

High AoA Working Group AePW-3 Telecon October 28, 2021

<https://nescacademy.nasa.gov/workshops/AePW3/public>

Next AePW-3 Meeting: November 4, 2021

Next High AoA Working Group Meeting, October 28, 2021

High AoA Working Group, October 28, 2021

Agenda:

1. SciTech 2022, IFASD 2022
2. Experimental data shock buffet

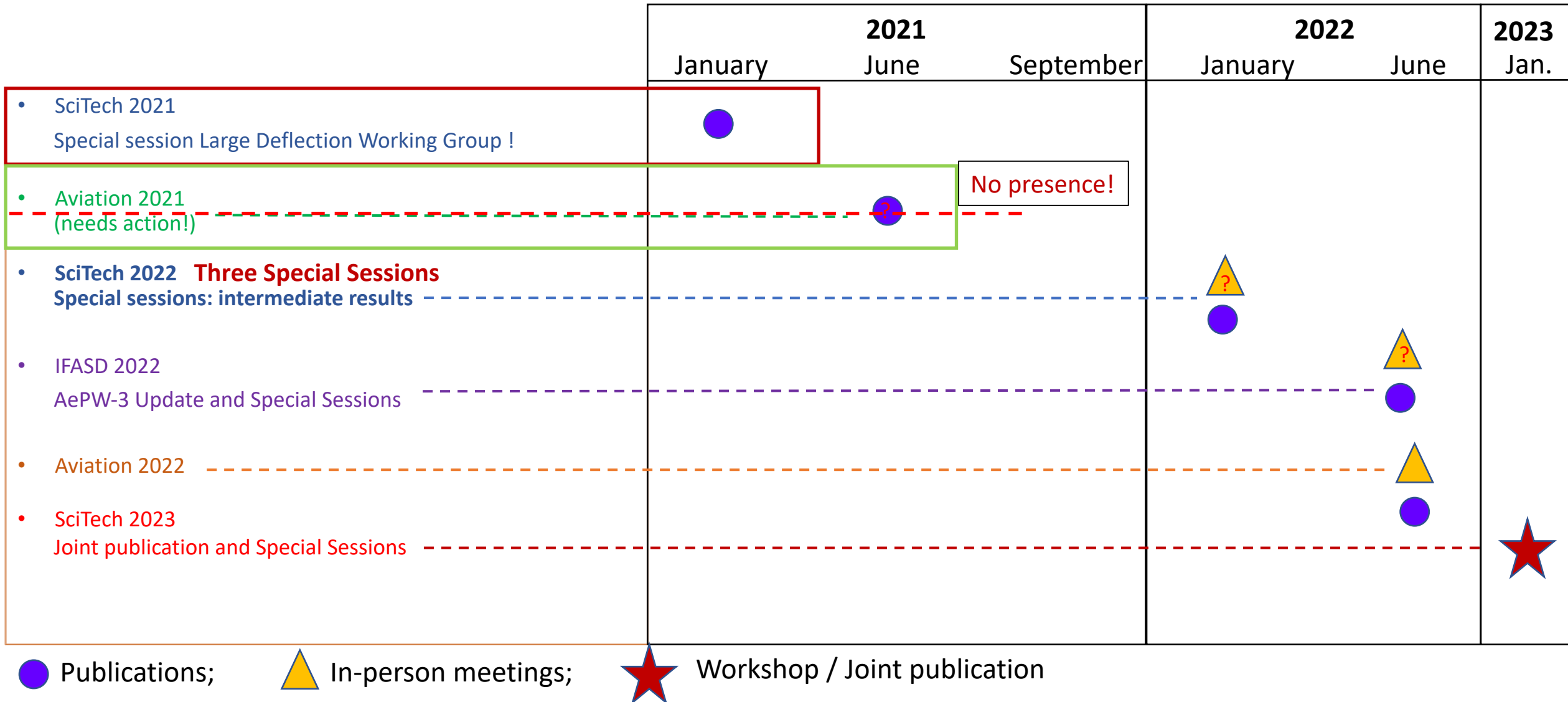
Next Meeting: October 28, 2021

High AoA WG Participants

Bret Stanford, Walter Silva, Pawel Chwalowski	NASA LaRC Aeroelasticity Branch, USA
Daniella Raveh, Wrik Mallik, Lior Poplingher	Technion, Israel
Adam Jirasek	USAFA, USA
Matt Forester, Giampaolo Pagliuce	BAE Systems, UK
Marcello Righi	University of Zurich, Switzerland
Antoine De Blois	Bombardier, Canada
Kartik Venkatraman, Magan Singh	Indian Institute of Science, India
Nicholas Giannelis	University of Newcastle, Australia
Arizono Hitoshi	JAXA, Japan
Lakshmi Sankar	Georgia Tech, USA
Sebastian Timme	University of Liverpool, UK
Ando Yuya	ANSYS, USA
Jennifer Heeg	NASA (retired), USA

Table 1.

Toward the next Aeroelastic Prediction Workshop (AePW-3): Timeline



IFASD 2022

Abstracts due November 2021

IFASD 2022 - International Forum on Aeroelasticity and Structural Dynamics 2022



Madrid, 13th - 17th June 2022

[HOME](#) | [COMMITTEES](#) | [CALL FOR ABSTRACTS](#) | [IMPORTANT DATES](#) | [COVID-2019 CAVEAT](#) | [FOR AUTHORS -](#) | [NEWS](#) | [CONTACT](#)

IMPORTANT DATES

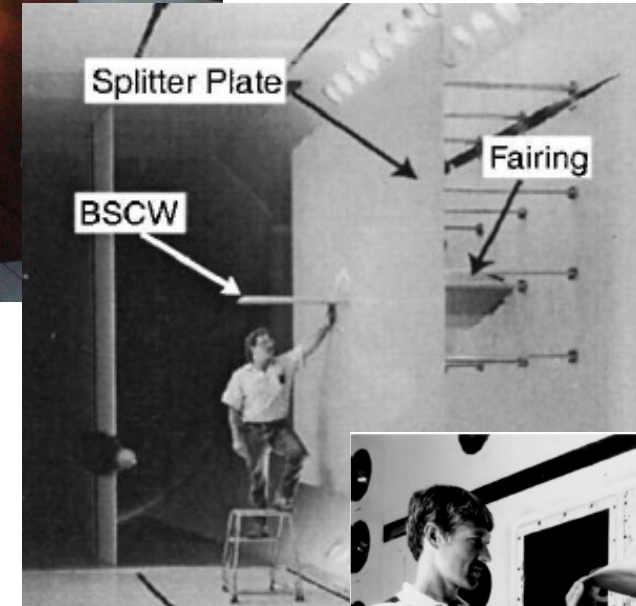
PROVISIONAL DATES	
Forum Announcement and Call for Abstracts:	April 1, 2021
Abstract Submission Opens:	September 1, 2021
Abstract Submission Deadline:	November 30, 2021
Abstracts review:	mid January to mid February 2022
Author Acceptance Notification:	February 20, 2022
Preliminary Technical Program:	March 1, 2022
Forum Registration Opening:	March 7, 2022
Forum Registration Early Bird Deadline:	April 15, 2022
Final paper / manuscripts Deadline:	May 20, 2022
Forum Registration Deadline:	May 30, 2022
IFASD 2022:	June 13-17, 2022

AePW-1 Configurations

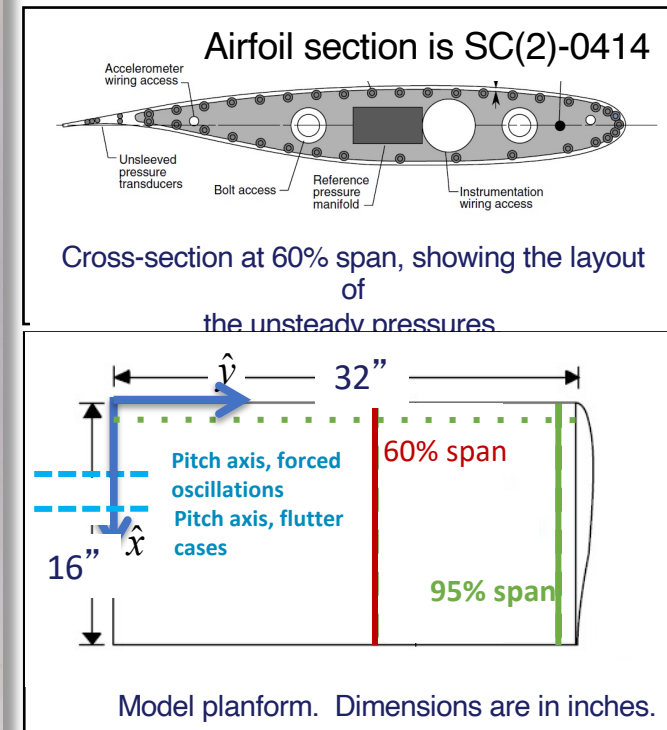
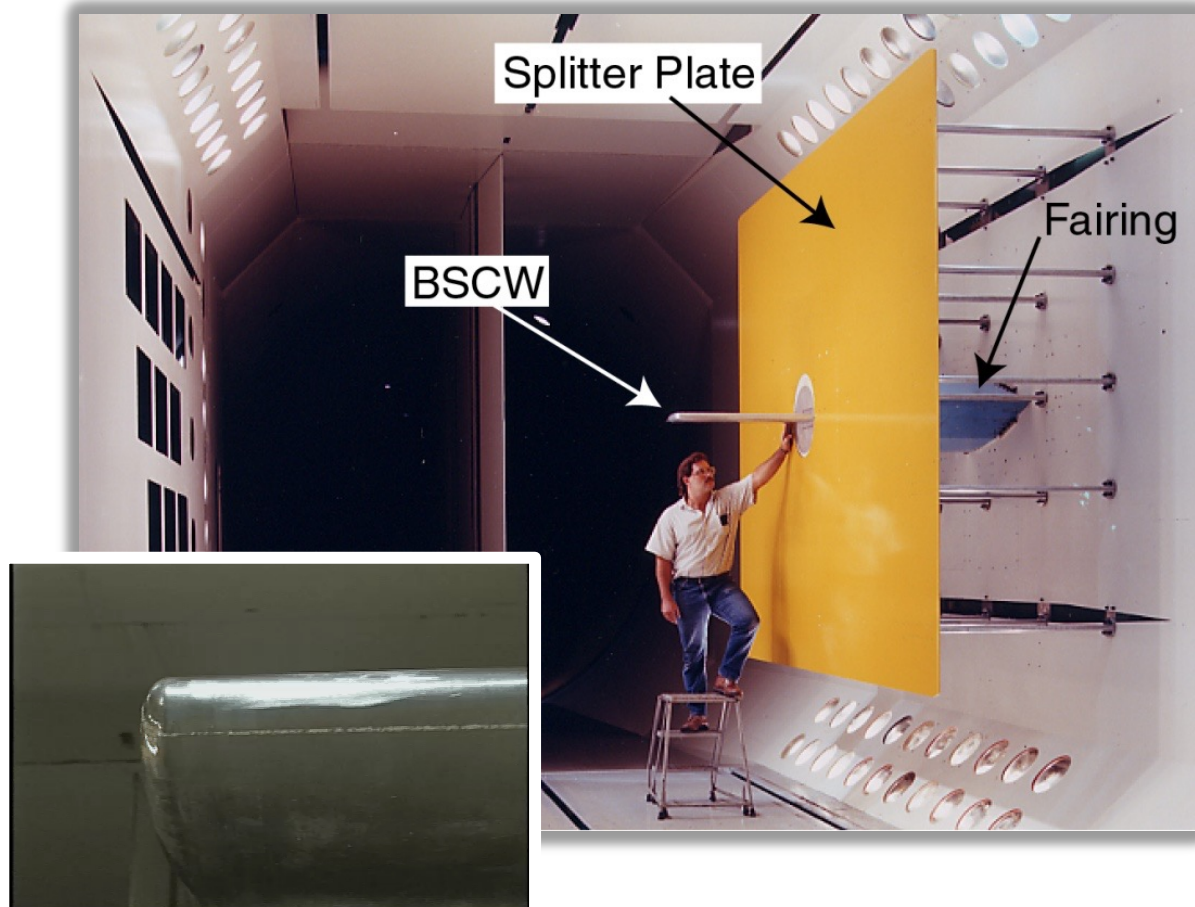
● High Reynolds number Aero-Structural Dynamics Model (HIRENASD)

● Benchmark Supercritical Wing (BSCW)

● Rectangular Supercritical Wing (RSW)



