

# GTS Model Experiment in the 7x10

Bruce Storms

J.T. Heineck

Steve Walker

James Bell

Dave Driver

etc...

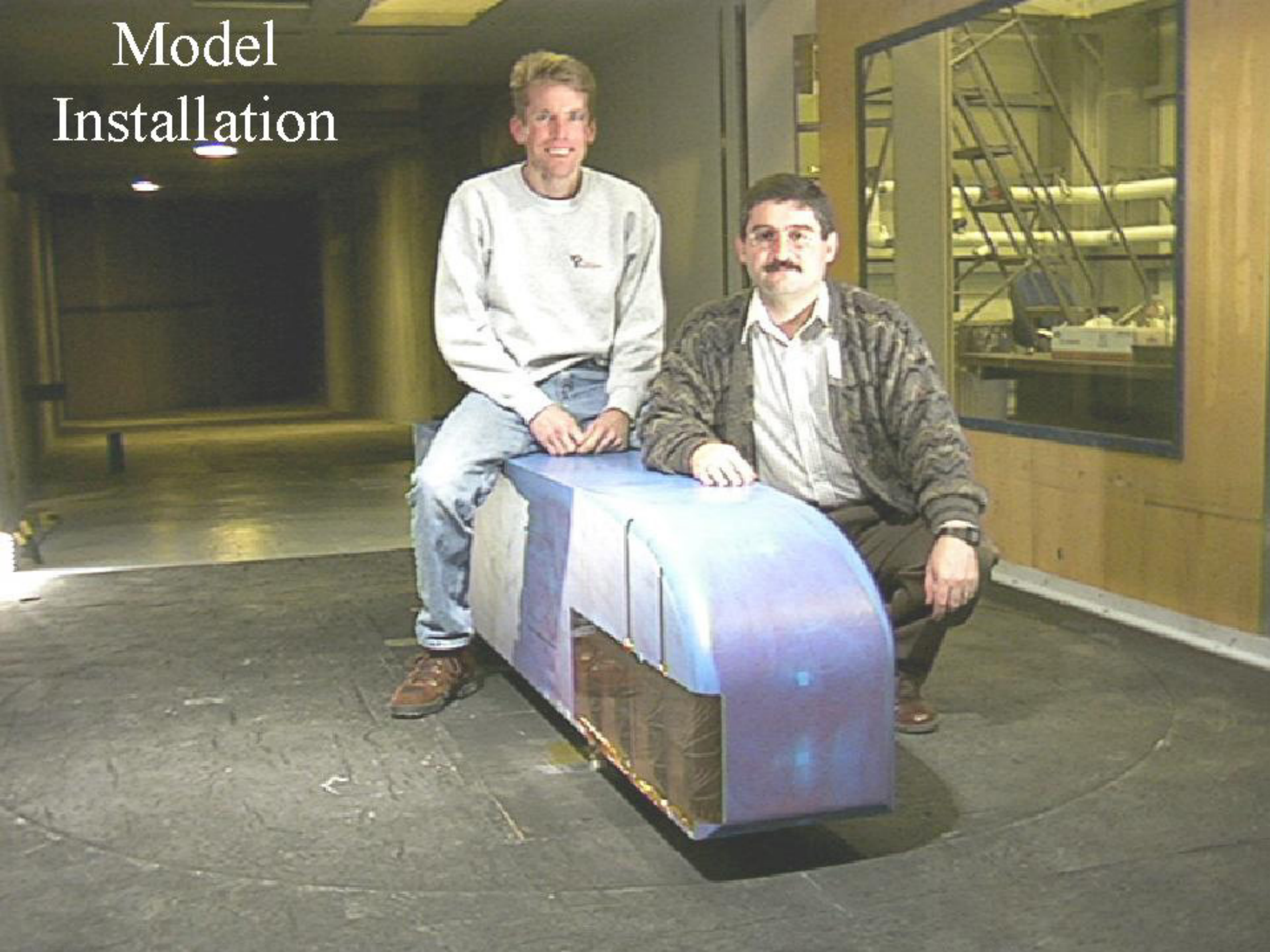
# Test Summary

- Test started February 8
- Test complete March 12
- Objective - CFD validation
- Principle measurements
  - Drag and discrete pressure measurements
  - Pressure-Sensitive Paint (PSP)
  - Unsteady pressure (one point on rear “door”)
  - Skin friction (oil film interferometry)
  - Particle Imaging Velocimetry
  - Transition (surface hot films)

# Summary of Results

- Drag data contaminated by fouling and sloppy lever train
  - One of the side-force scales has loose bearing
  - Drag data for negative yaw is poor
  - Positive yaw data is good
- PSP data noisy but usable - at very low end of measurable pressure variations
- All other data looks good

