

**PC with acquisition and analysis software**

**Camera**

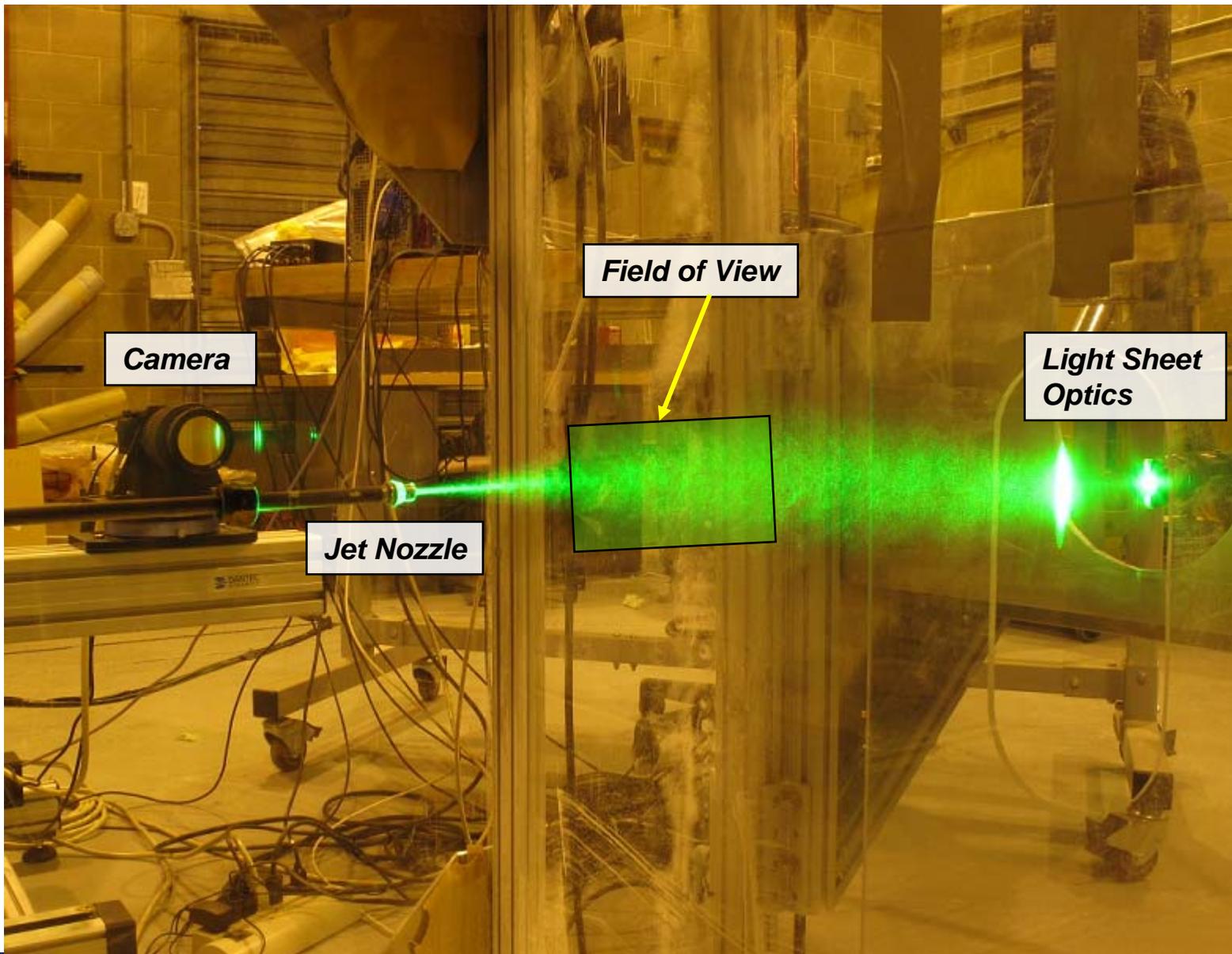
**Laser Head**

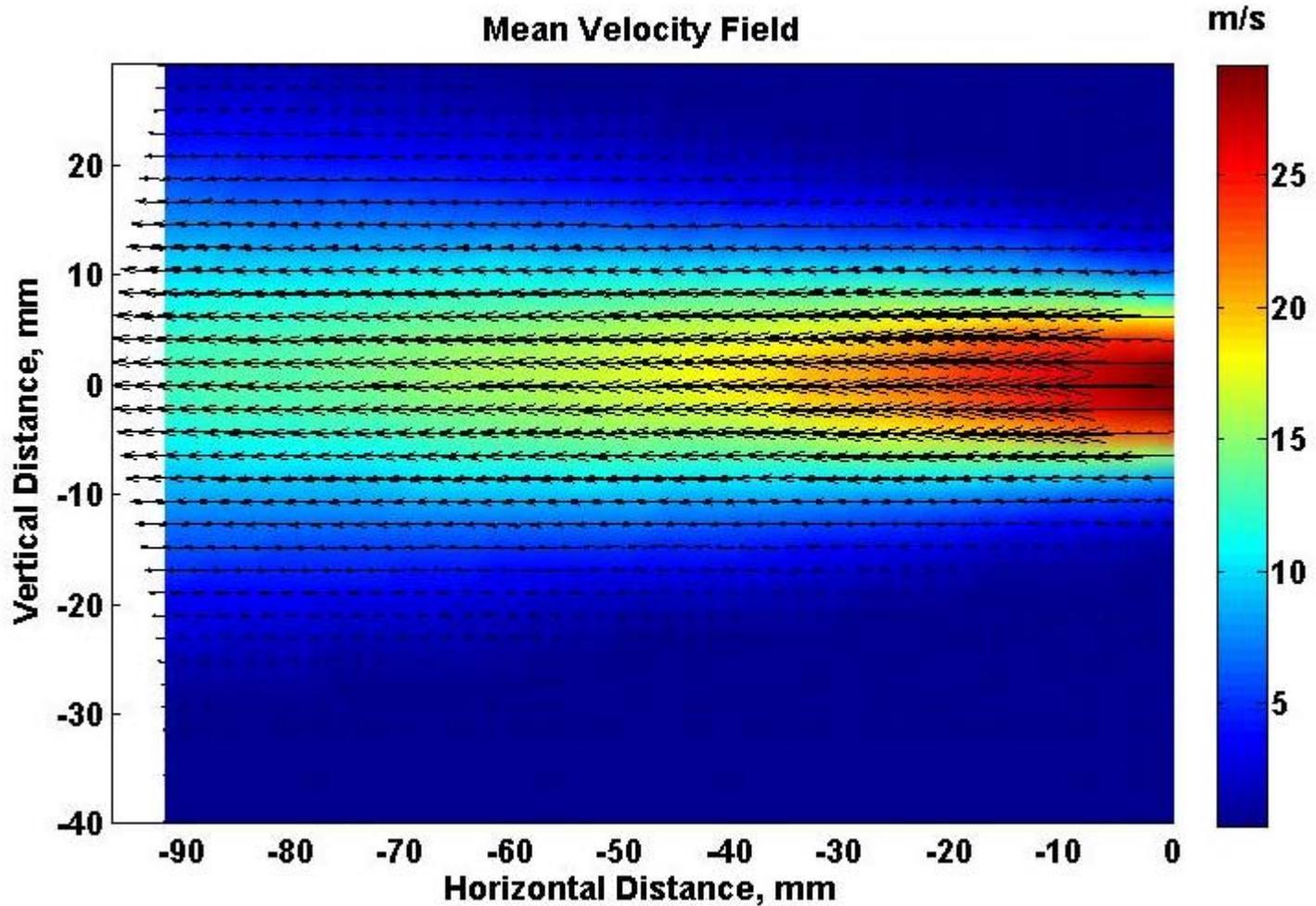


**Light Sheet Optics**

**Camera**

**Jet Nozzle**





# Calibration Objectives

- **Velocity measurements of a turbulent jet**
  - Velocity profile at various  $Re$ ,  $x$
  - Velocity fluctuations (turbulence)
- **Compare results with data published in literature**
- **Determine accuracy of measurements**

# Questions, Comments, Concerns?

## Contact:

Robert Ochs

DOT/FAA Tech Center

BLDG 287

Atlantic City Int'l Airport

NJ 08405

[robert.ochs@faa.gov](mailto:robert.ochs@faa.gov)

1 (609) 485 4651