Benchmark Supercritical Wing (BSCW) Model



AePW-2 Configurations for Flutter Computation

Config	Mach	α	Re_c , millions
BSCW	0.7	3	4.56
BSCW	0.74	0	4.45
BSCW	0.85	5	4.49



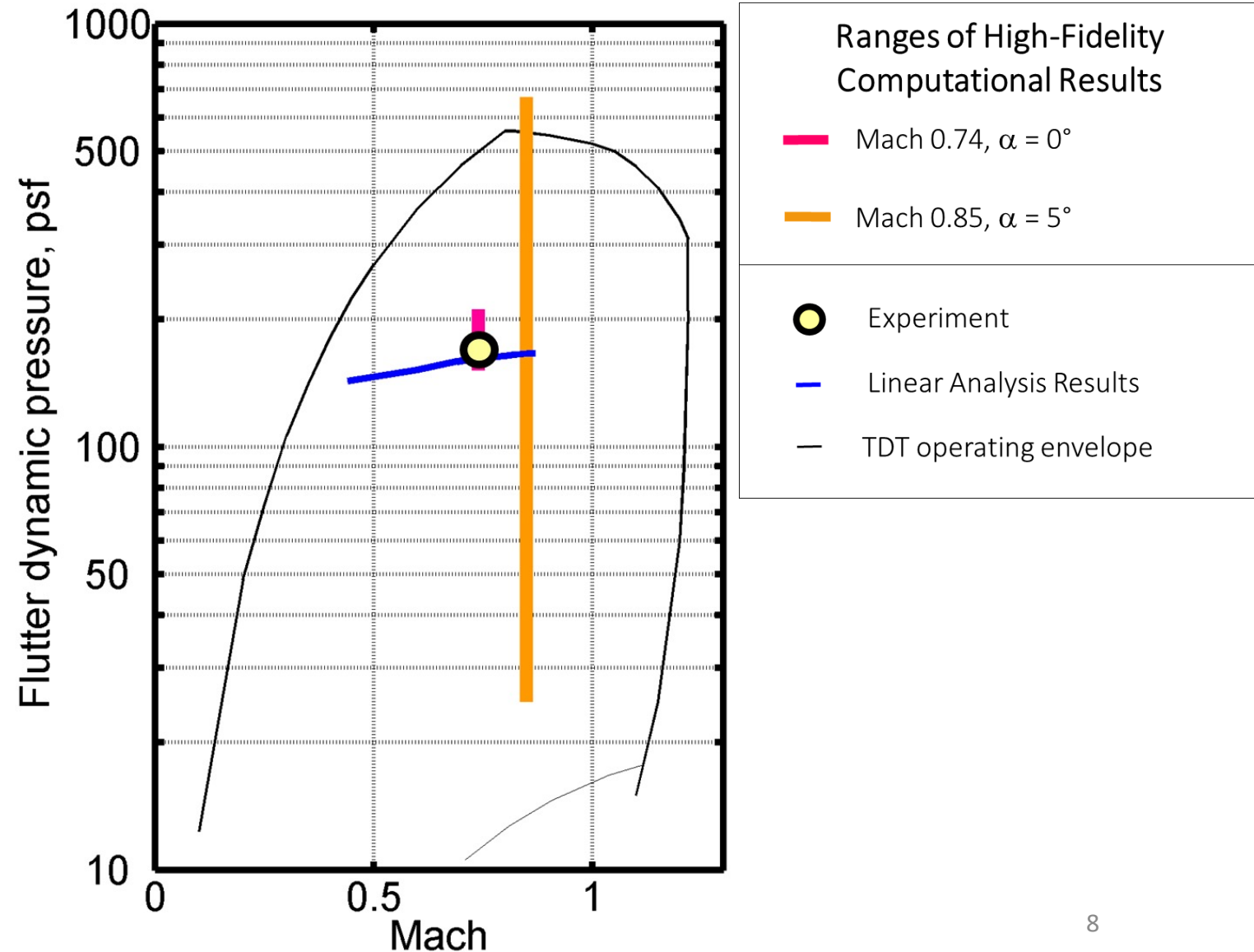
Experimental data: Flutter



Blind computational test: Unforced Unsteady,
Forced Oscillation, Flutter

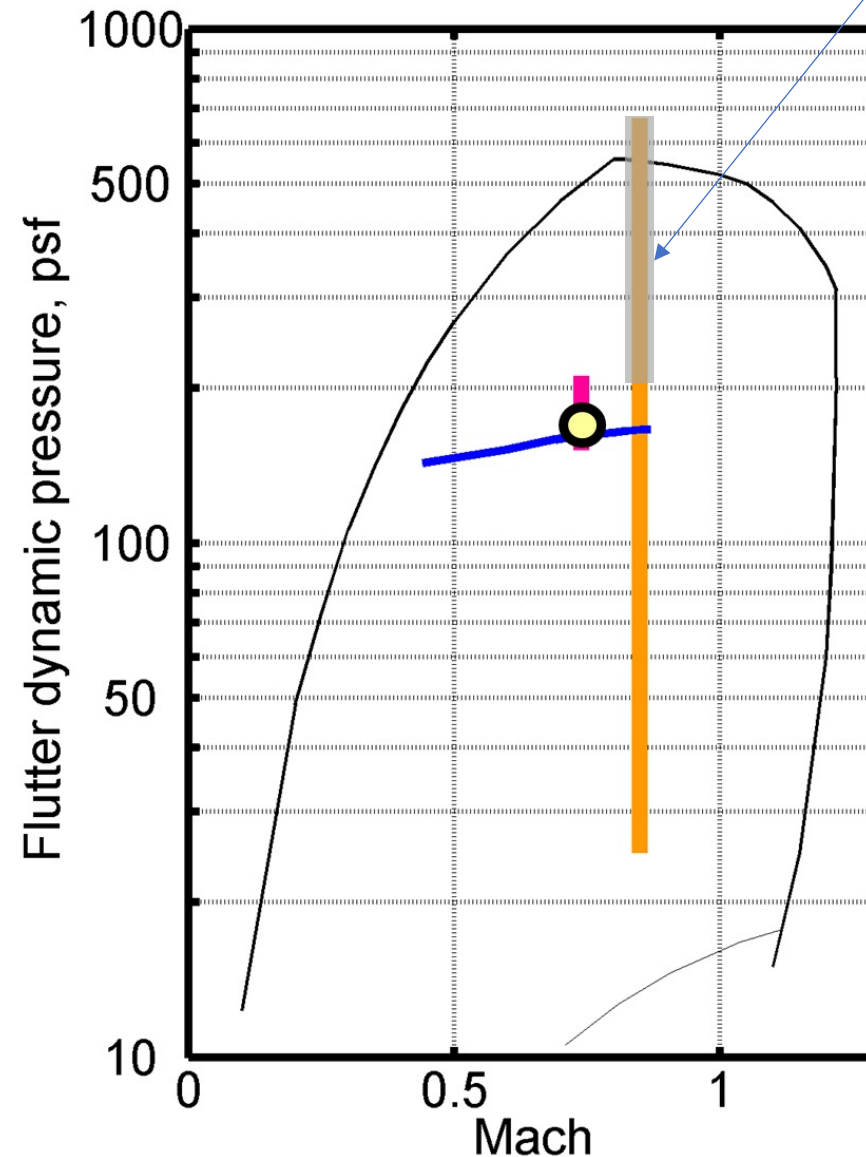
AePW-2 Summary of Results

- At Mach 0.74, $\alpha = 0^\circ$
 - Small variation in computational results
 - Match the experimental results well
 - Match the linear results well
- At Mach 0.85, $\alpha = 5^\circ$
 - Significant variation in predictions
 - No experimental data for comparison



AePW-2 Summary of Results

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 - Significant variation in predictions
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Post workshop analyses

Ranges of High-Fidelity Computational Results

Mach 0.74, $\alpha = 0^\circ$

Mach 0.85, $\alpha = 5^\circ$

Experiment

Linear Analysis Results

TDT operating envelope

EXPERIMENTAL UNSTEADY PRESSURES AT
FLUTTER ON THE SUPERCRITICAL WING
BENCHMARK MODEL

AIAA-93-1592-CP

Bryan E. Dansberry, Michael H. Durham*, Robert M.
Bennett**, José A. Rivera*, Walter A. Silva*, and Carol
D. Wieseman*; Structural Dynamics Division, NASA
Langley Research Center, Hampton, VA 23681-0001
and David L. Turnock*
Lockheed Engineering and Sciences Corporation

Stall Flutter: Additional flutter points were acquired at non-zero angles of attack at a constant Mach number of 0.8. These data, acquired in 11-12 with fixed transition, are presented in figure 9 as flutter dynamic pressure versus α . The test conditions and flutter parameters for these stall flutter points are included in table 6. Due to load limits of the PAPA mount only three points could be acquired at angles of attack greater than two degrees. The data acquired, however, shows trends consistent with those of models previously tested on the PAPA mount. Results for models previously tested on the PAPA mount show that the flutter dynamic pressure varies only slightly as α is increased to some critical angle (above four degrees in reference 4). At this point, a rapid decrease in flutter dynamic pressure with increasing angle of attack and a rise in the flutter frequency to very near the wind-off torsion frequency is seen. This rapid change in character from equal participation in the flutter mechanism of pitch and plunge to a pitch dominated flutter mechanism is associated with wing stall conditions during a portion of the pitch oscillation cycle.

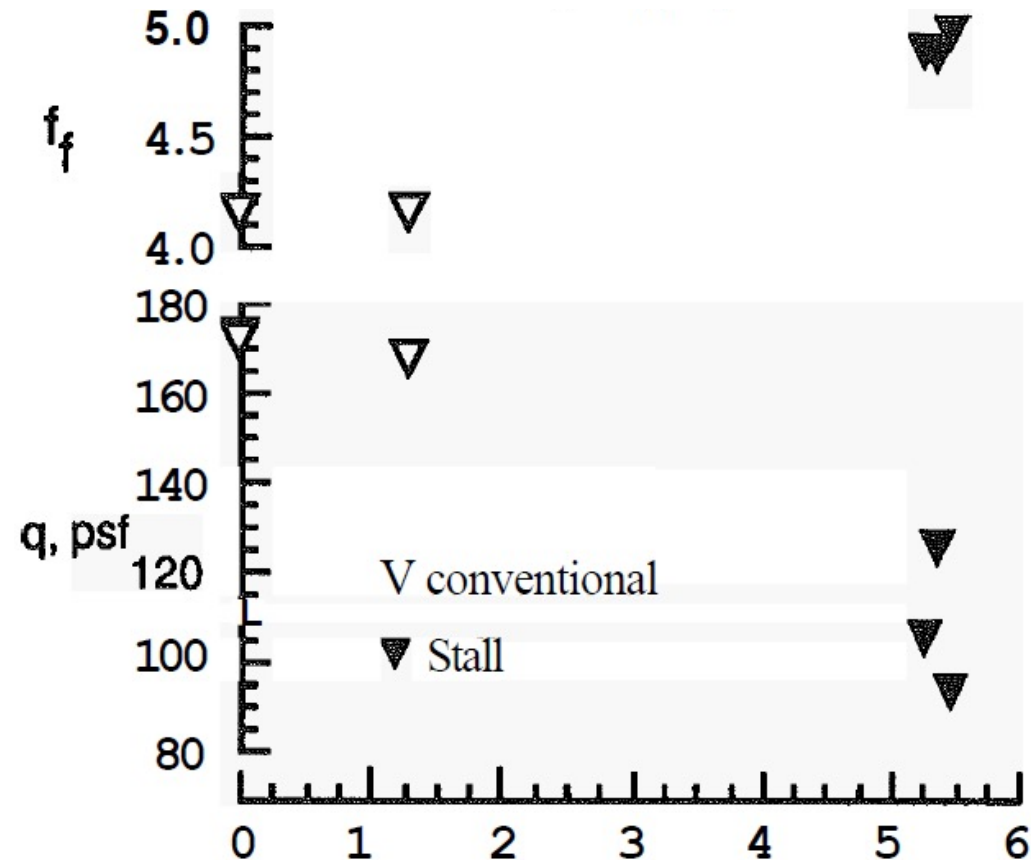


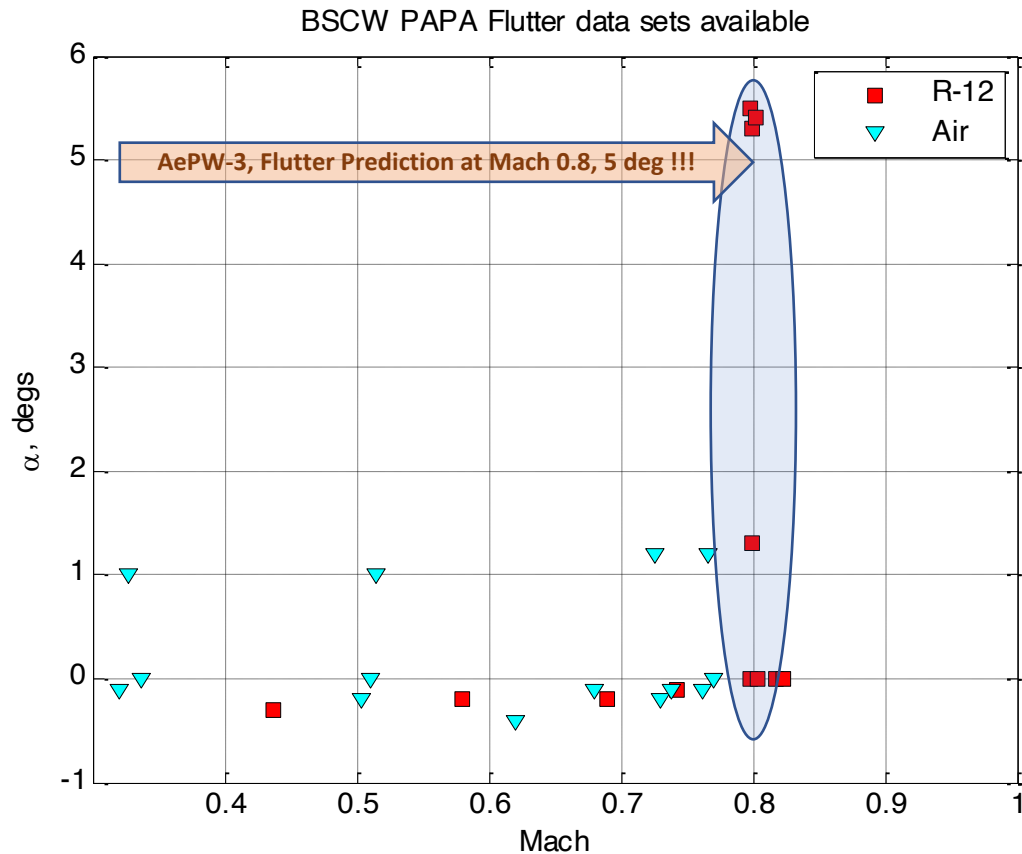
Figure 9. Stall flutter boundary in R-12 at $M = 0.80$.

What they have termed “stall flutter” corresponds to the test conditions where separated flow is first observed for the unforced system. For the oscillated system, the time histories from the OTT test indicate that the wing goes in and out of separated flow as the wing is Pitched nose up and nose down.

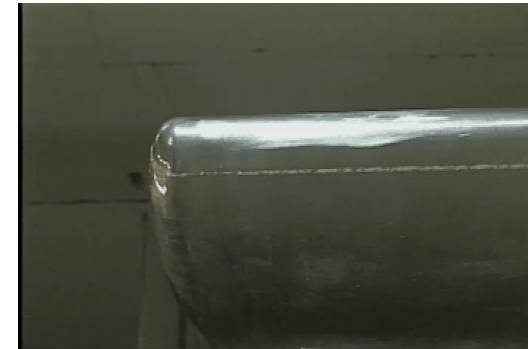
- Two potential topics for AePW-3 High Angle Working Group

- Flutter prediction: time domain and/or frequency domain, Mach 0.8, AoA = 5deg
- Buffet analysis, BSCW rigid wing, unsteady flow

Flutter prediction based on experimental data published in AIAA-93-1592



Buffet analysis based on experimental data described in AIAA-2013-1802



AoA = -1*, 0, 1, 2*, 3, 5 deg

Q / Mach psf	0.5	0.6	0.7	0.8	0.85	0.87
100	x	x	x	x		x
170	x	x	x	x		x
200				x	x	

EXPERIMENTAL UNSTEADY PRESSURES AT
FLUTTER ON THE SUPERCRITICAL WING
BENCHMARK MODEL

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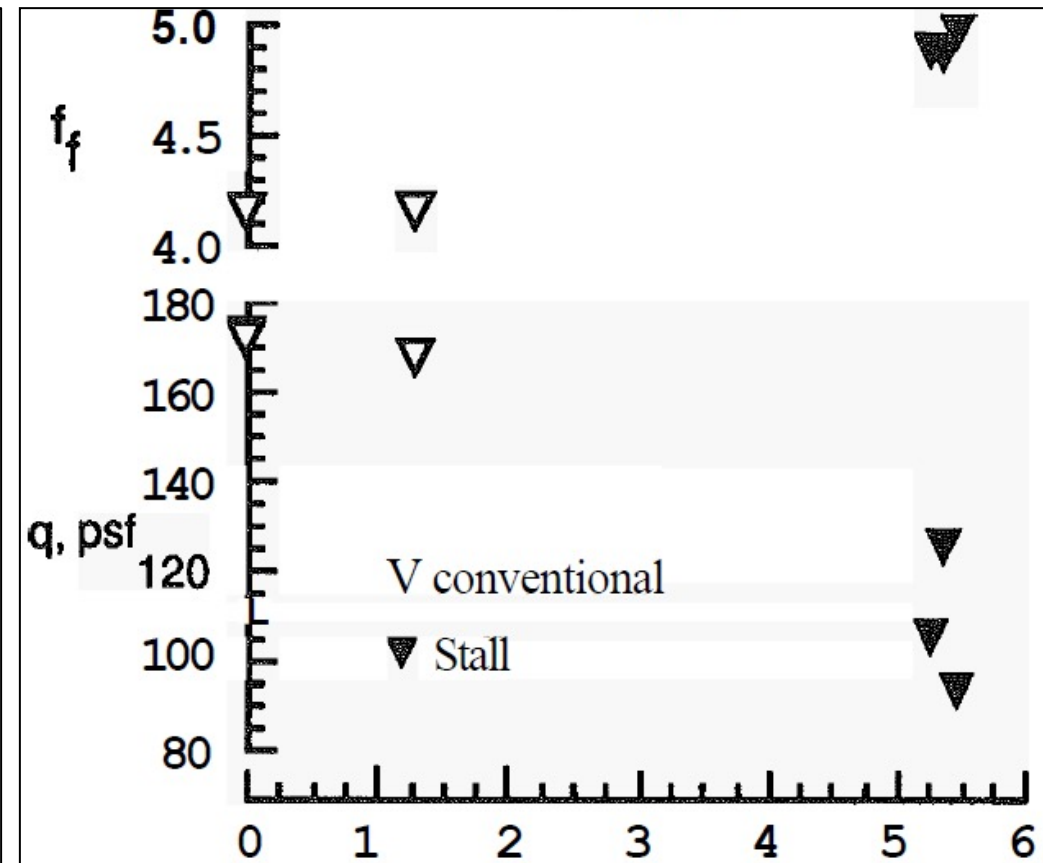
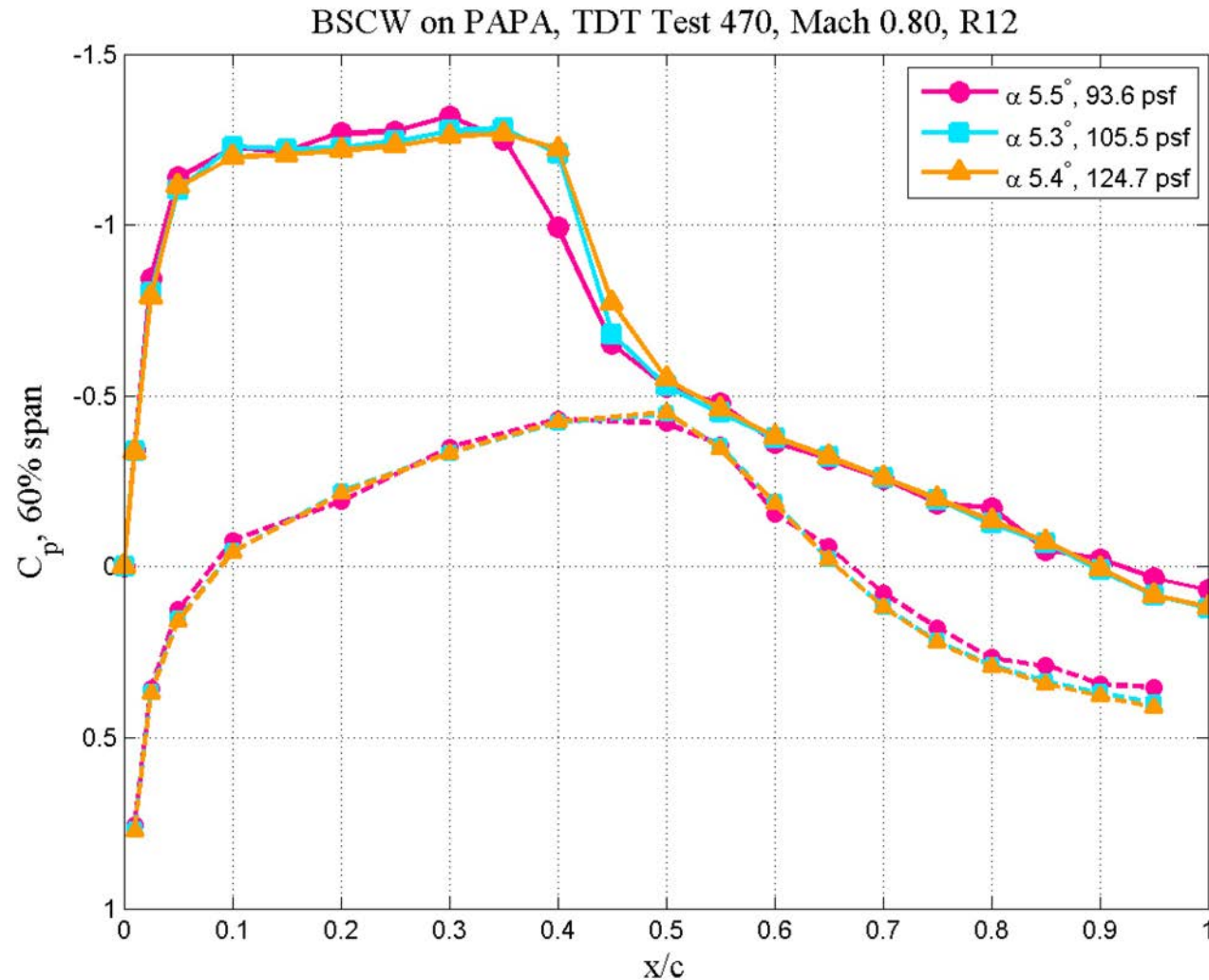


Figure 9. Stall flutter boundary in R-12 at $M = 0.80$.