# Model Installation



# GTS Model in 7x10



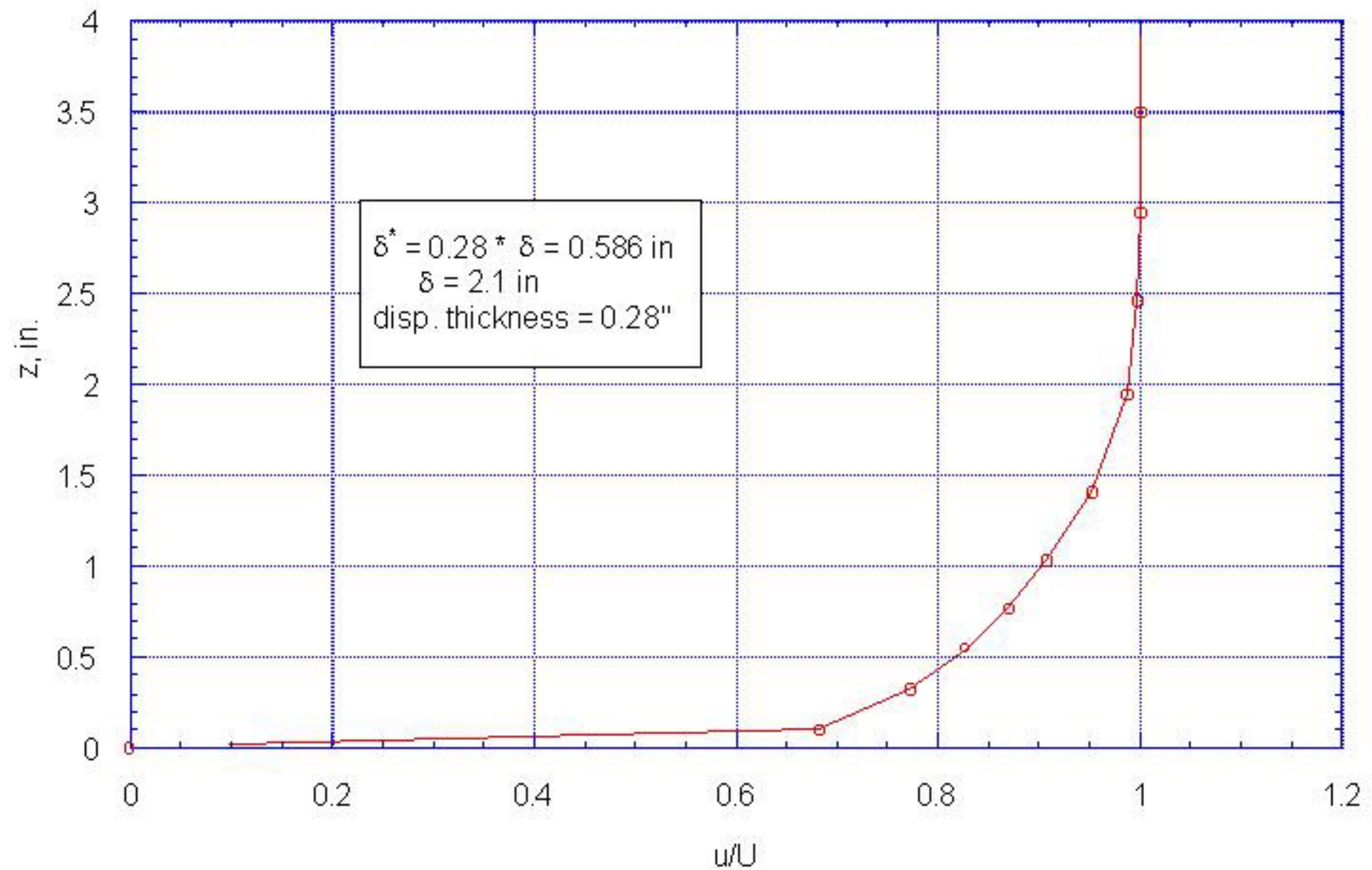
Hot Film Sensors  
on Model



Continuum  
Dynamics  
Boattail Plates  
Installed on  
Model



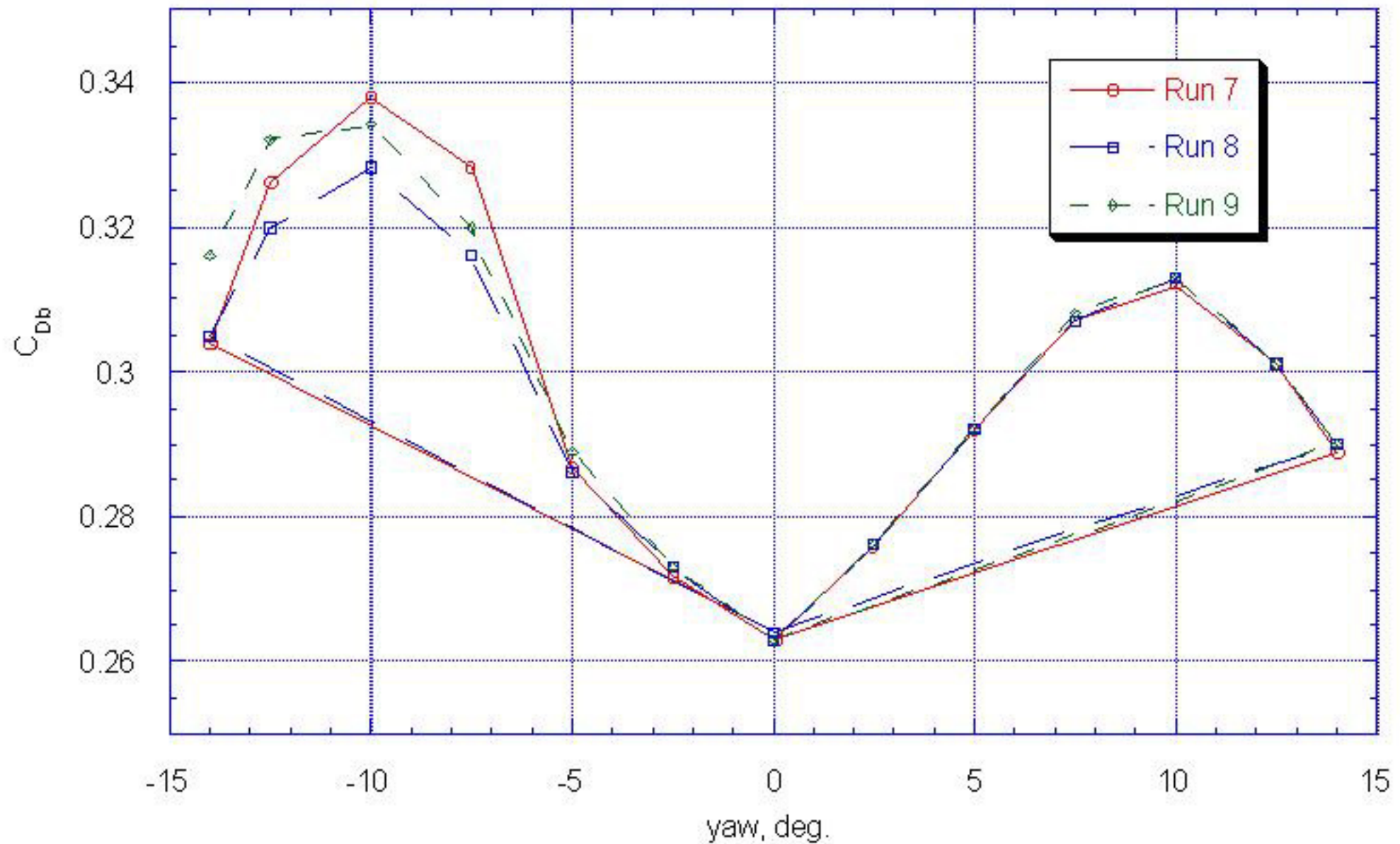
# Floor Boundary Layer Profile in 7x10



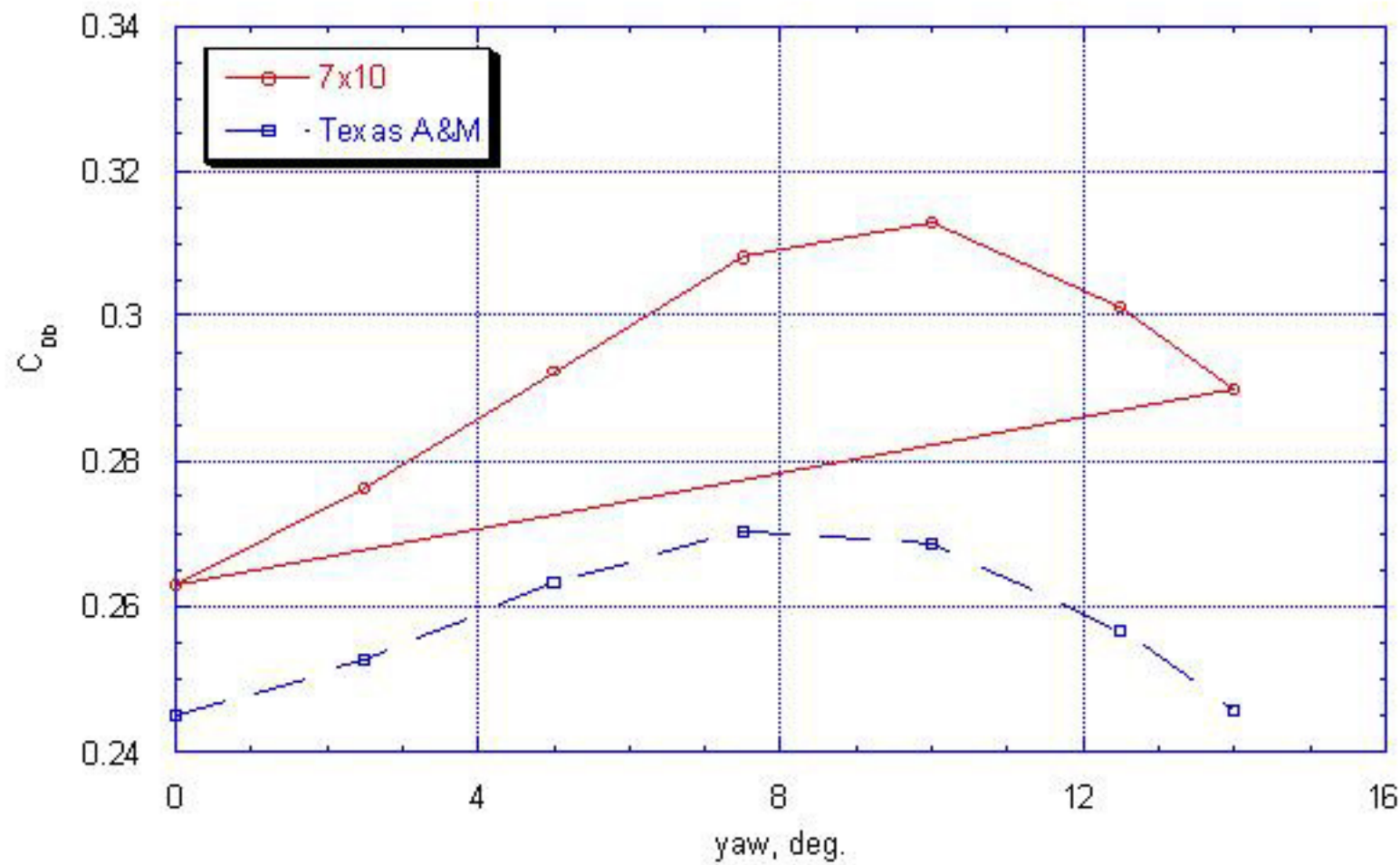


# Drag Repeatability

Body-axis drag coefficient

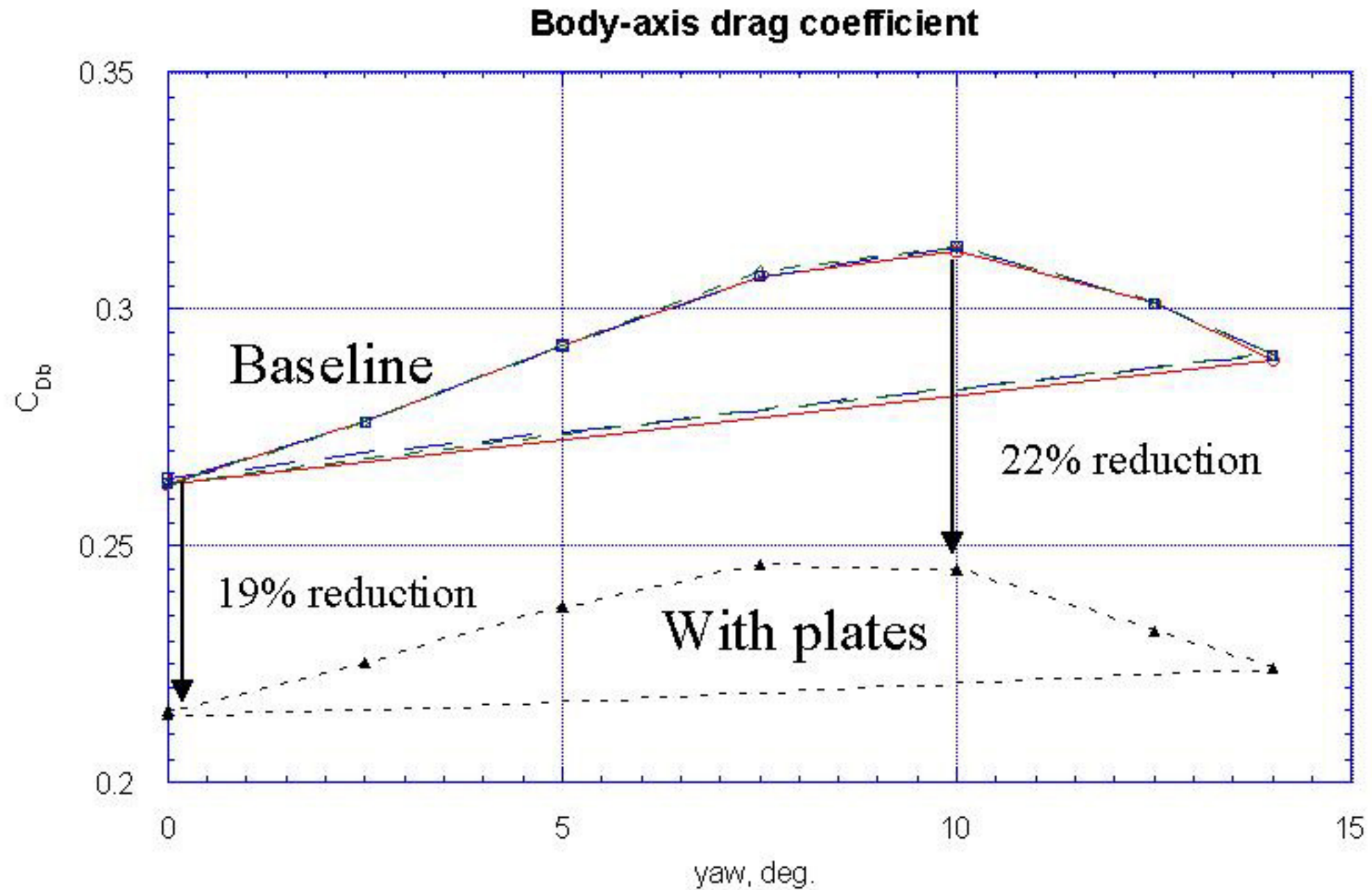