BSCW, Mach 0.8, AoA = 5deg Results

BSCW Current Analysis:

FUN3D

Loci/Chem

Kestrel

EZNSS / MOAR

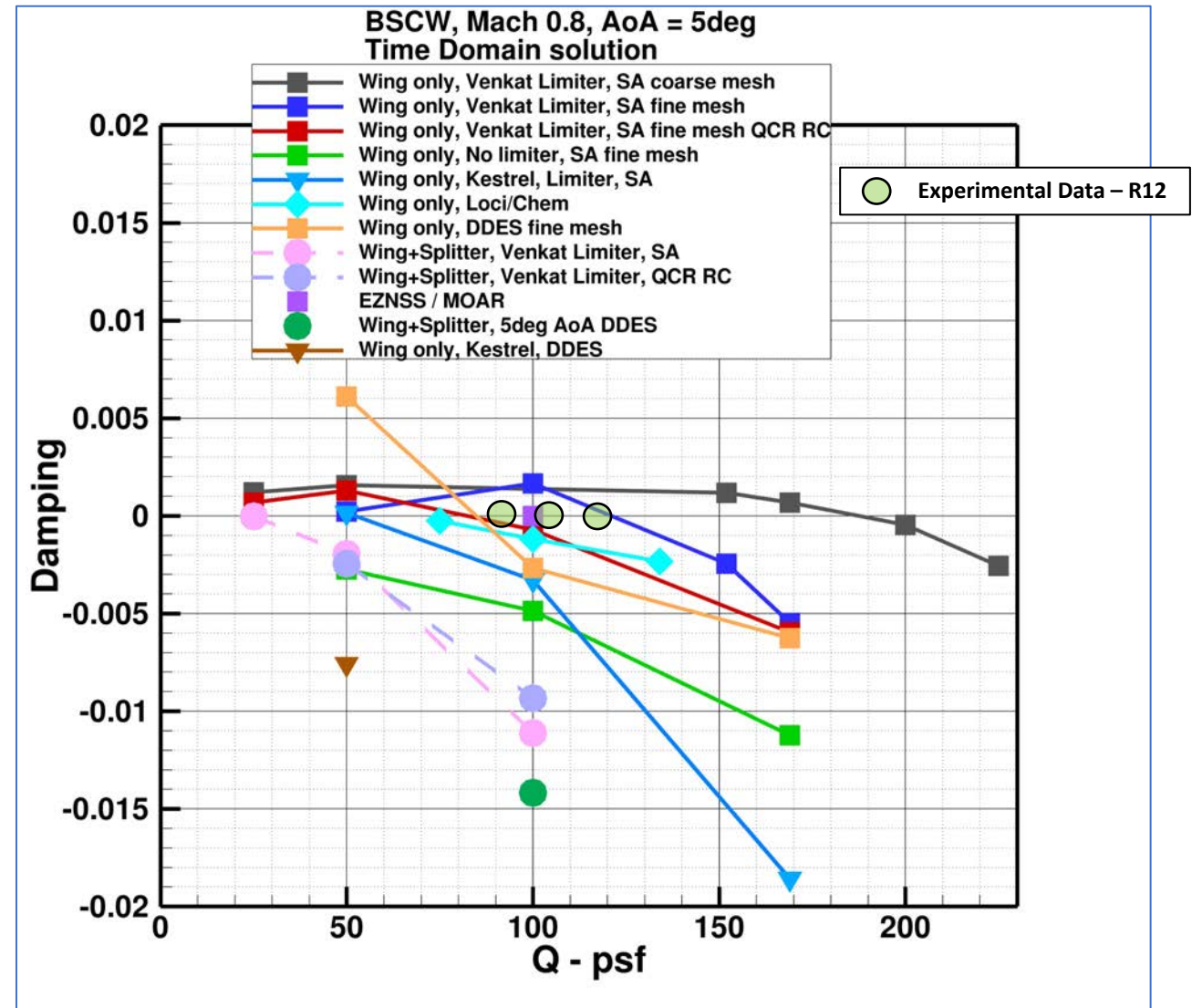
SA – Spalart-Allmaras model

QCR - Quadratic Constitutive Relationship

RC - rotation/curvature correction

Venkat - Venkatakrishnan limiter

DDES – Delayed Detached Eddy Simulation



BSCW, Mach 0.8, AoA = 5deg Results

BSCW Current Analysis:

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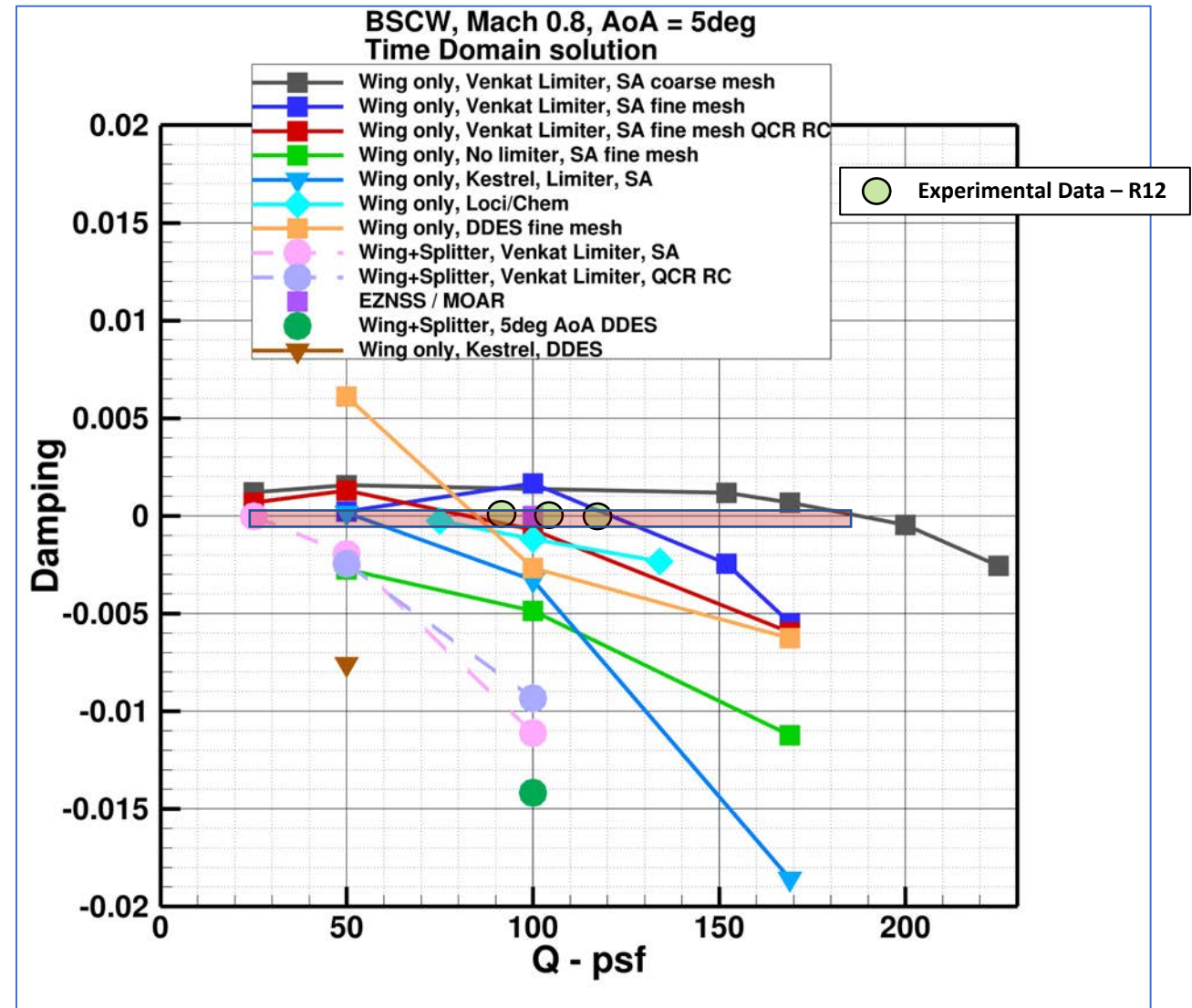
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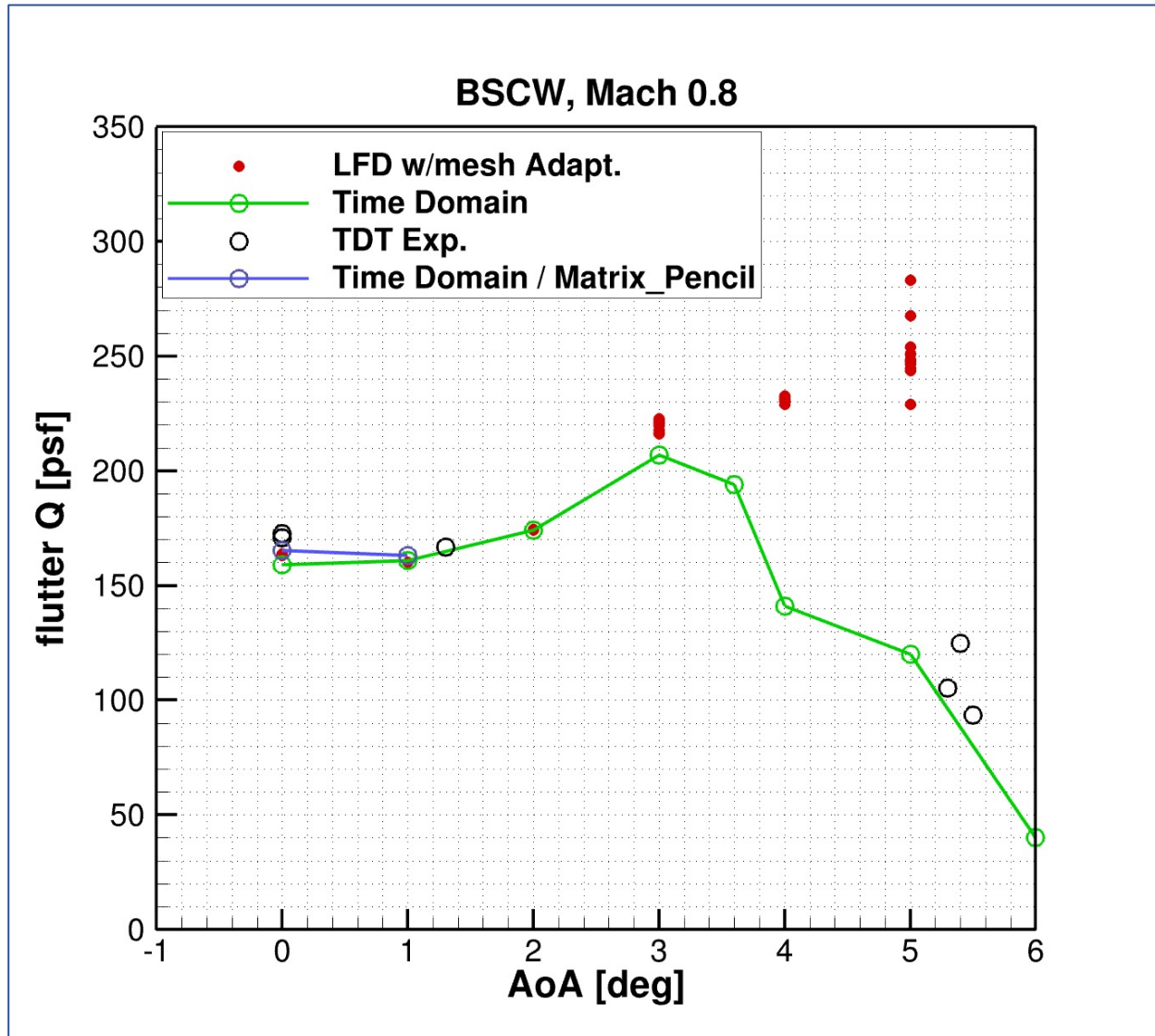
Venkat - Venkatakrishnan limiter

DDES – Delayed Detached Eddy Simulation



FUN3D, Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation

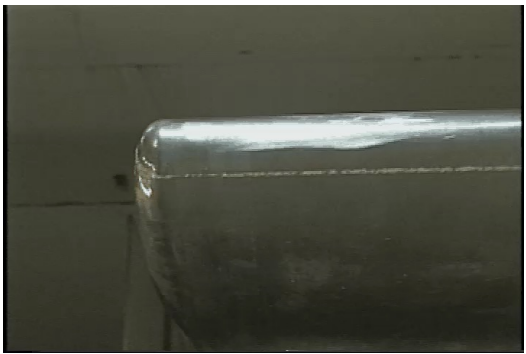


Shock buffet

- Can we release raw experimental data? **Yes!!!**
- We generated FFT, PSD, RMS, min/max/mean Cp, vs. frequency, Strouhal#, reduced frequency, etc.