# Comparison of 7x10 and Texas A&M Drag Results



- Differences
  - Corrections applied at A&M?
  - Location of static reference pressure ring

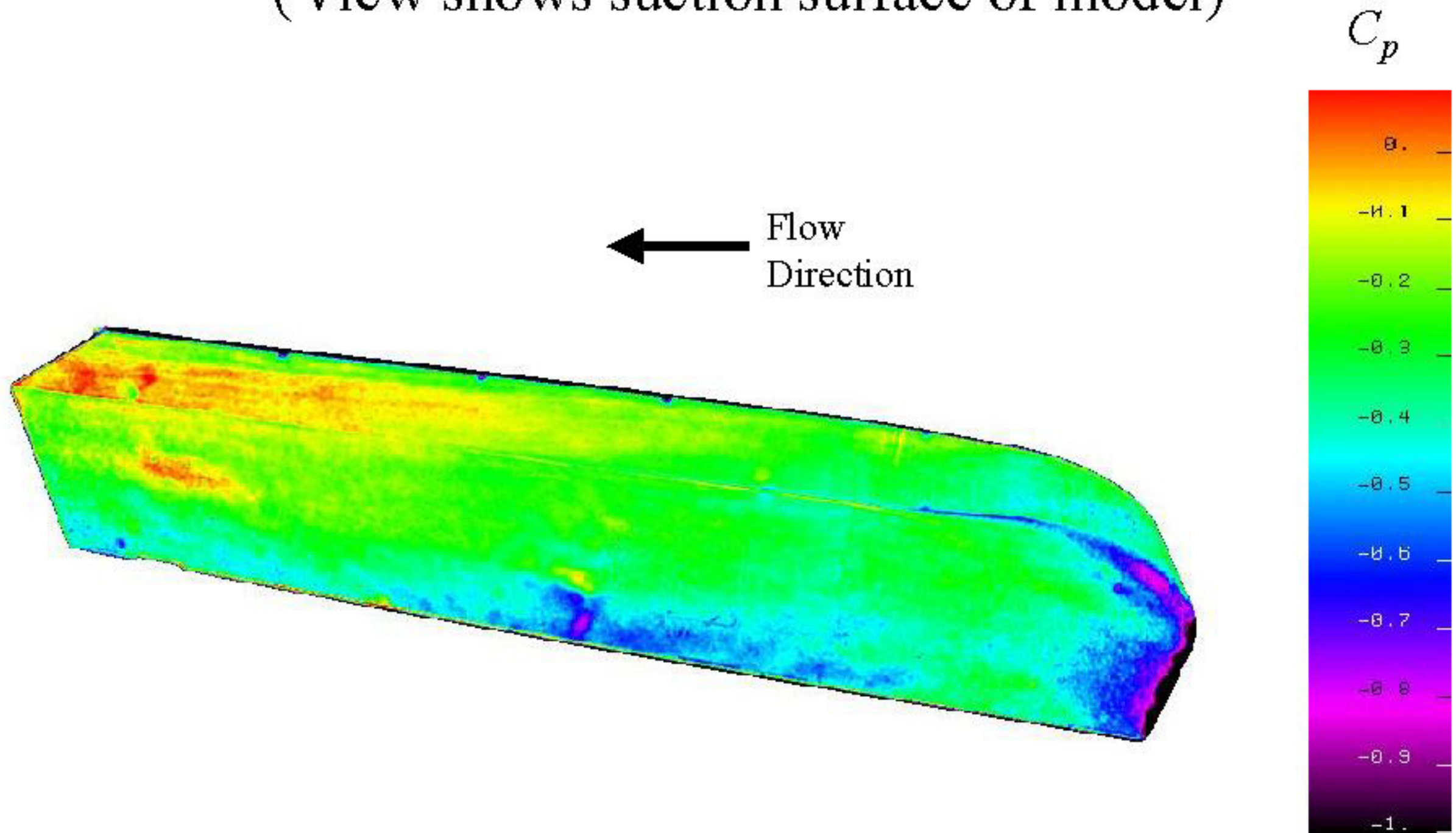
# Effect of Boattail Plates on Drag



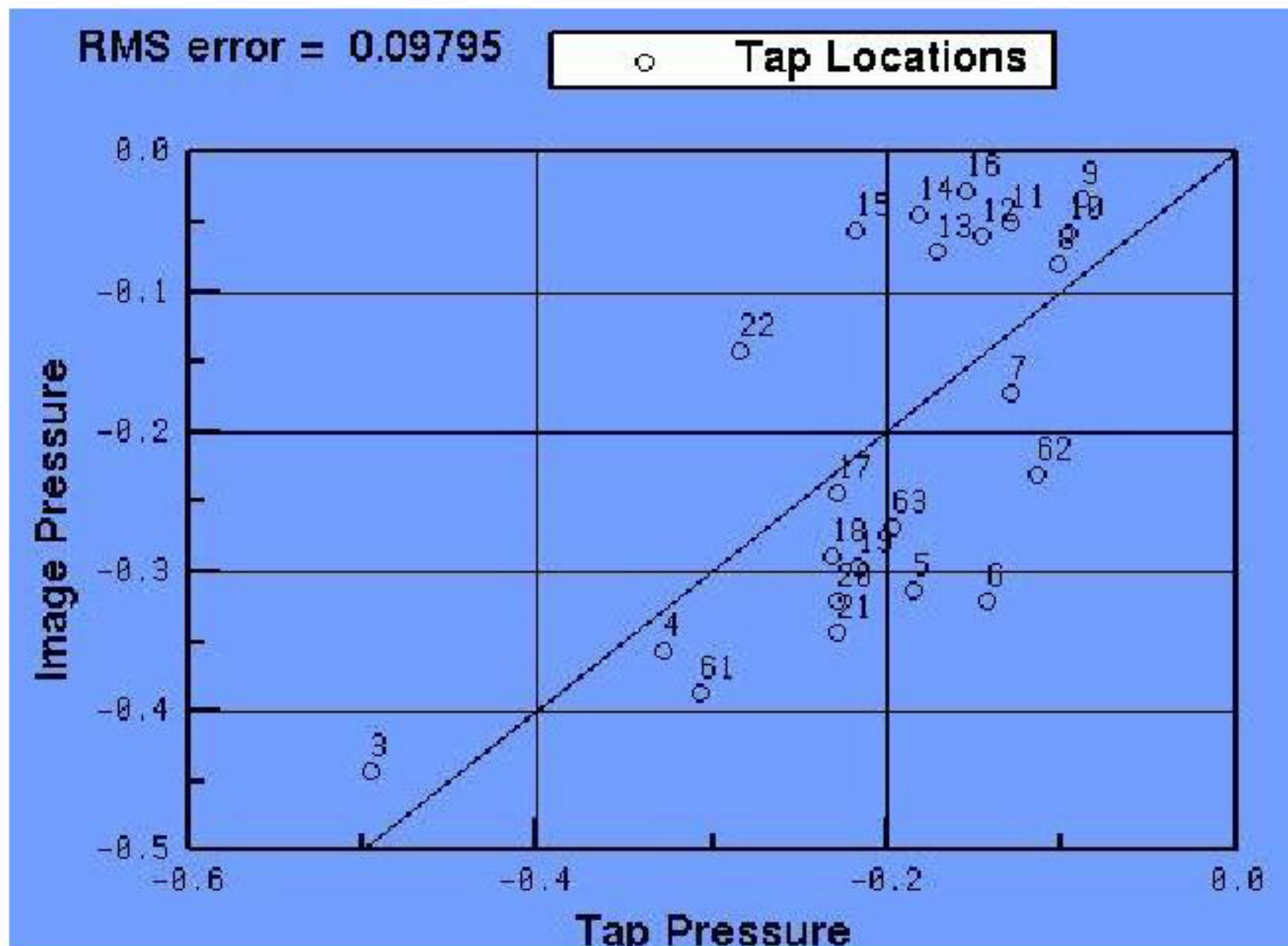
# PSP Results on GTS Model in Ames 7x10

$Q=88$  psf, Yaw =  $10^\circ$

(View shows suction surface of model)