Can we release processed data? **Yes!!!**

Buffet analysis based on experimental data described in AIAA-2013-1802

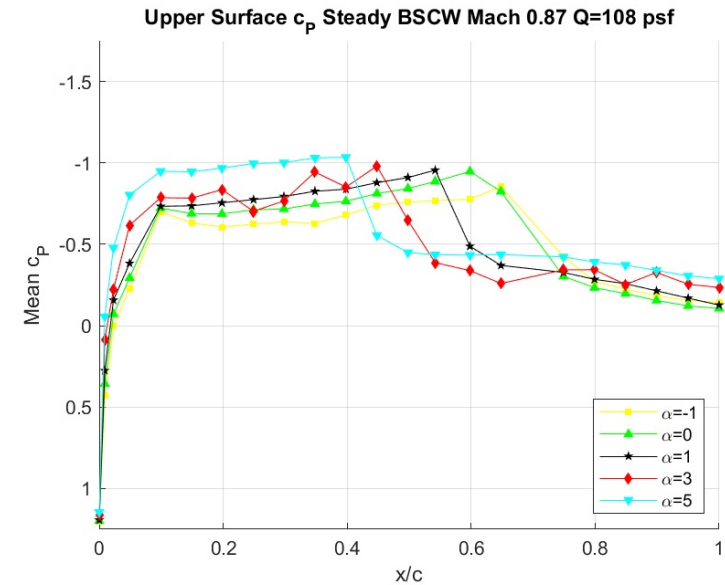
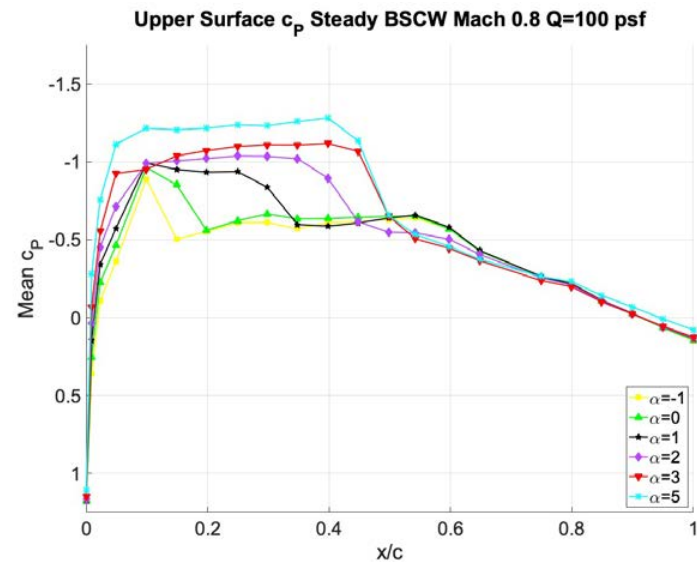
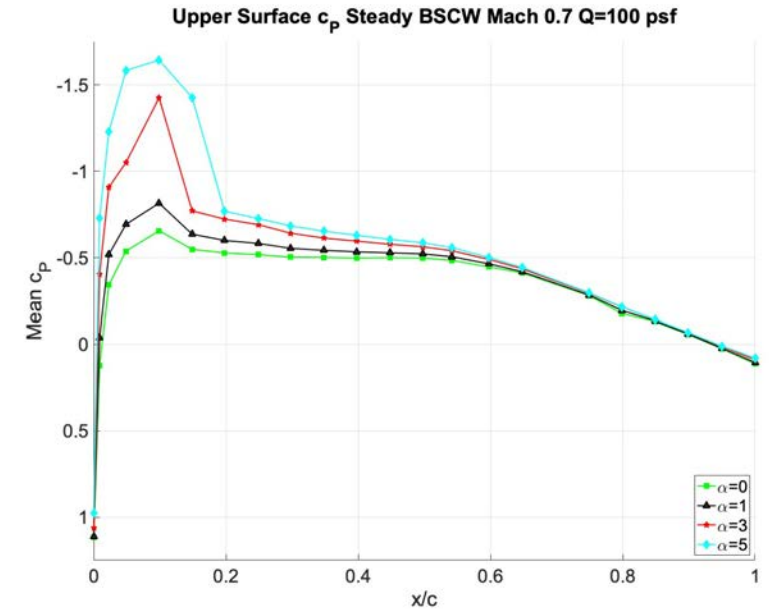
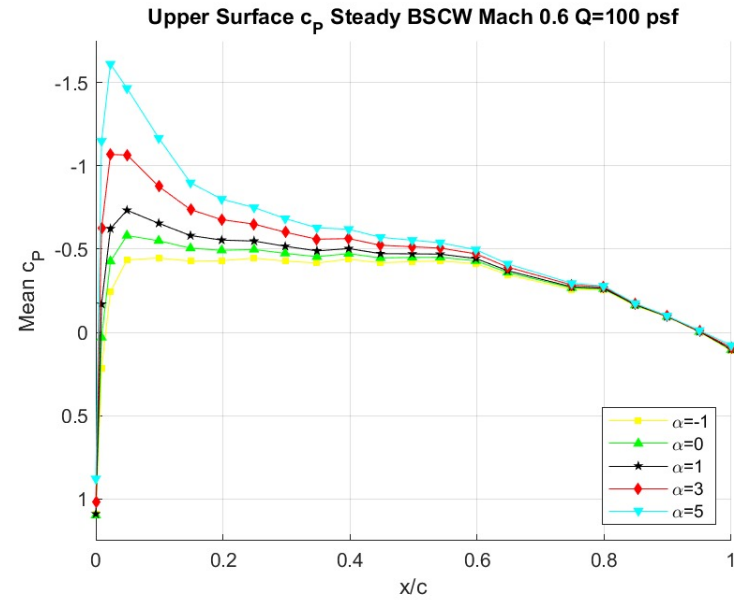
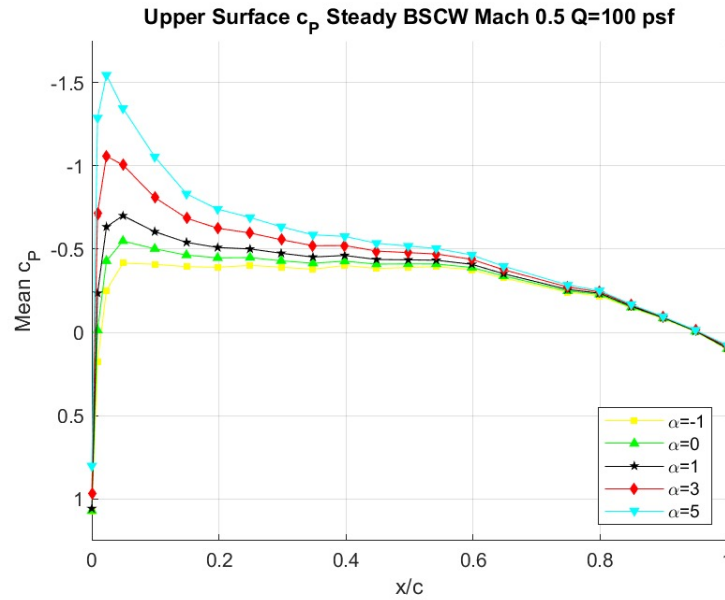


AoA = -1*, 0, 1, 2*, 3, 5 deg

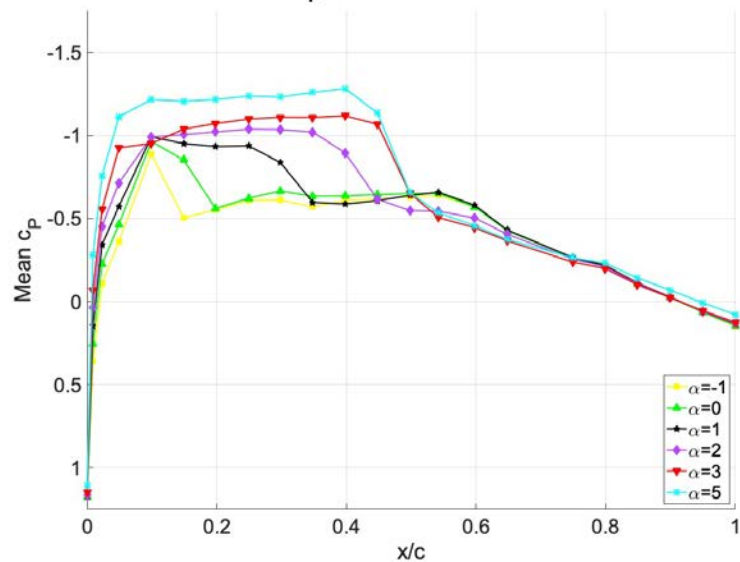
Sample data set

Q / Mach psf	0.5	0.6	0.7	0.8	0.85	0.87
100	x	x	x	x		x
170	x	x	x	x		x
200				x	x	

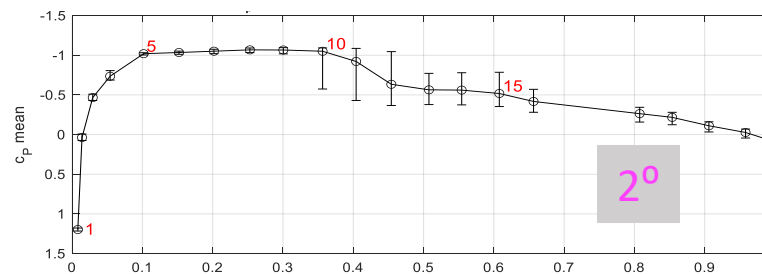
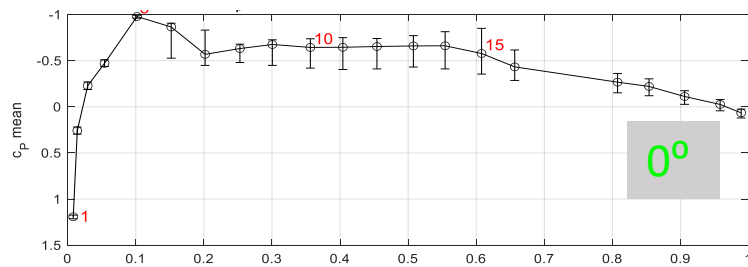
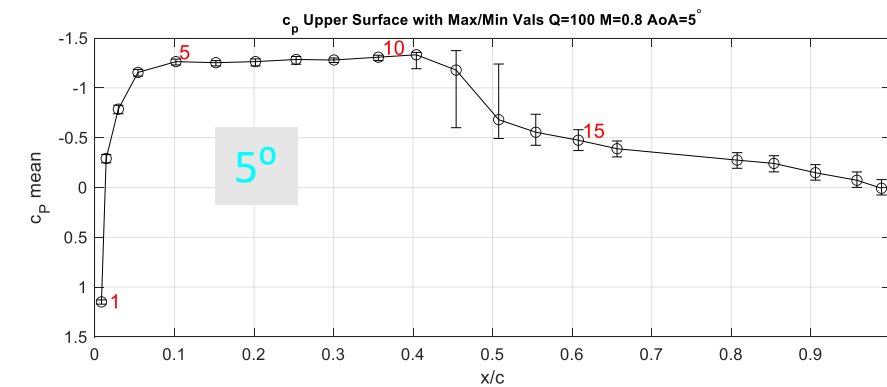
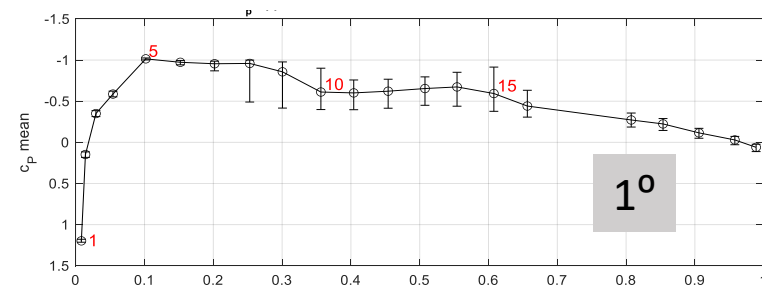
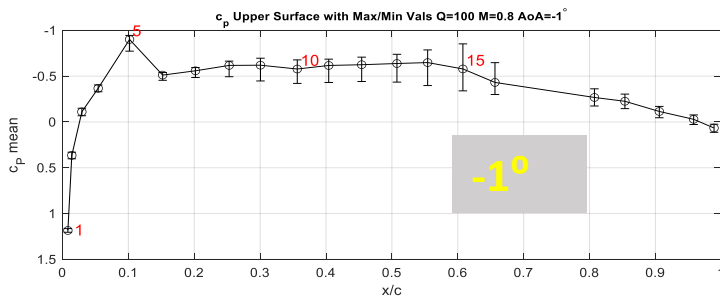
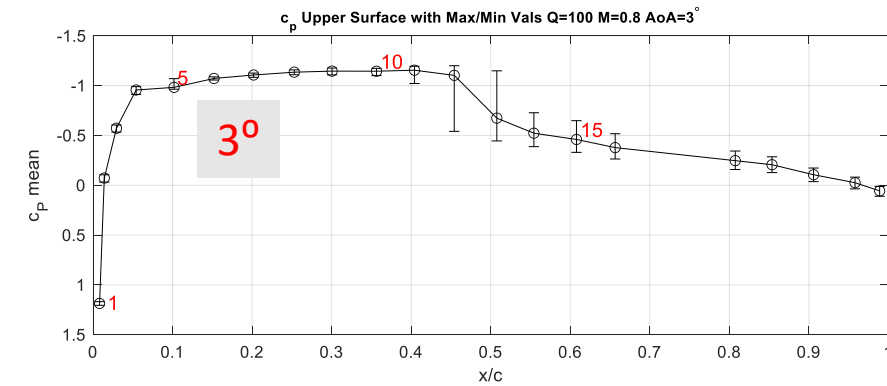
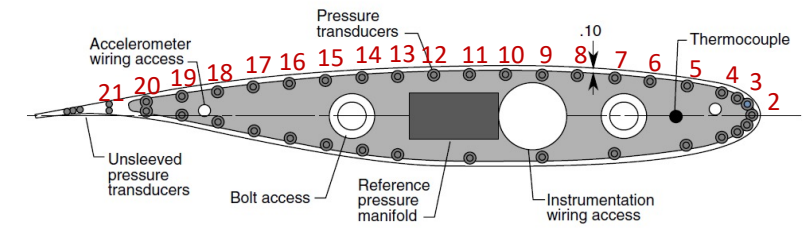
**Q = 100 psf, Mach 0.5, 0.6, 0.7, 0.8, 0.87,
AoA = -1*, 0, 1, 2*, 3, 5 deg
Mean Cp plots Upper surface**