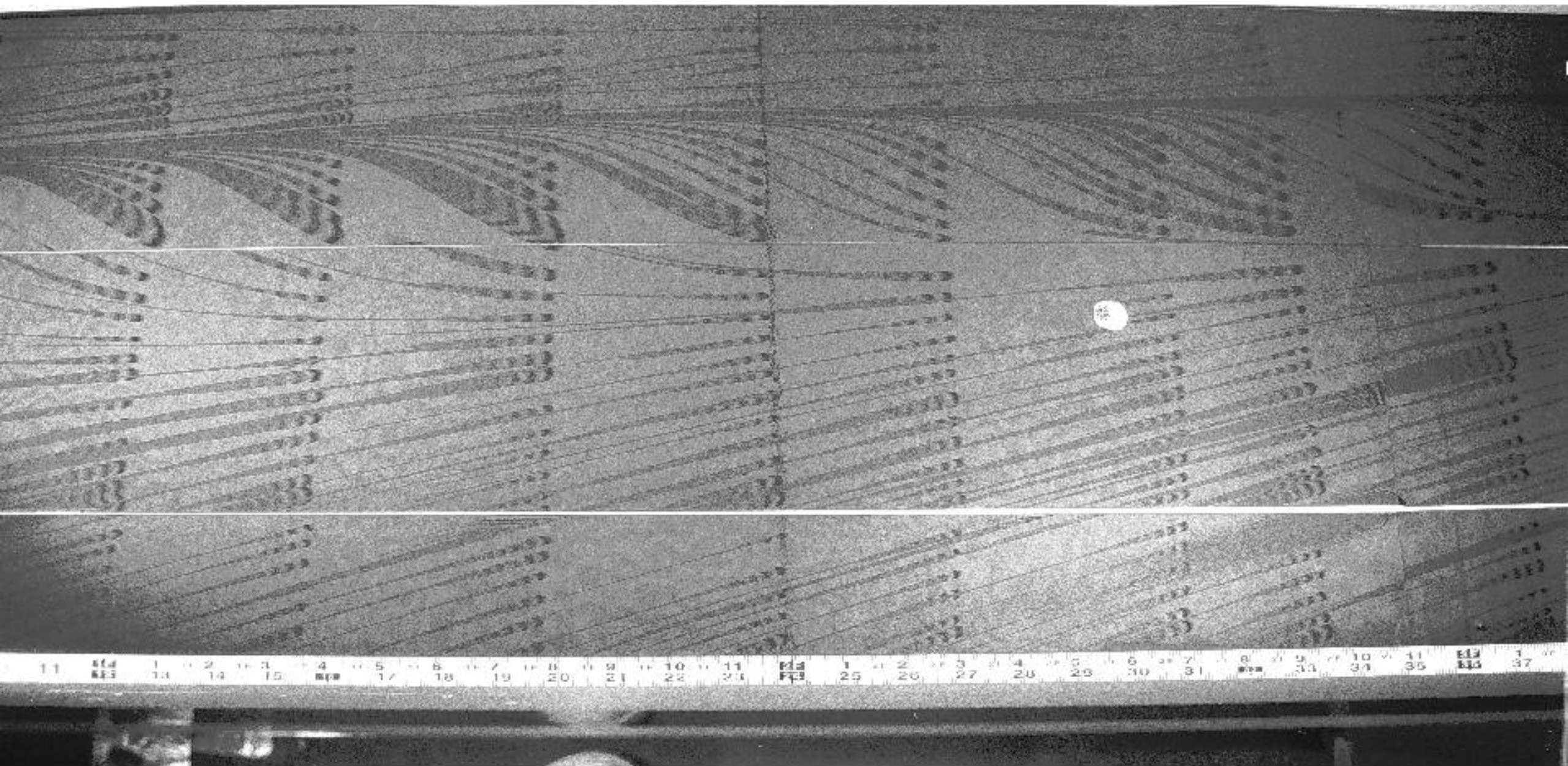
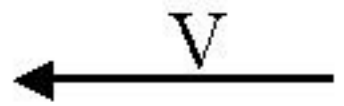


PSP Results on GTS Model in Ames 7x10  
Scatter plot shows tap vs PSP comparison  
For  $Q=88$  psf,  $Yaw=10^\circ$  case



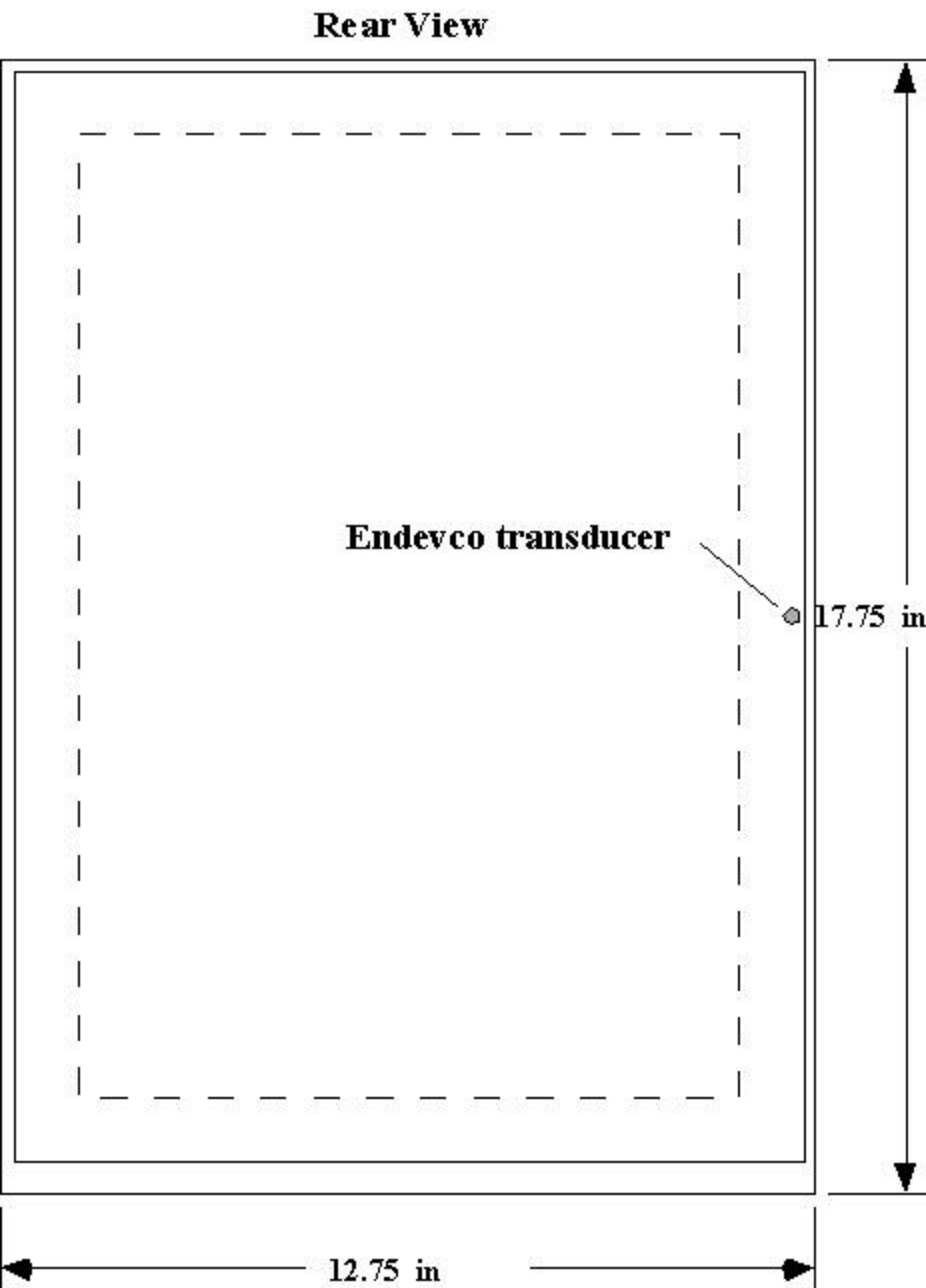
# Oil film image

Top view of trailer at  $10^\circ$  yaw



Skin friction proportional to fringe spacing  
(high under vortex)