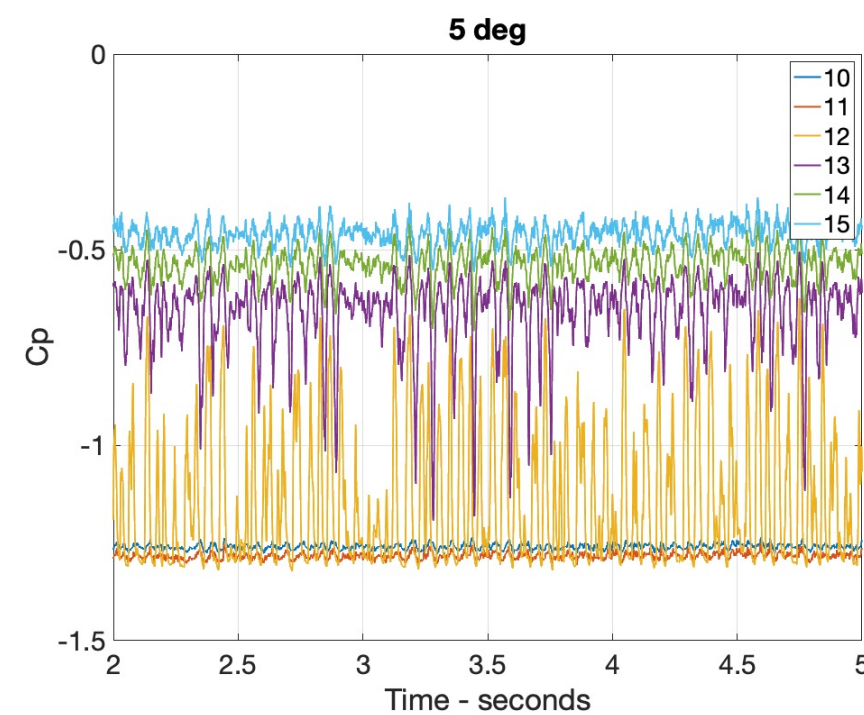
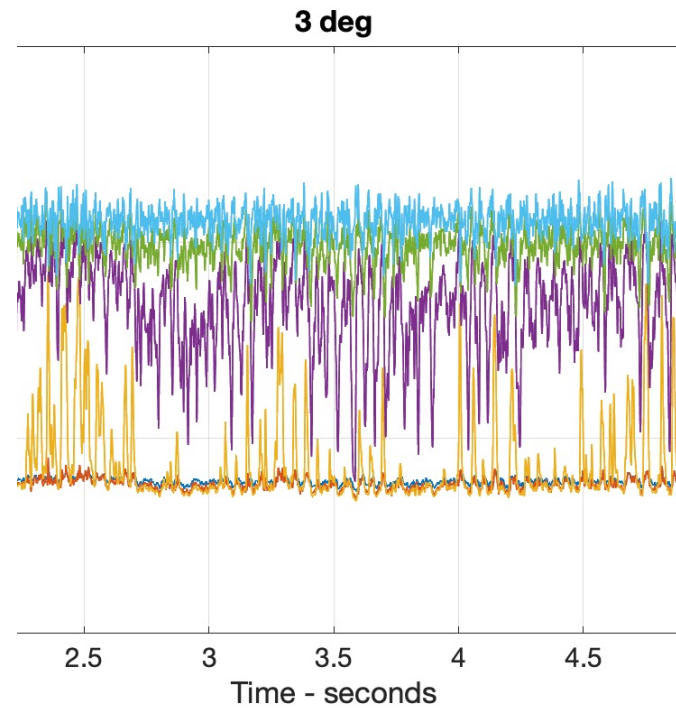
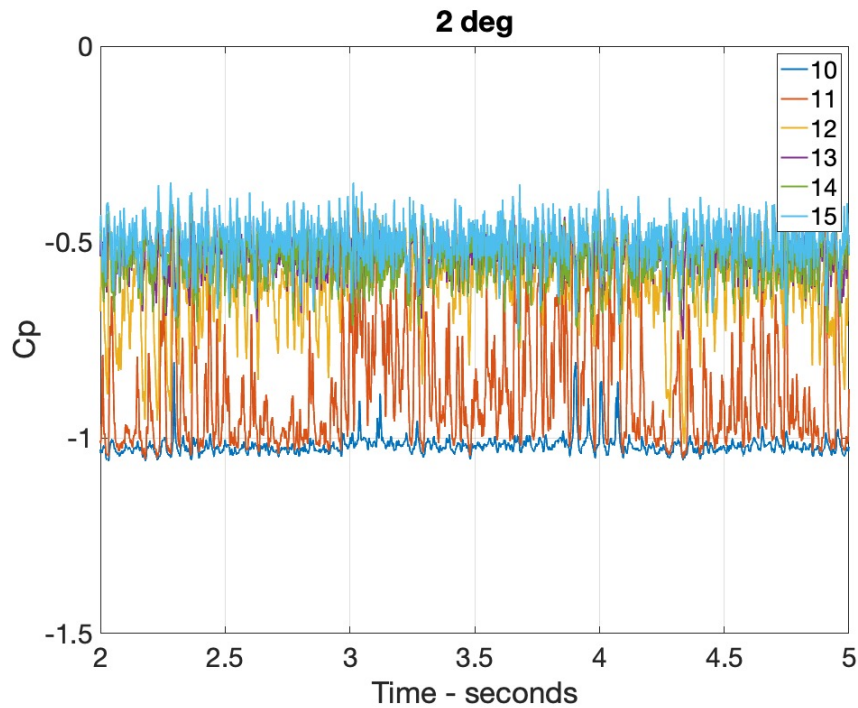
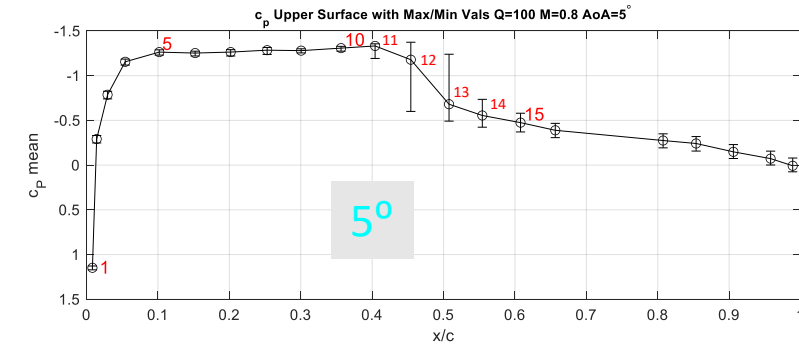
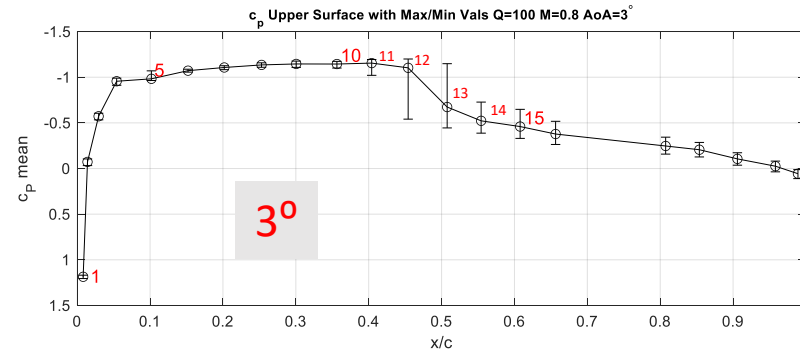
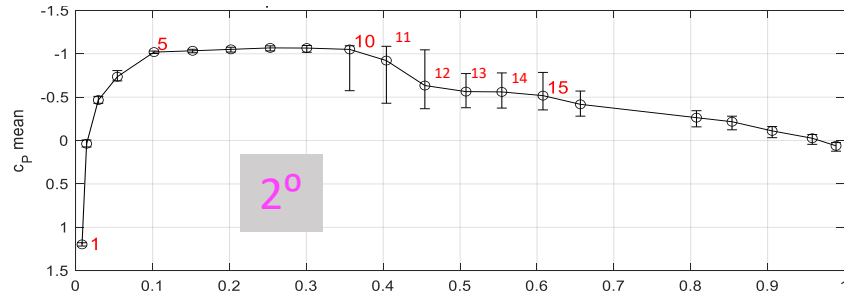
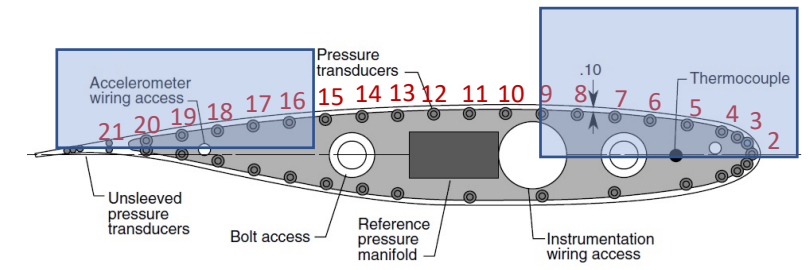
Upper Surface c_p Steady BSCW Mach 0.8 Q=100 psf



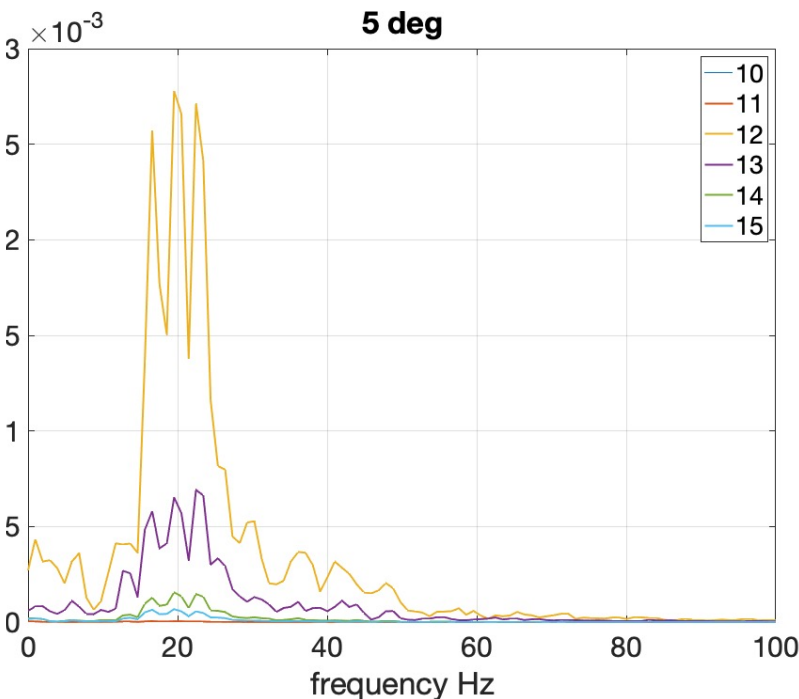
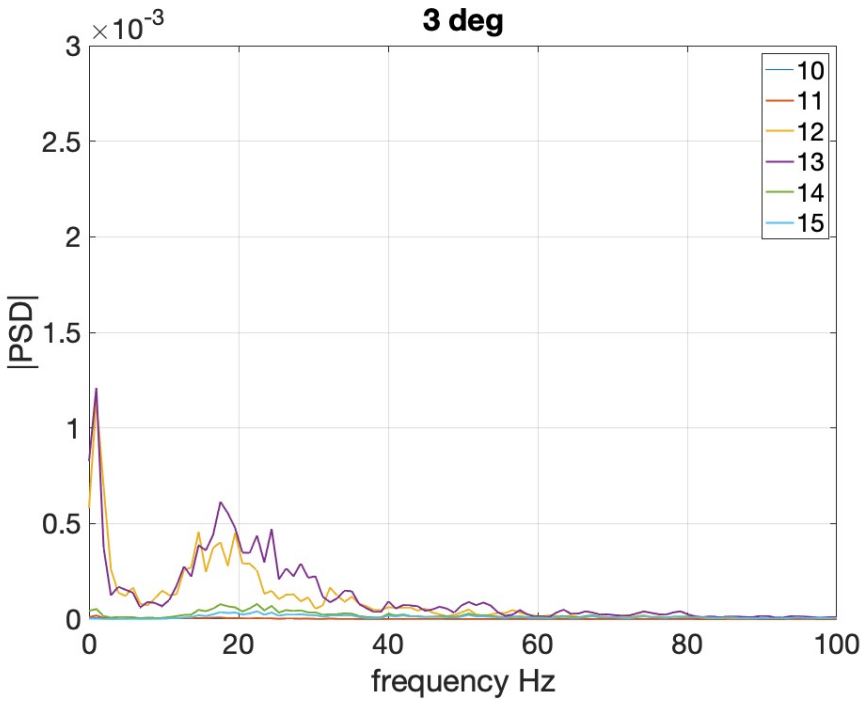
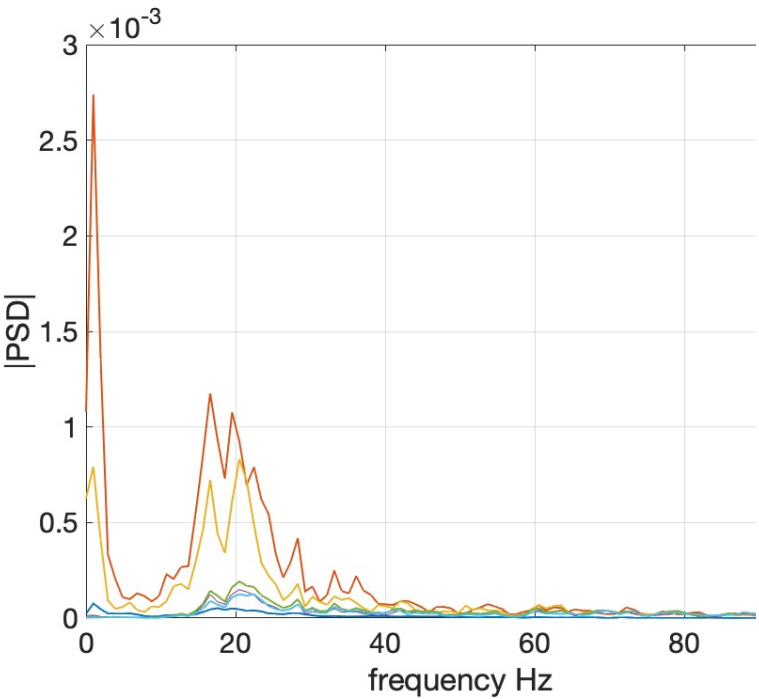
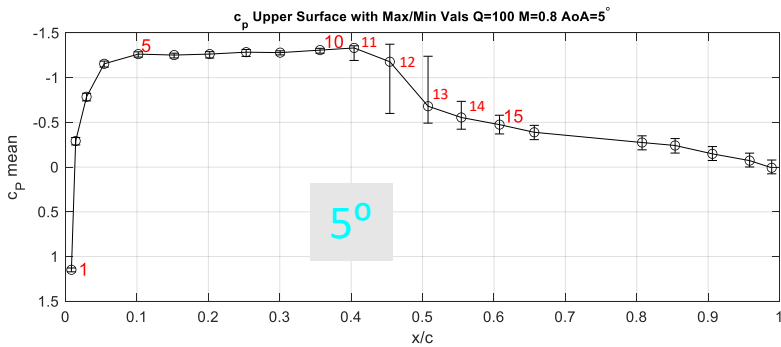
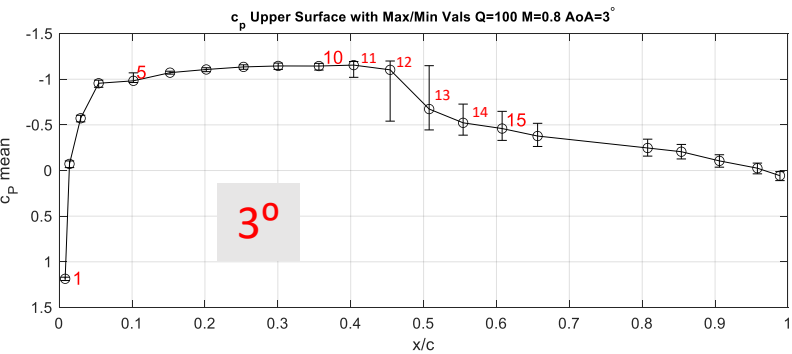
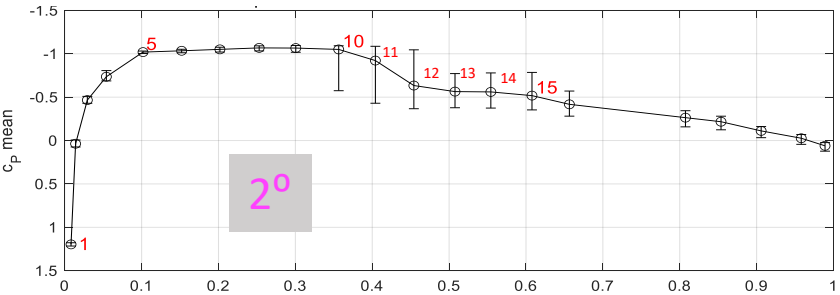
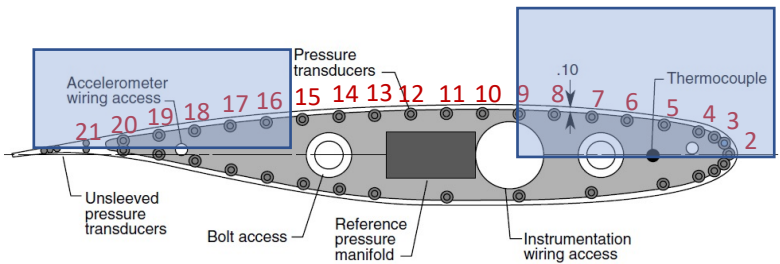
Q = 100 psf, Mach 0.8,
AoA = -1,0,1,2,3,5 deg
Mean Cp plots Upper surface



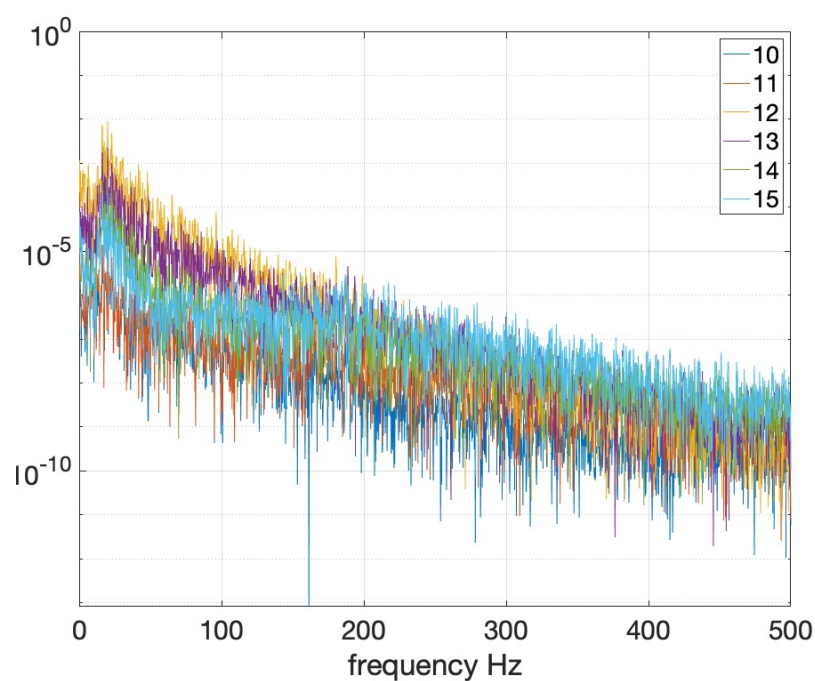
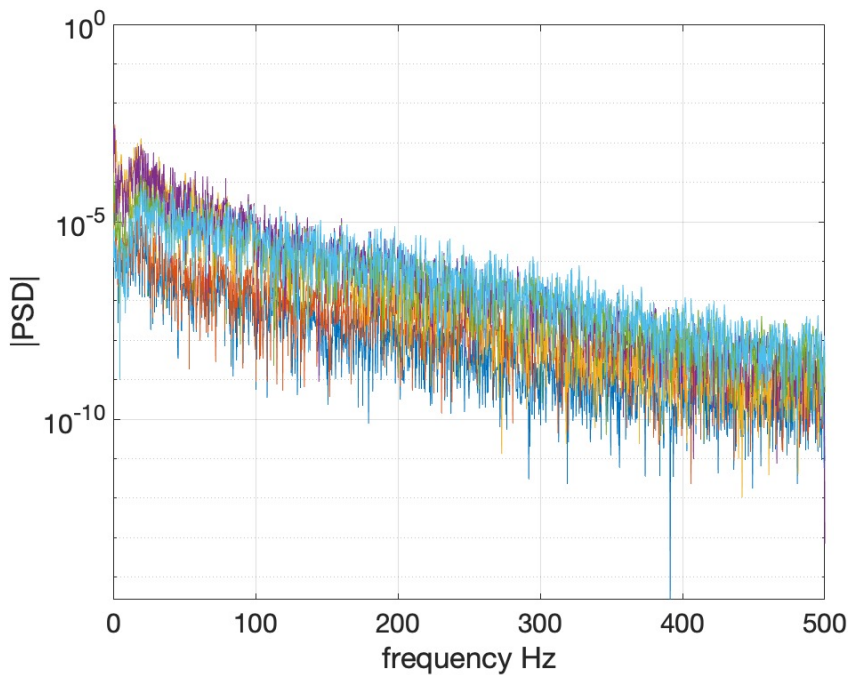
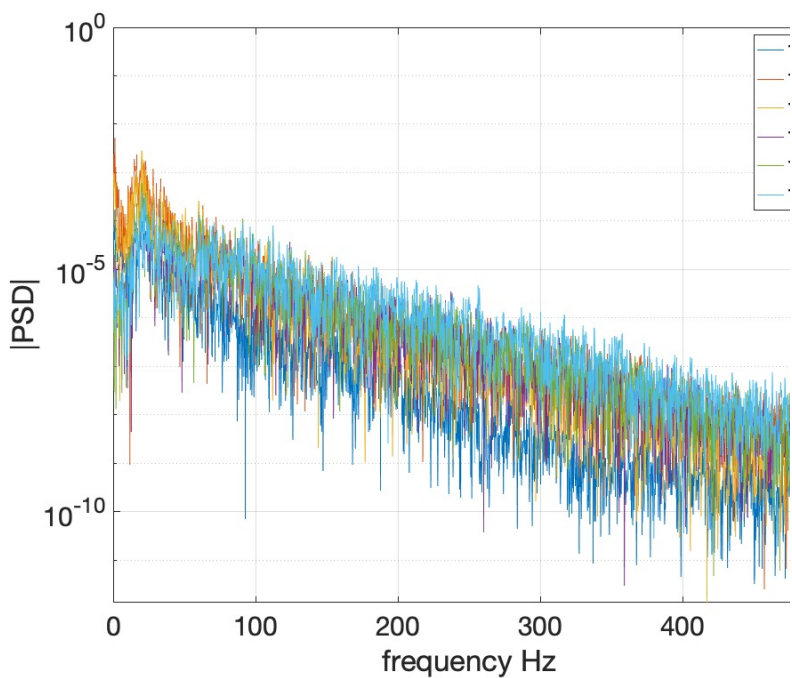
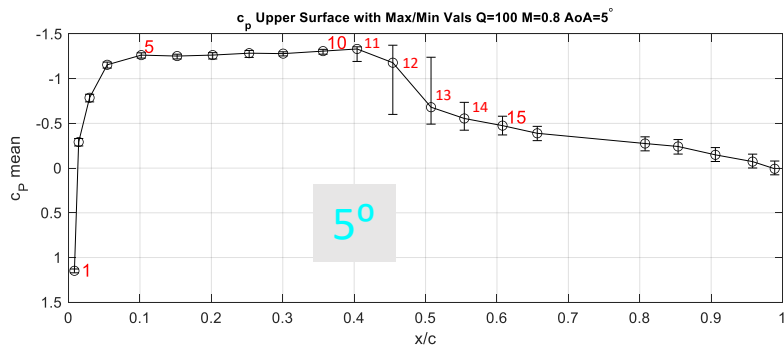
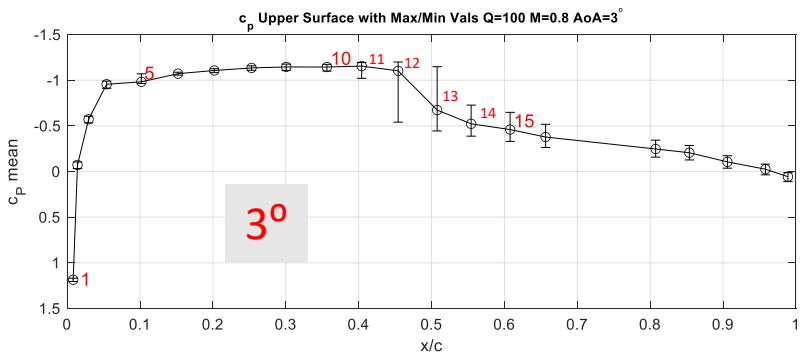
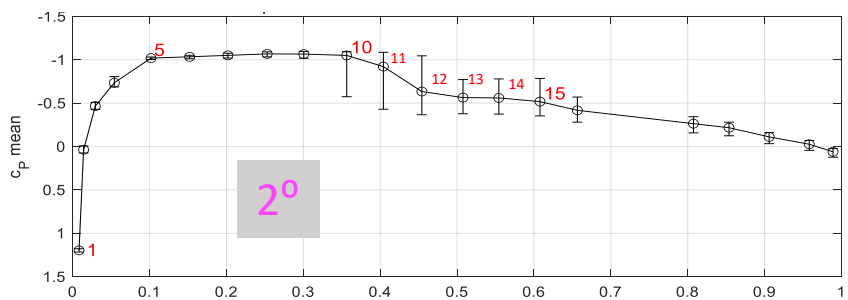
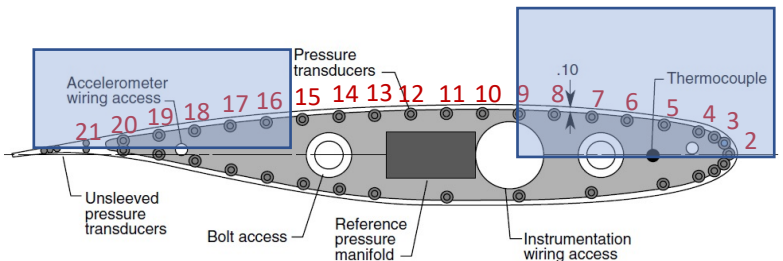
Q = 100 psf, Mach 0.8,
AoA = -1,0,1,2,3,5 deg
Mean Cp plots Upper surface
and raw data

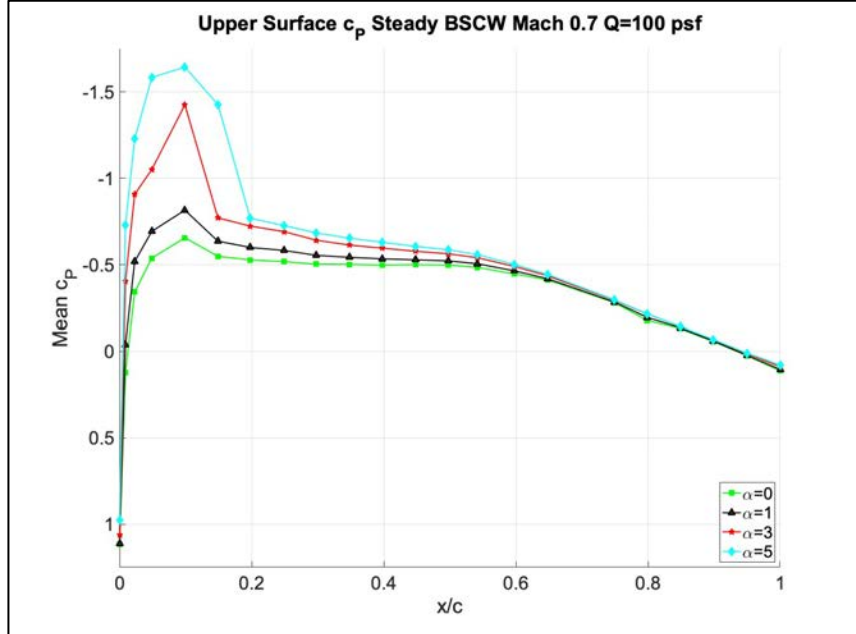


**Q = 100 psf, Mach 0.8,
AoA = 2,3,5 deg
PSD Upper surface**

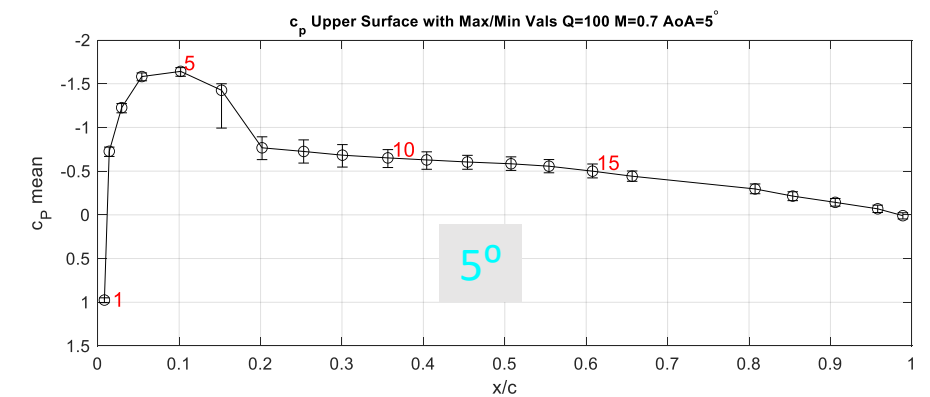
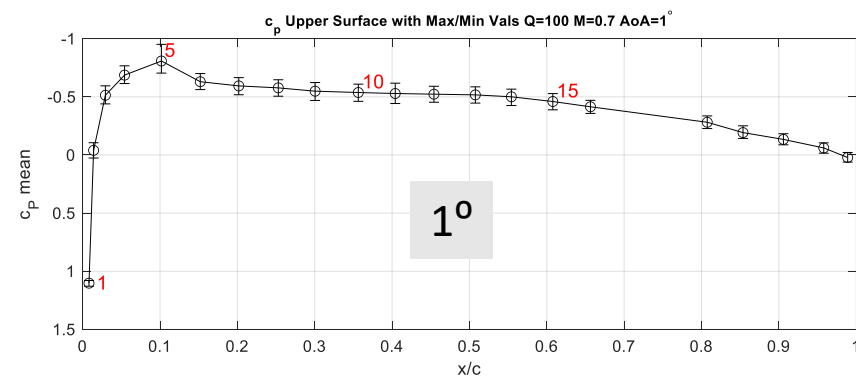
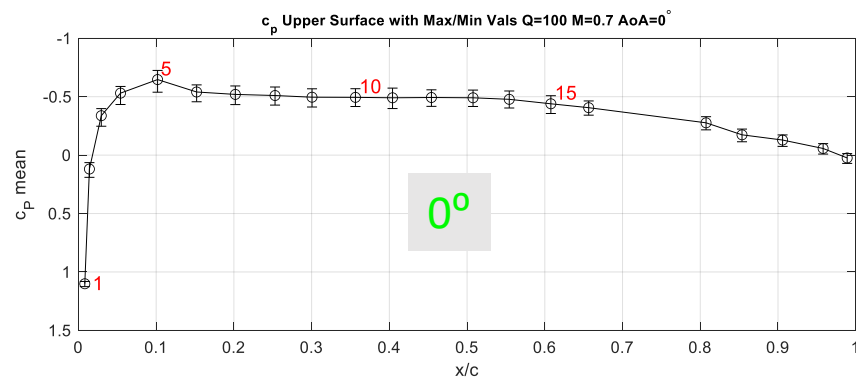
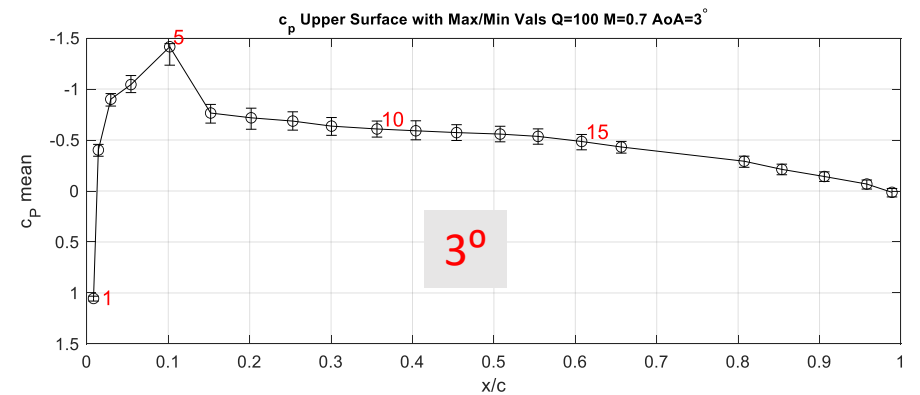
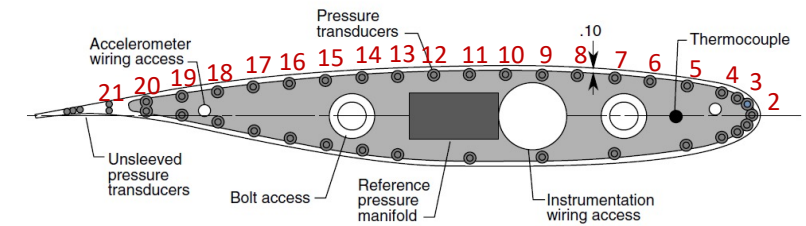


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AoA = 2,3,5 deg
PSD Upper surface**

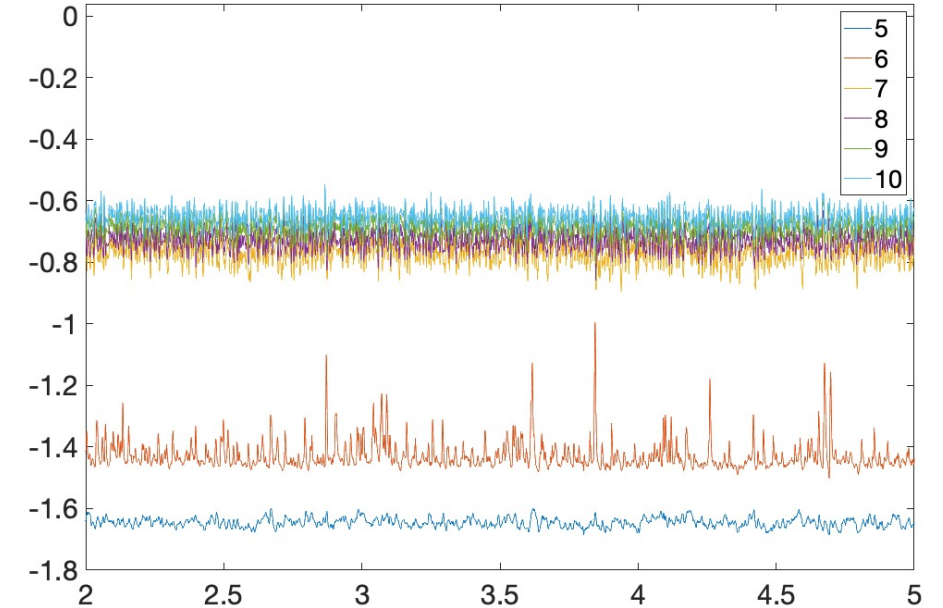
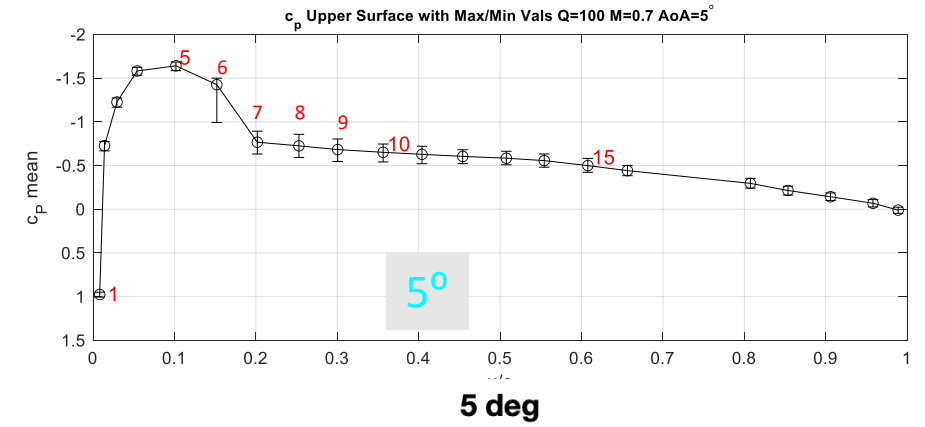
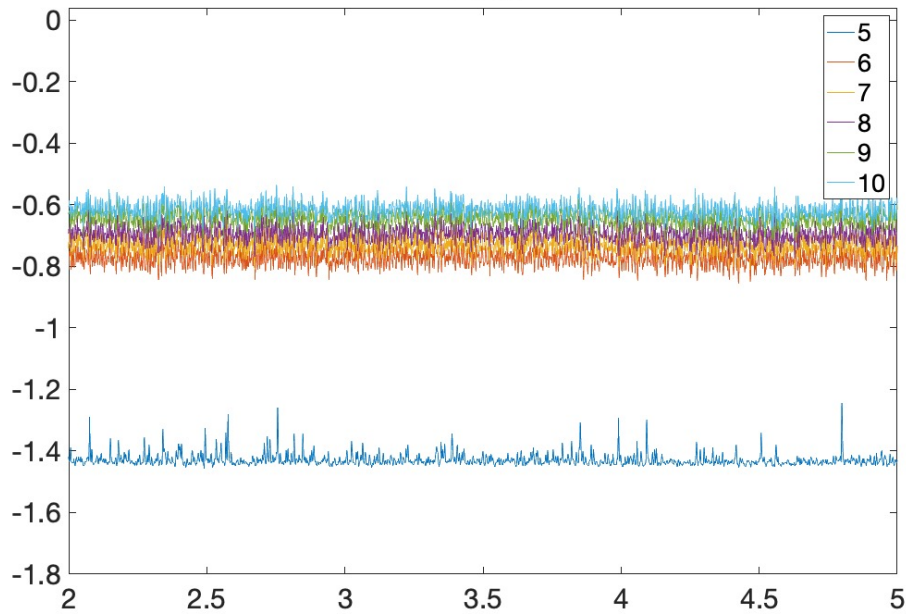
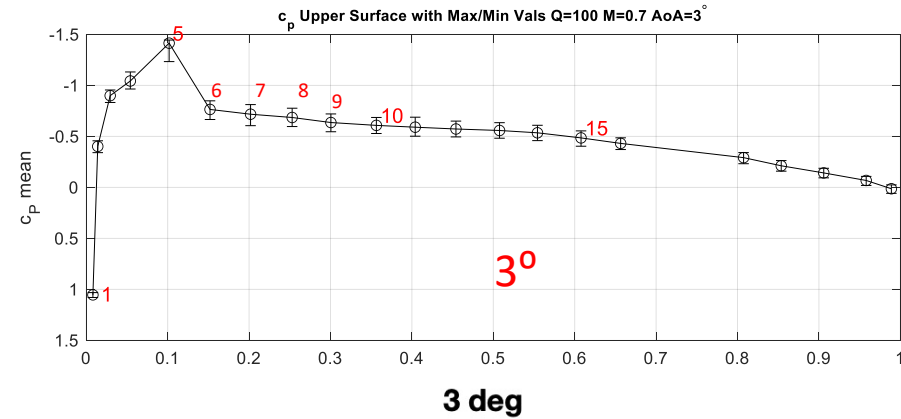
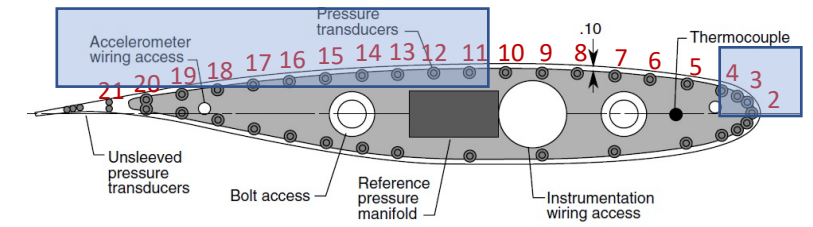