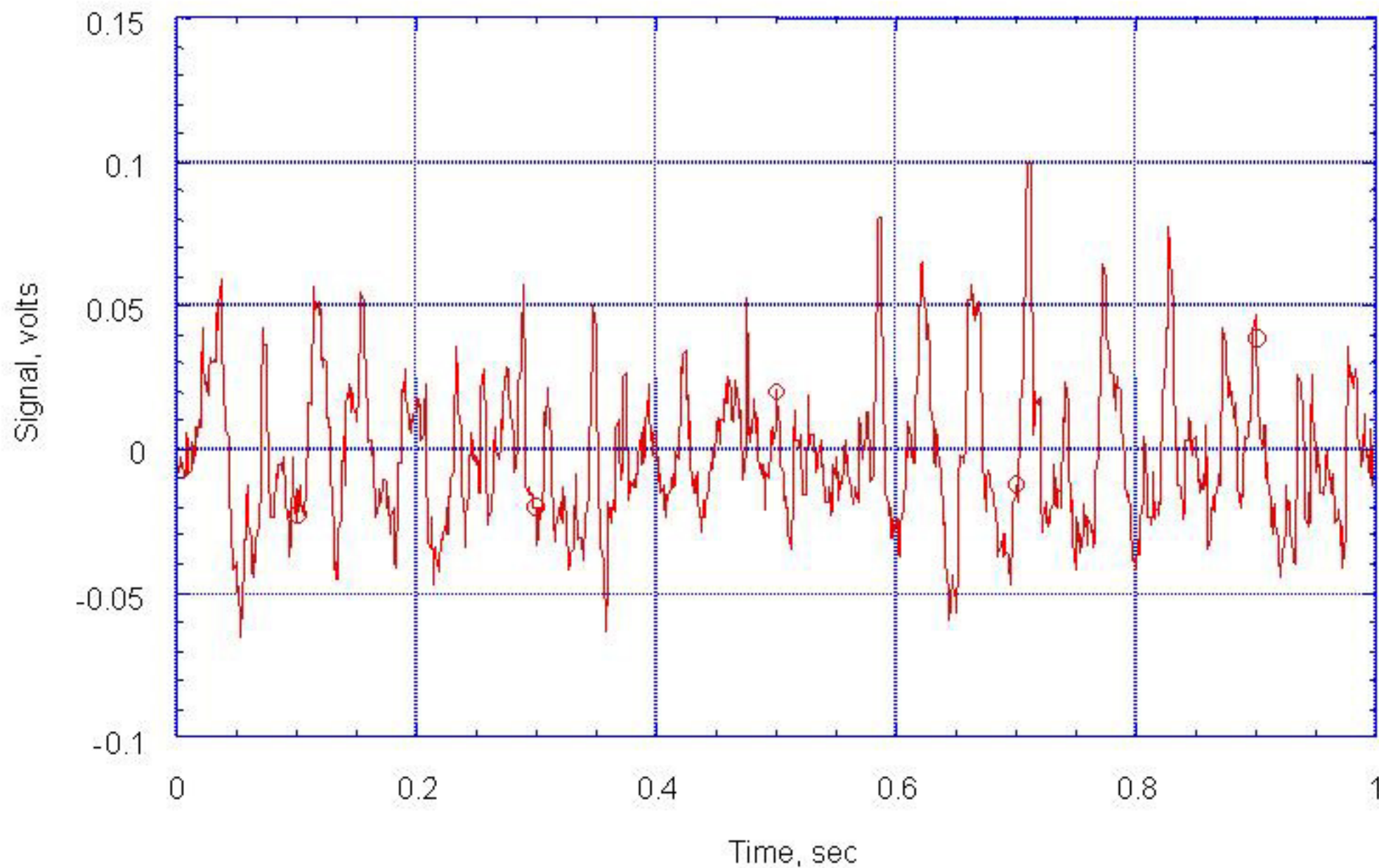
# Unsteady Pressure Measurements



- 15 psia transducer
- Mid-height on right side of rear door (nose right is positive yaw)
- Center of transducer is 0.25" from side edge