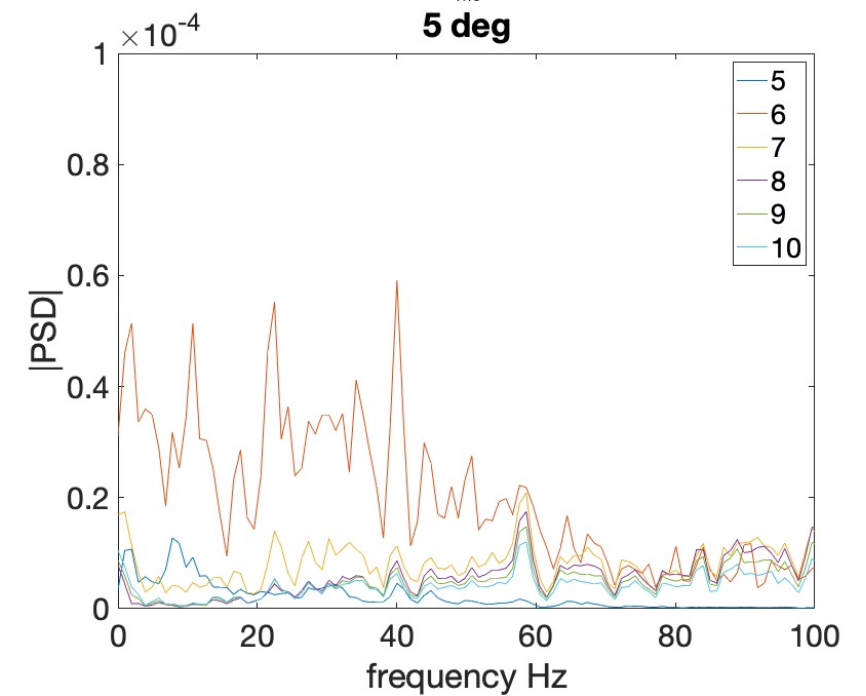
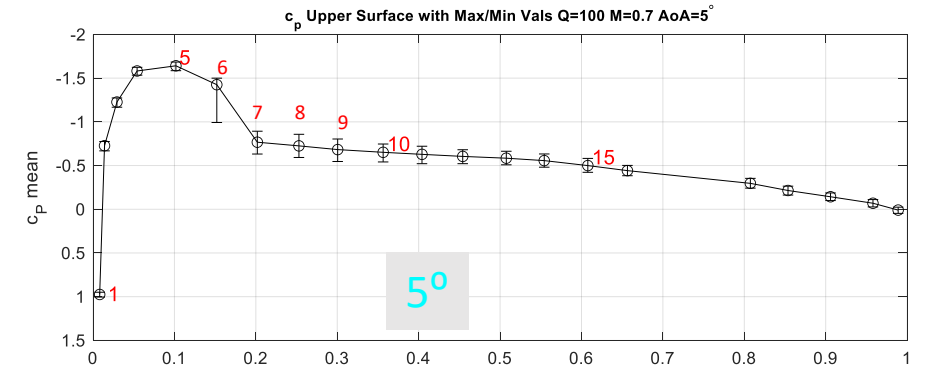
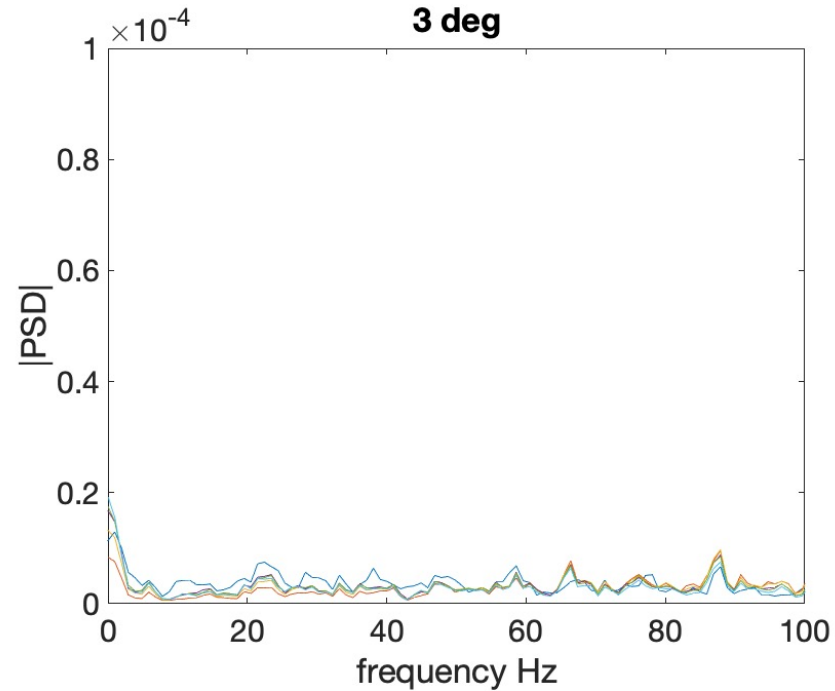
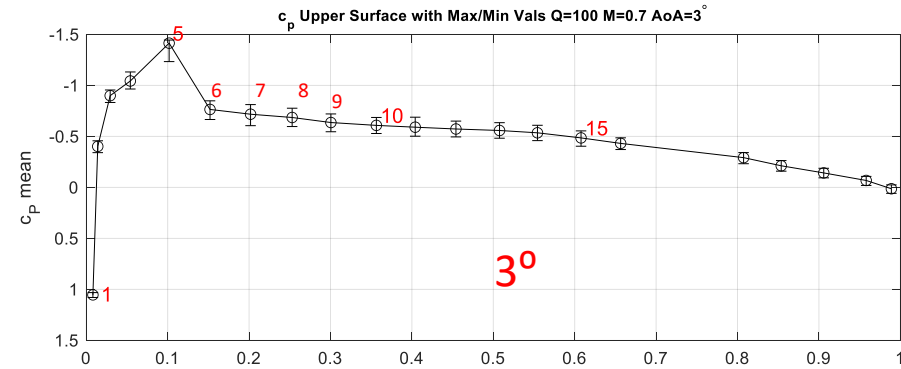
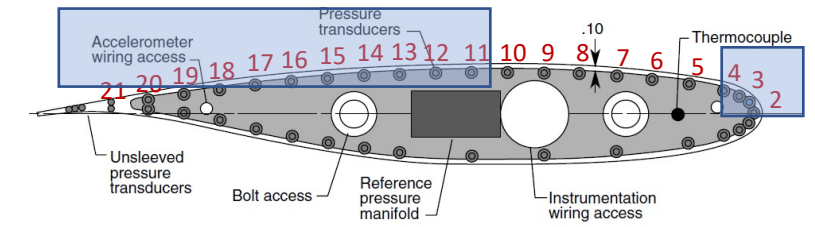
**$Q = 100$ psf, Mach 0.7,
AoA = 0,1,3,5 deg
Mean C_p plots Upper surface**



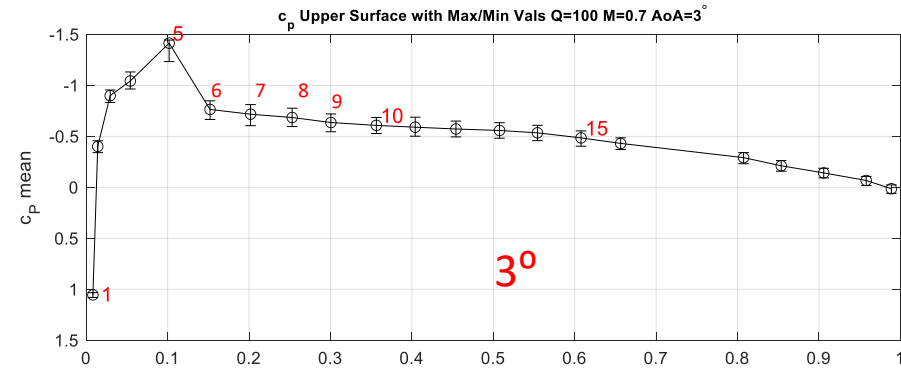
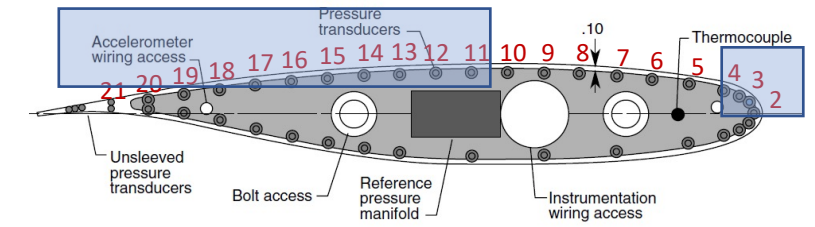
**Q = 100 psf, Mach 0.7,
AoA = 3,5 deg
Mean Cp plots Upper surface
and raw data**



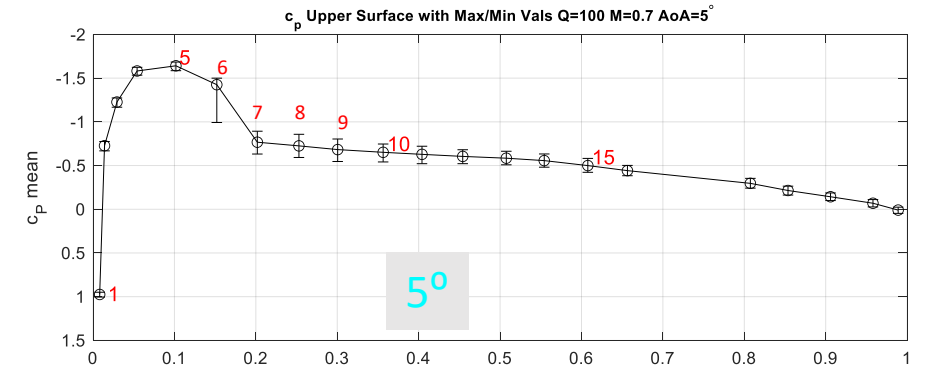
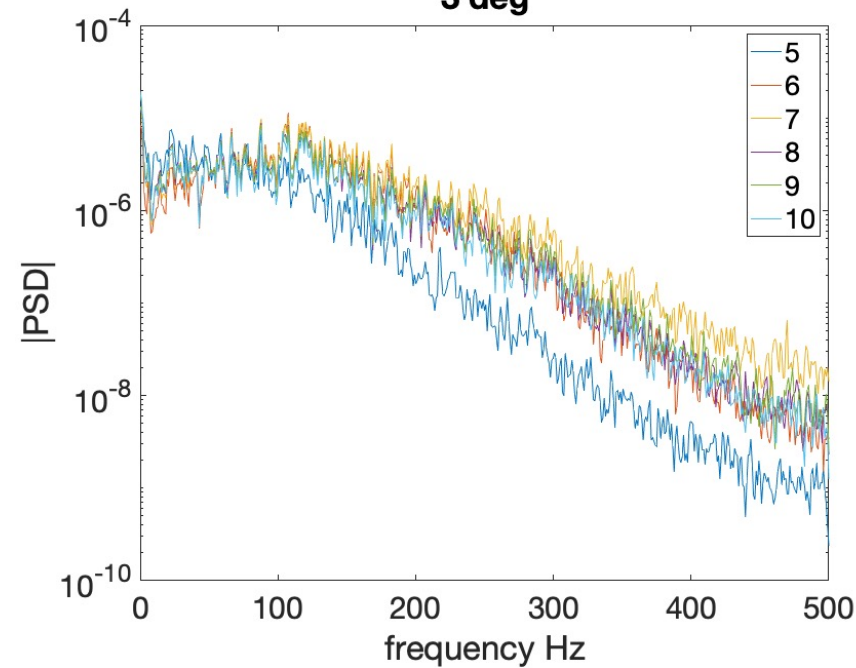
Q = 100 psf, Mach 0.7,
AoA = 3,5 deg
Mean Cp plots Upper surface
and PSD



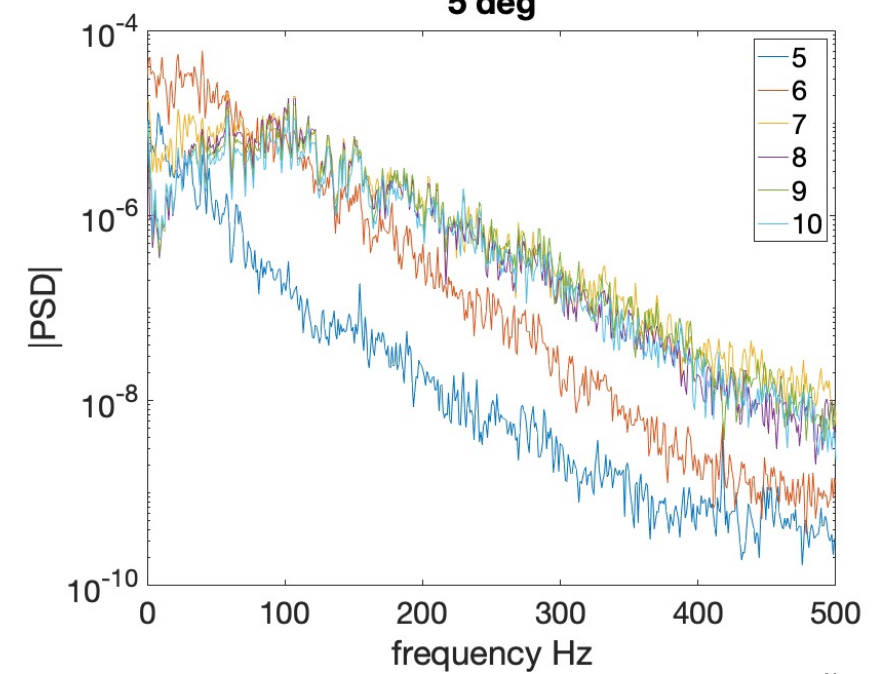
Q = 100 psf, Mach 0.7,
AoA = 3,5 deg
Mean Cp plots Upper surface
and PSD