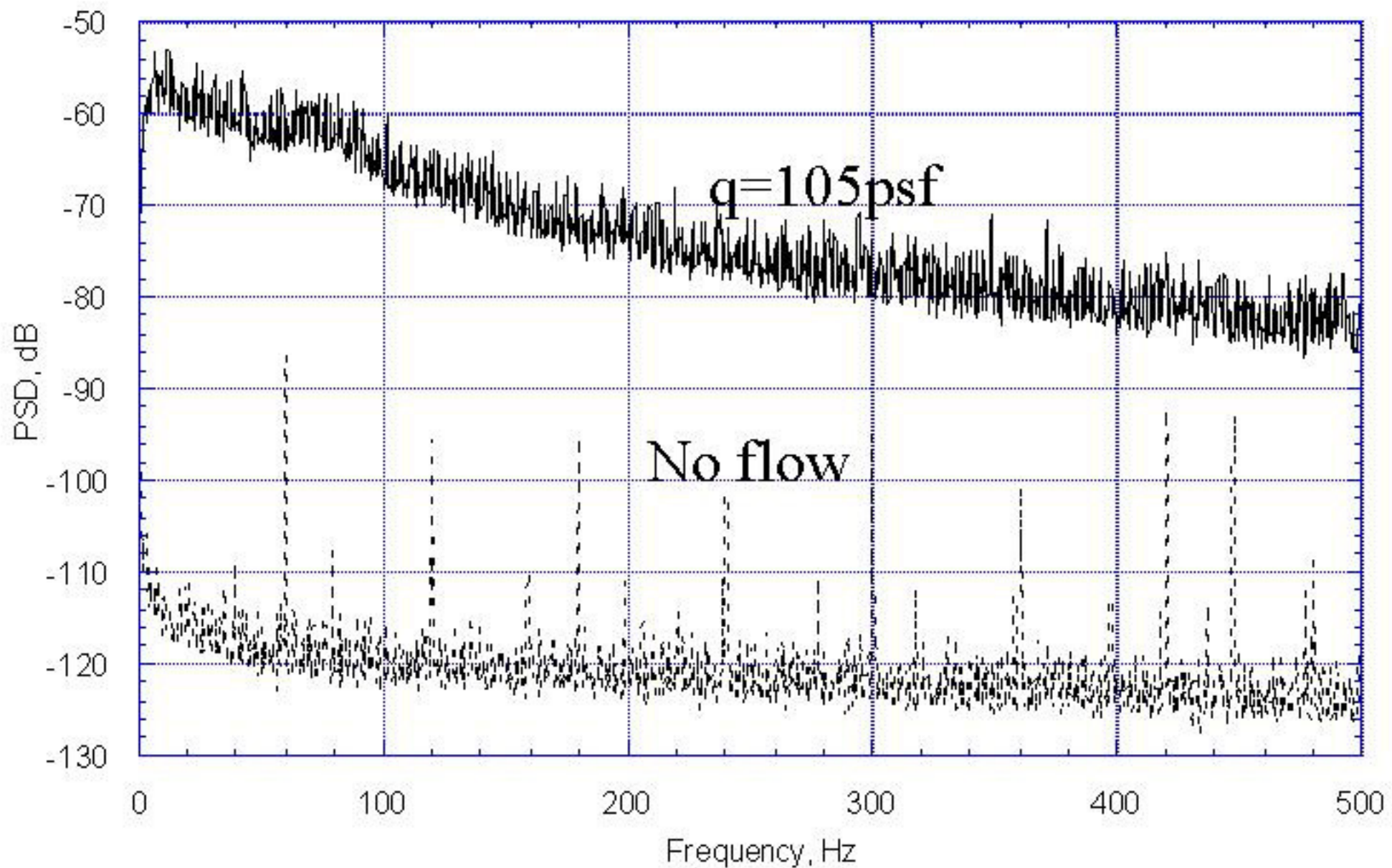
# Unsteady Pressure Signal

$q = 105 \text{ psf}$ ,  $0^\circ$  yaw, baseline



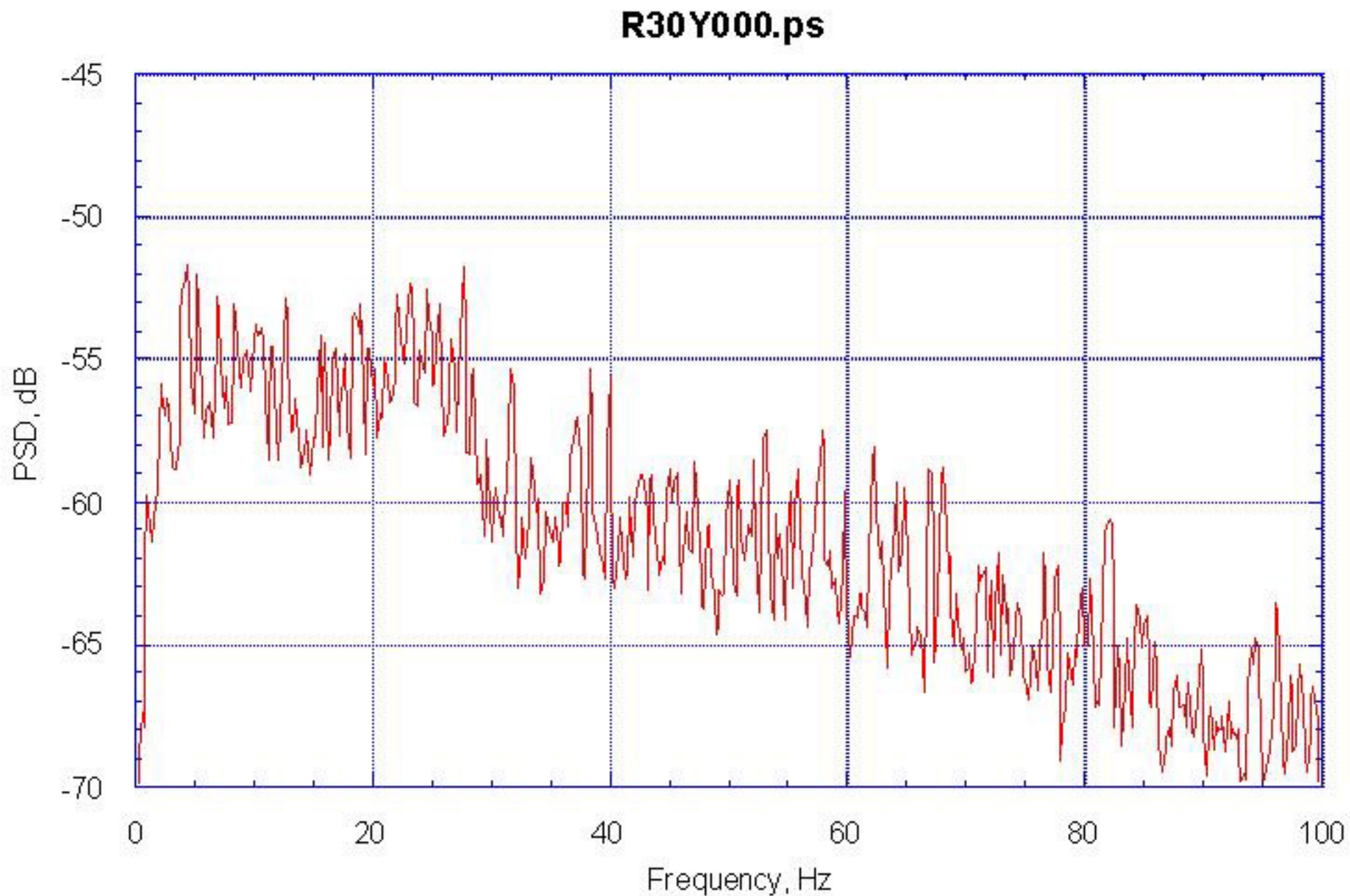


# Signal Quality for Unsteady Pressures



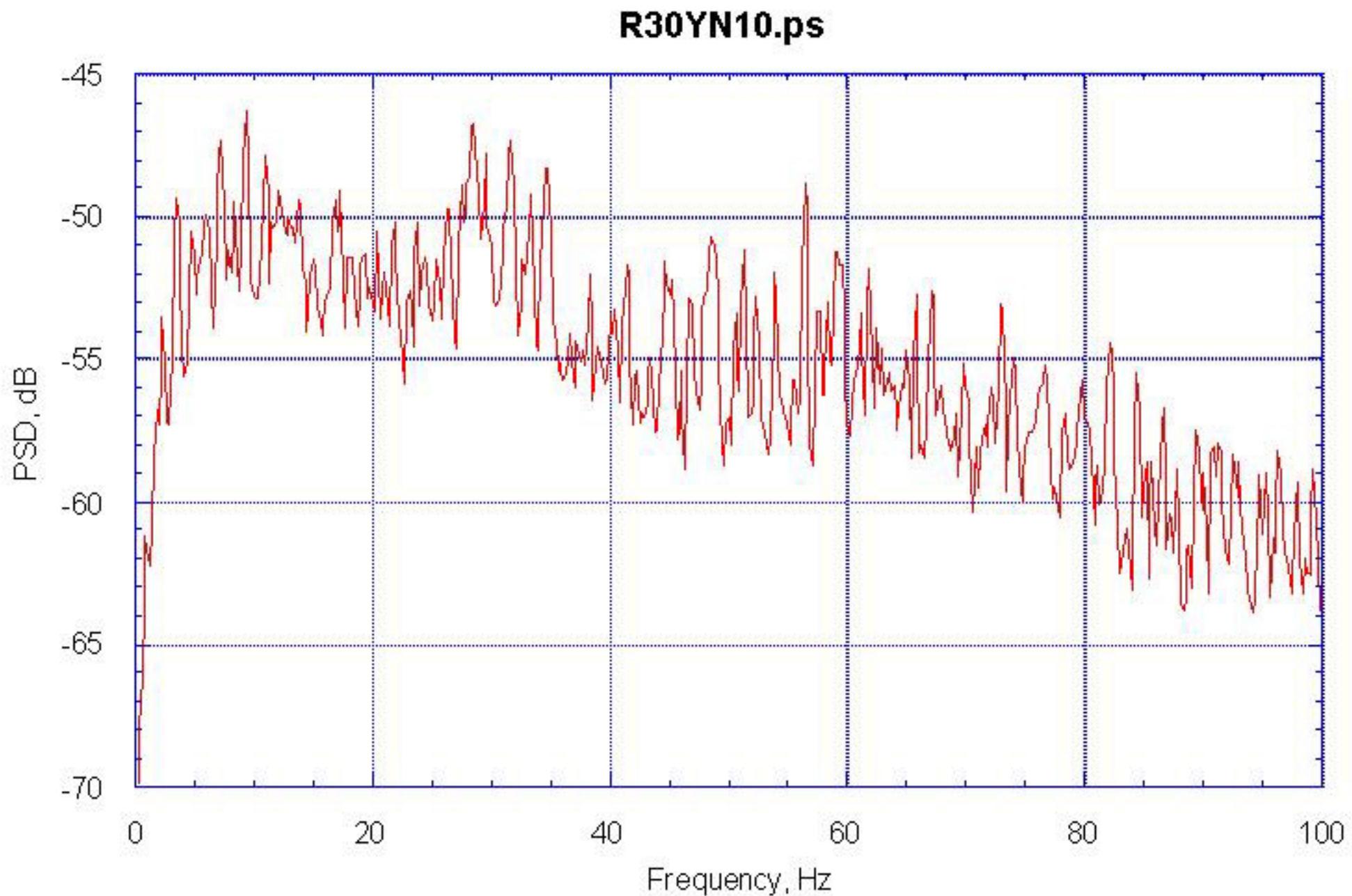
# Power Spectrum of Pressure Signal

$q = 105 \text{ psf}$ ,  $Re = 1.2M$ ,  $0^\circ$  yaw, baseline



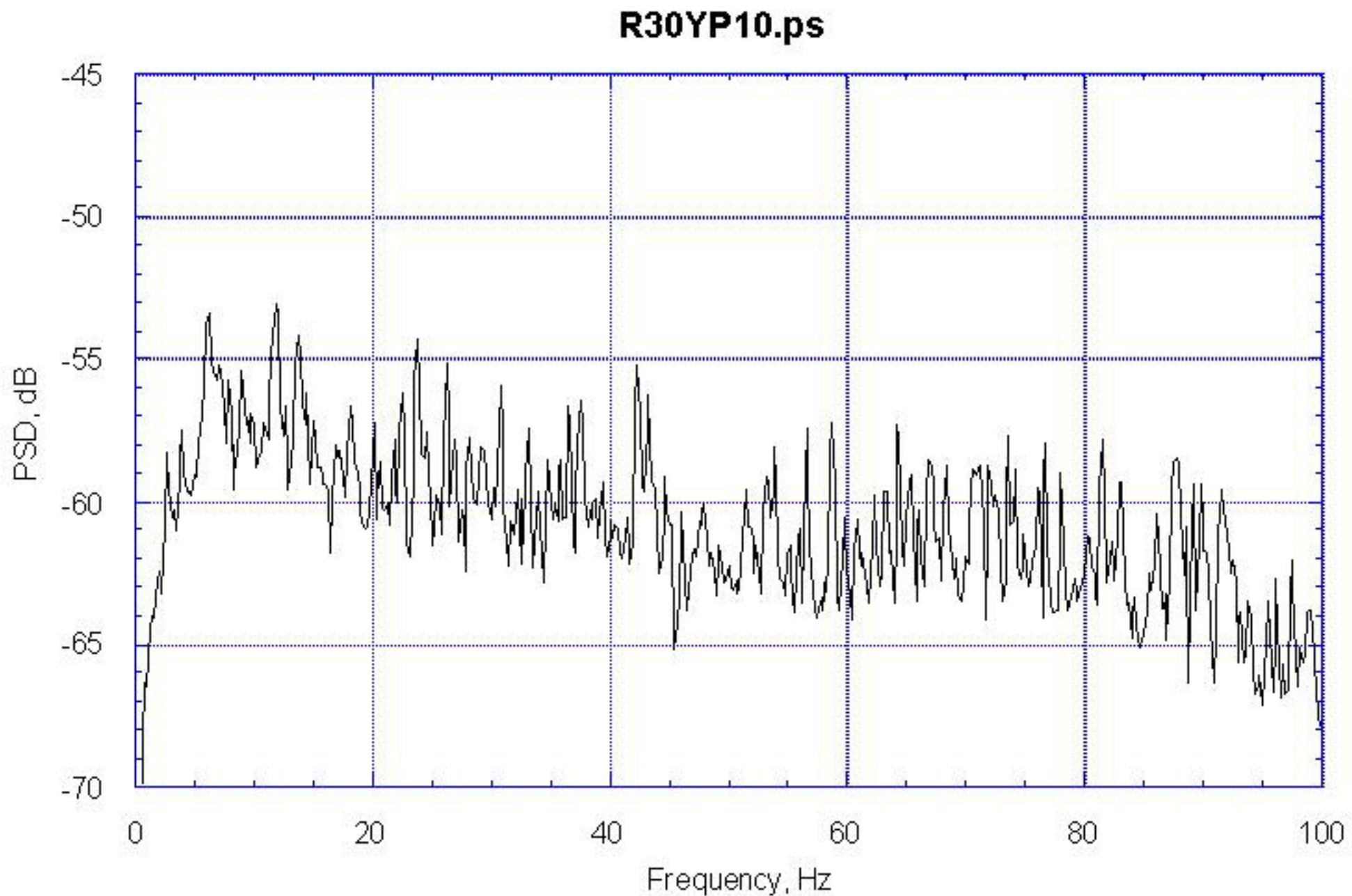
# Power Spectrum of Pressure Signal

$q = 105 \text{ psf}$ ,  $Re = 1.2M$ ,  $-10^\circ$  yaw, baseline



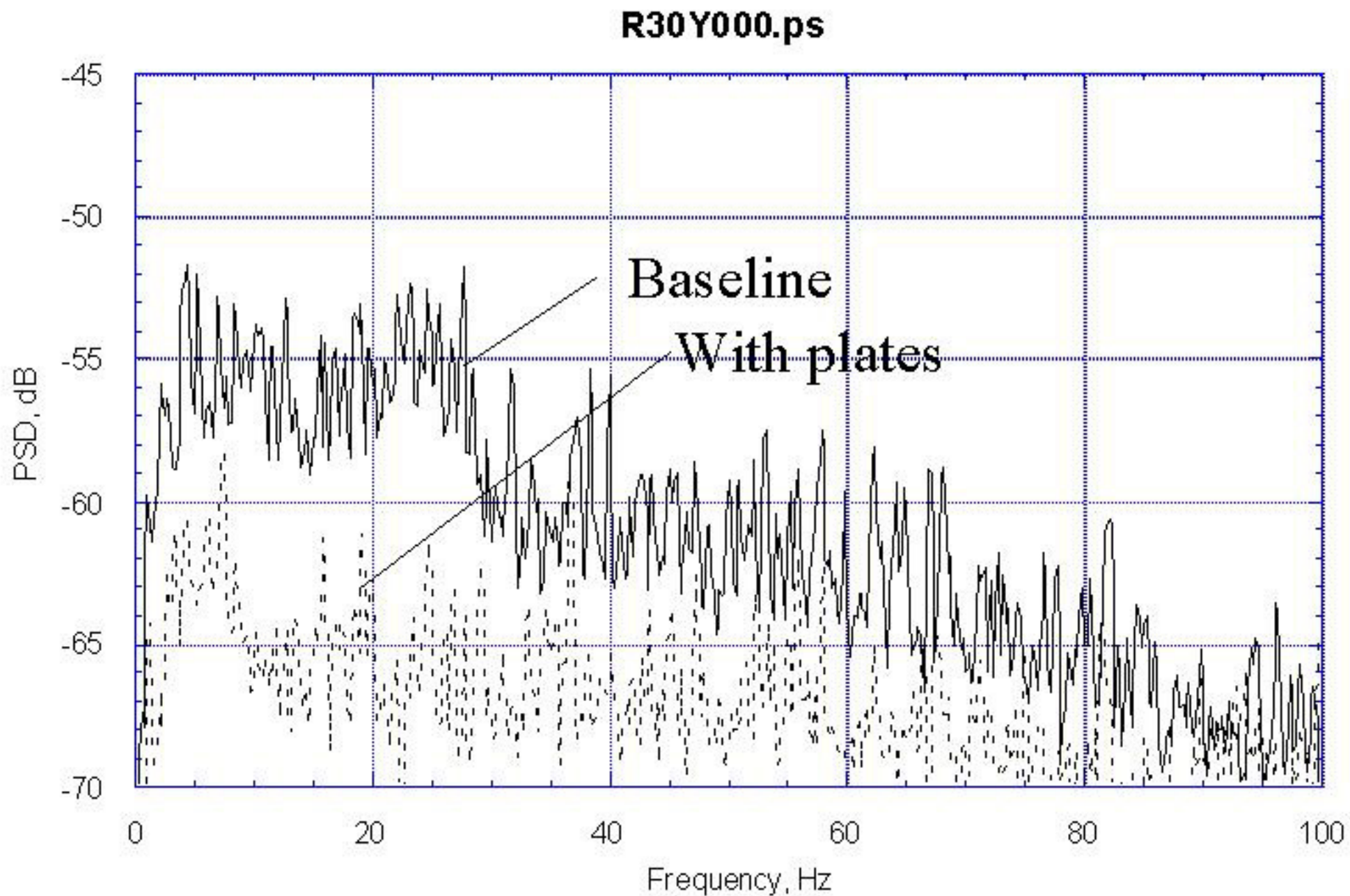
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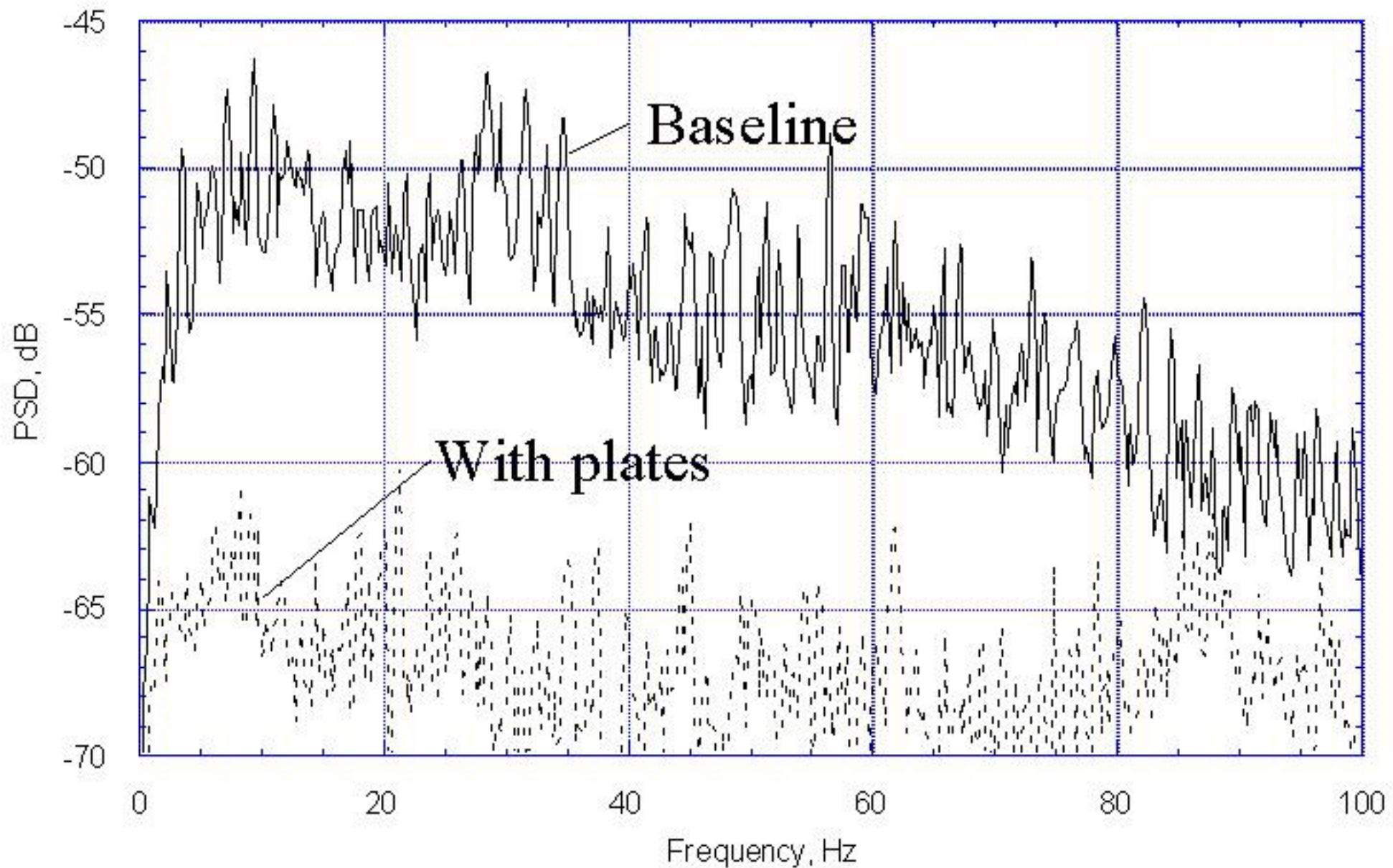
# Effect of Boattail Plates on Pressure Spectrum

$q = 105 \text{ psf}$ ,  $Re = 1.2M$ ,  $0^\circ \text{ yaw}$



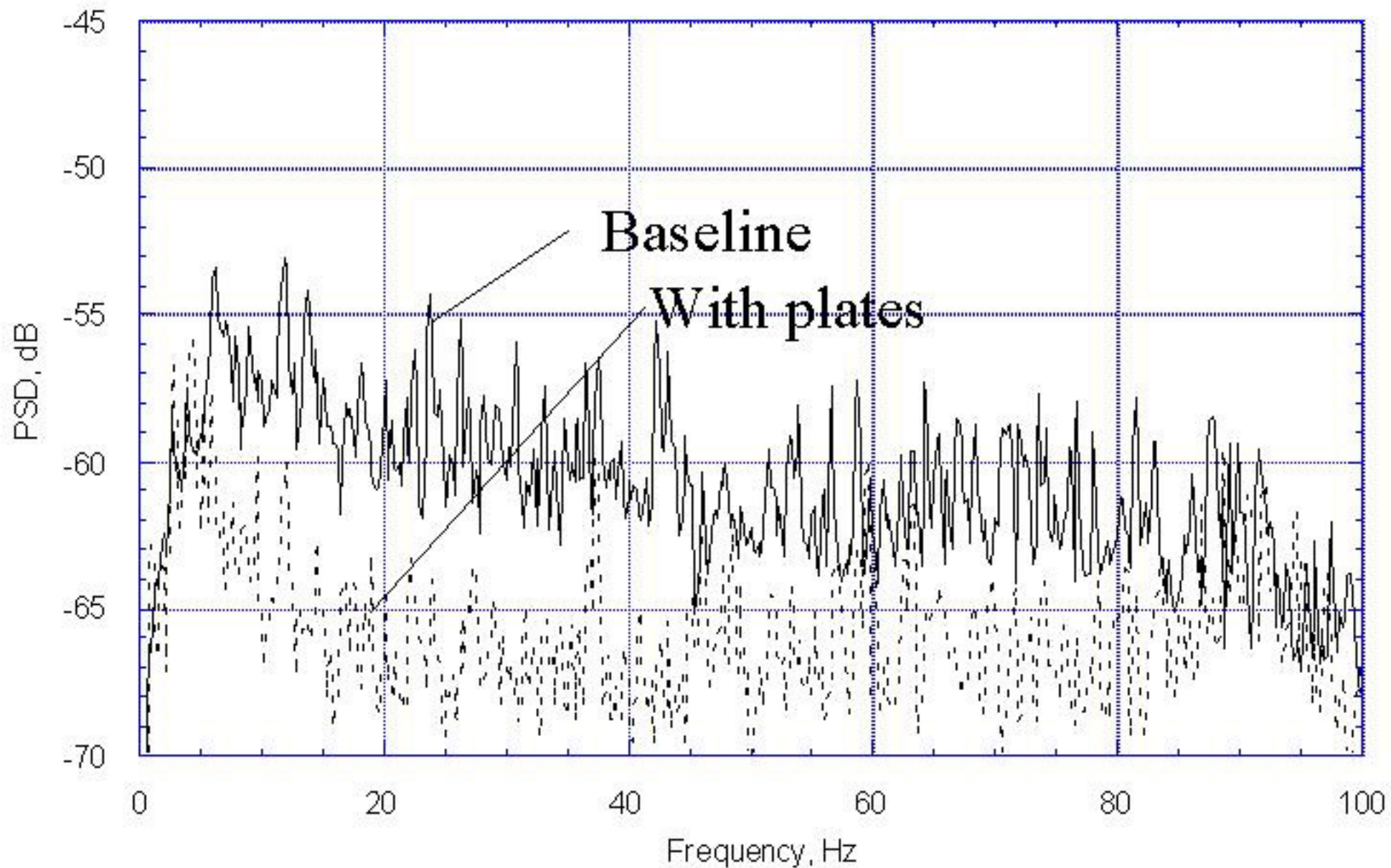
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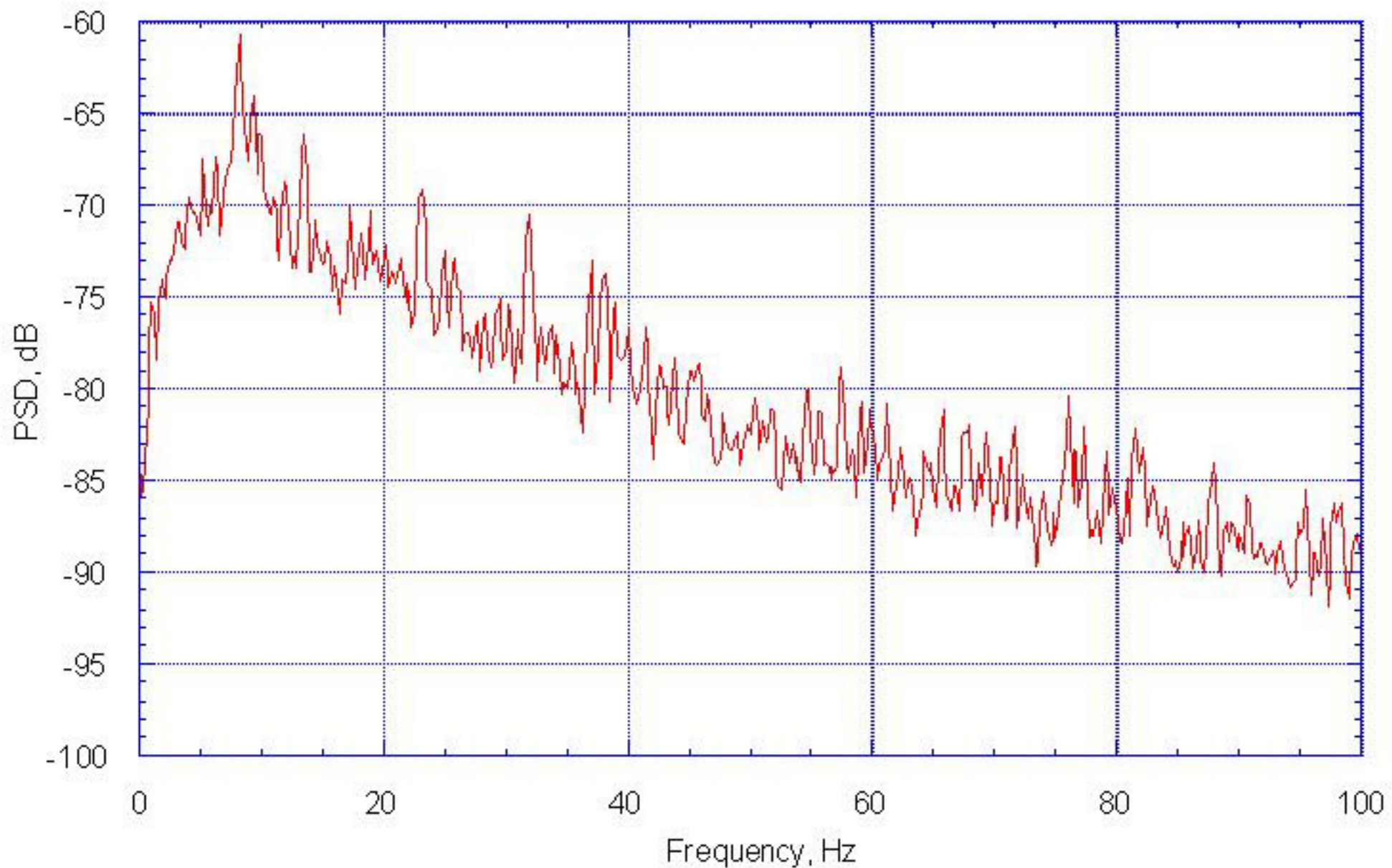
# Effect of Boattail Plates on Pressure Spectrum

$q = 105$  psf,  $Re = 1.2M$ ,  $10^\circ$  yaw



# Pressure PSD at Low Speed

$q = 15$  psf,  $Re = 450,000$ ,  $0^\circ$  yaw





# Movie of Wake

# Remaining Work

- Complete test
- Assemble data report
- Distribute data for validation work
  - Data format is an open issue

# Plans for 12' PWT Test

- Examine Re effects up to full-scale on 1/8<sup>th</sup>-scale model
- Determine minimum Re for various aspects of geometry
  - Gap
  - Cooling flow
  - Mirror
  - Base-drag reduction
  - ?
- CFD validation data at range of Re