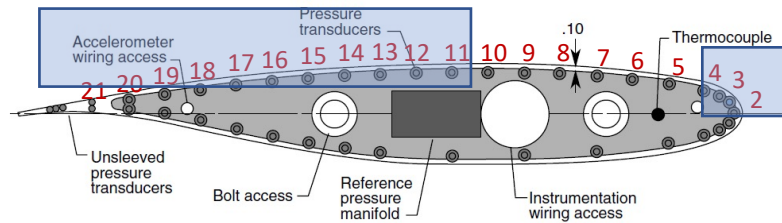


3 deg

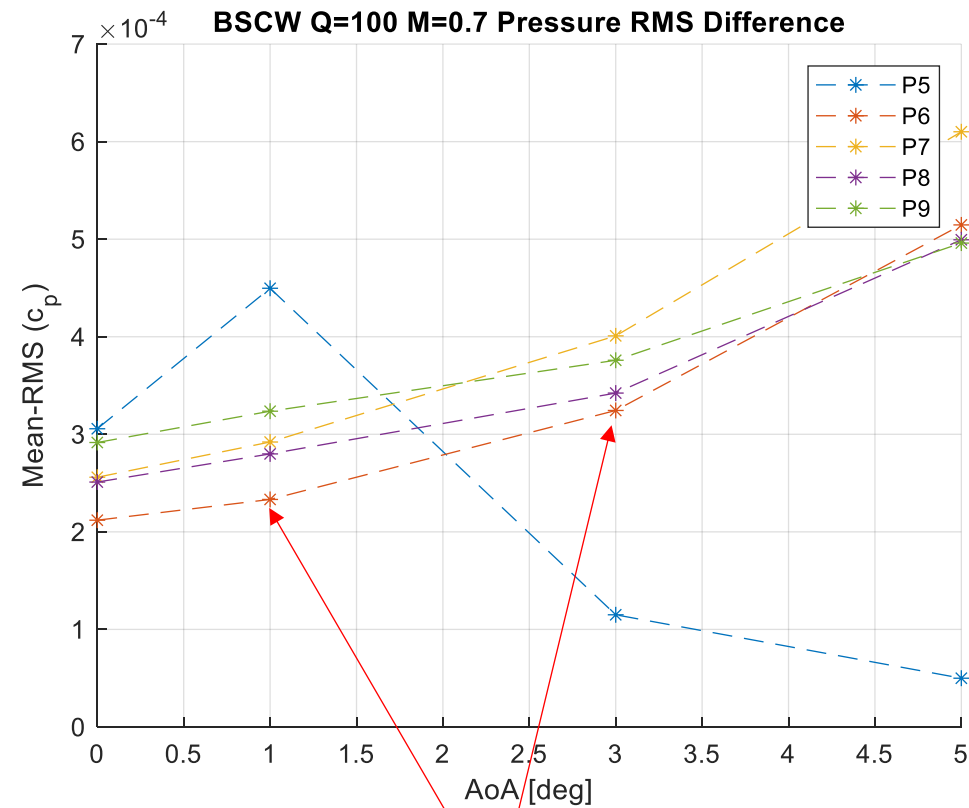


5 deg

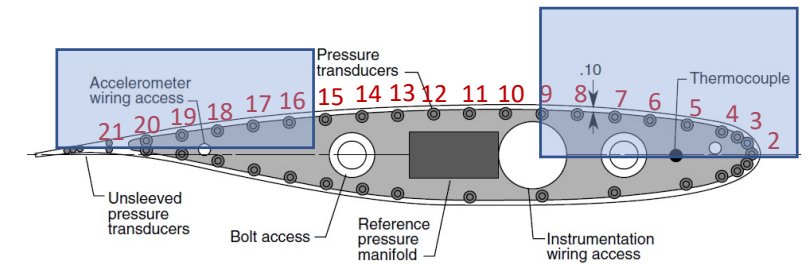




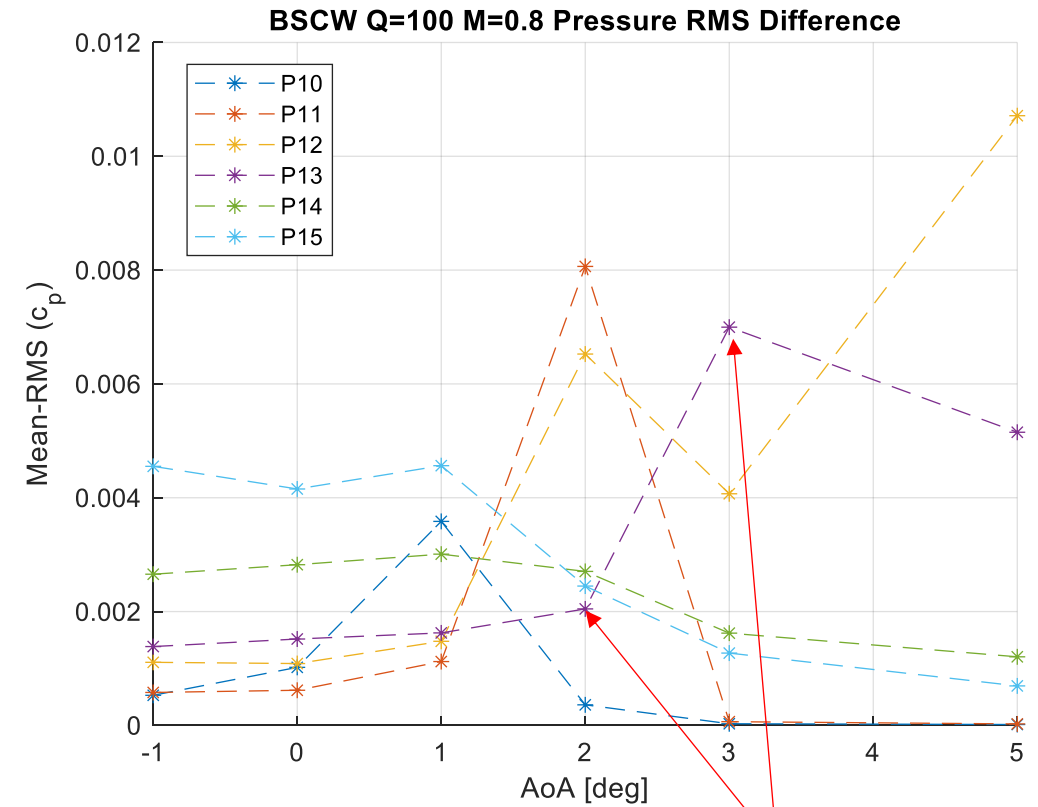
**Q = 100 psf, Mach 0.7,
AoA = 0,1,3,5 deg
Mean RMS plots Upper surface**



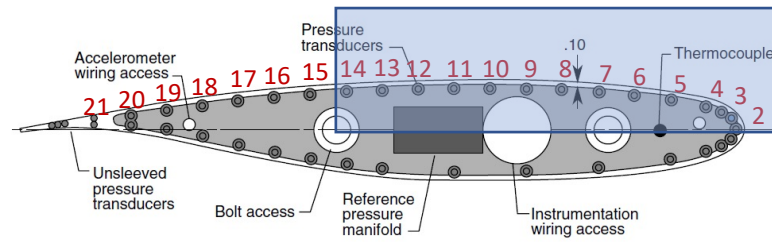
Shock
Buffet
Onset?



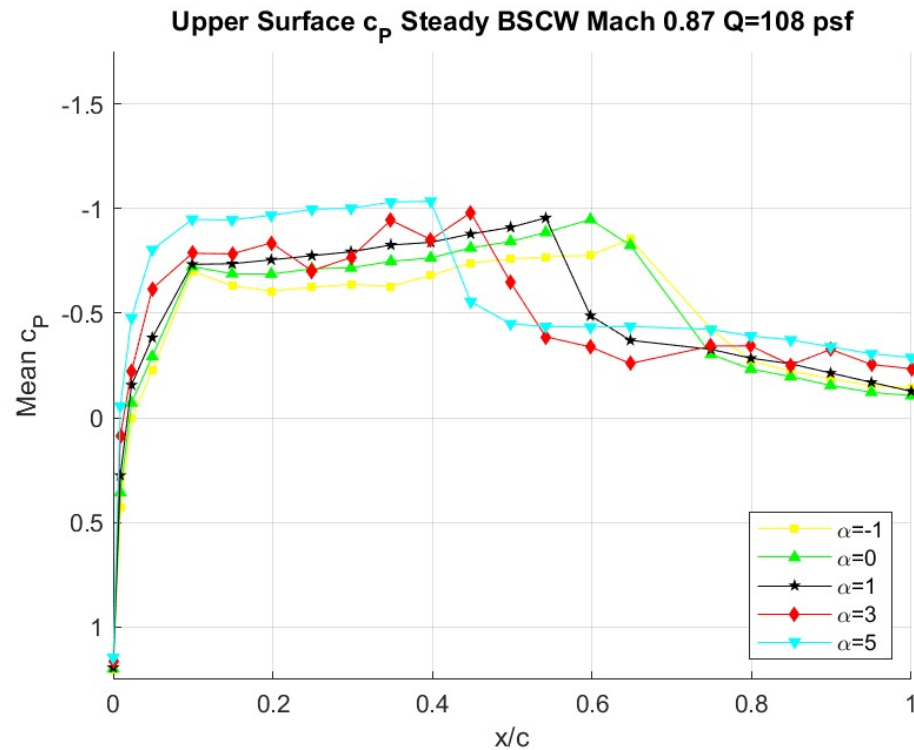
**Q = 100 psf, Mach 0.8,
AoA = -1,0,1,2,3,5 deg
Mean RMS plots Upper surface**



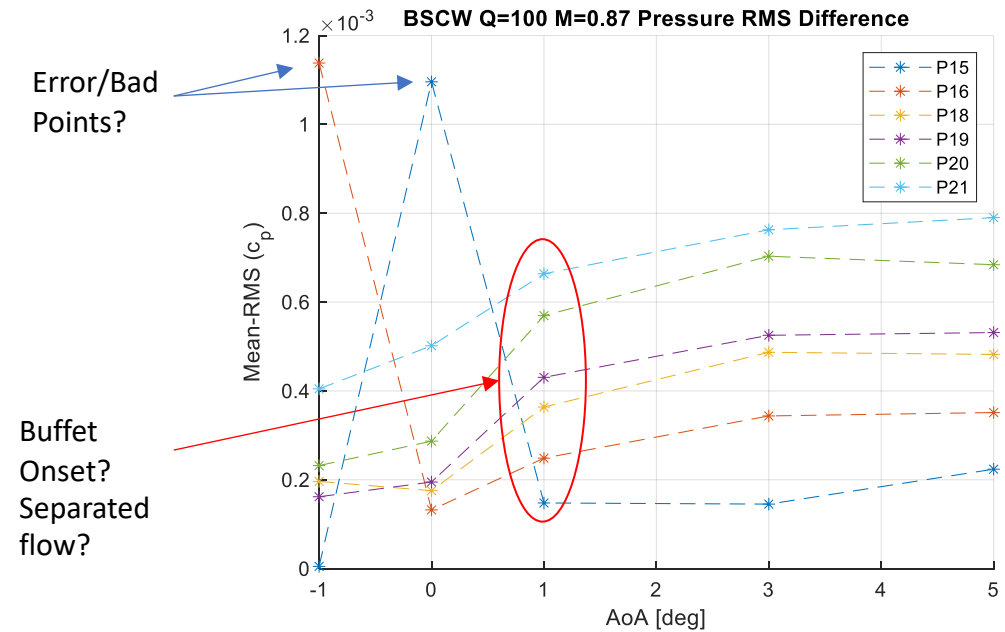
Shock
Buffet
Onset?



**Q = 100 psf, Mach 0.87,
AoA = -1,0,1,3,5 deg
Mean C_p plots Upper surface**

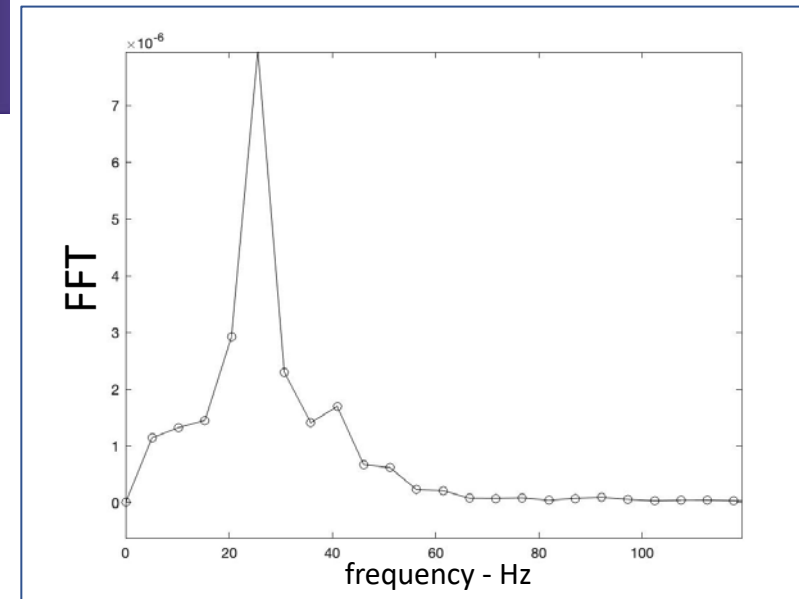
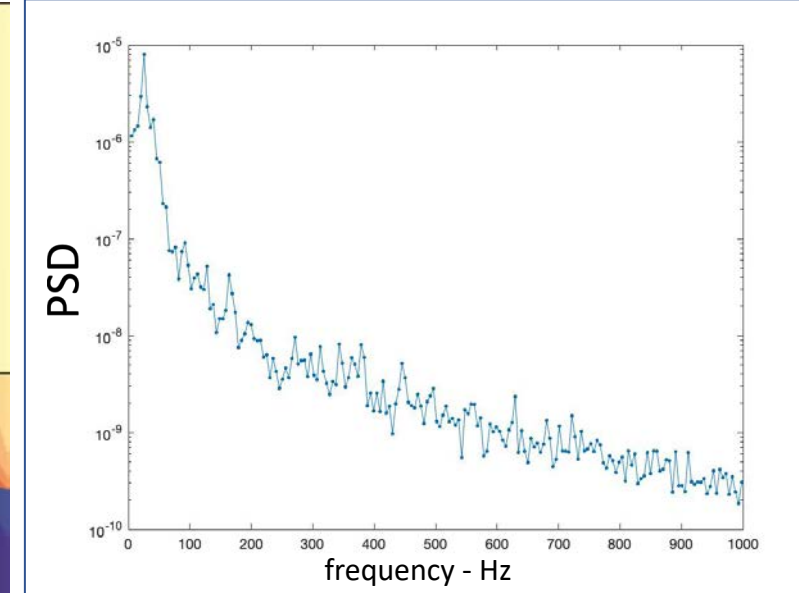
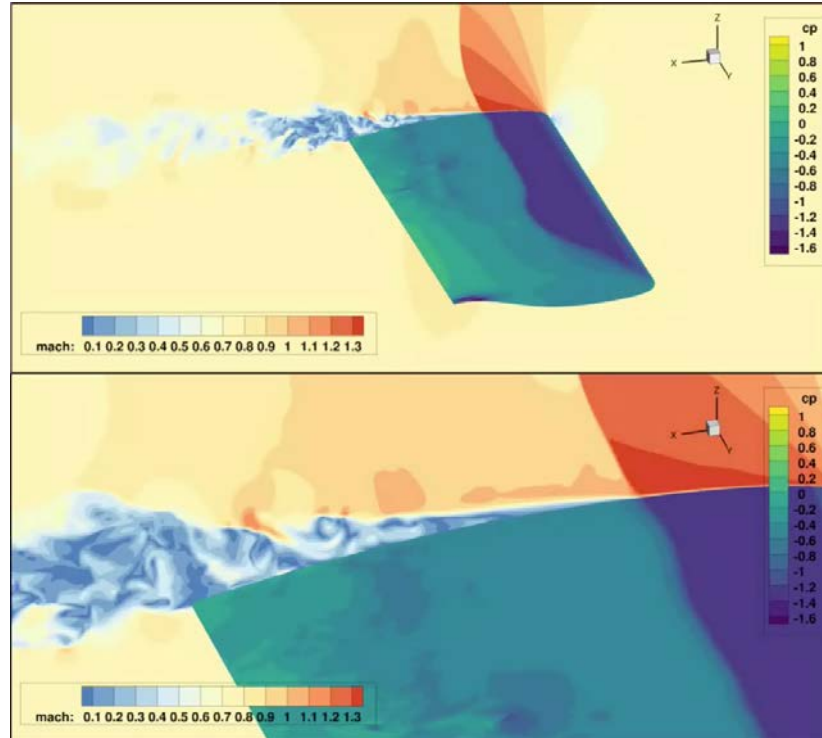
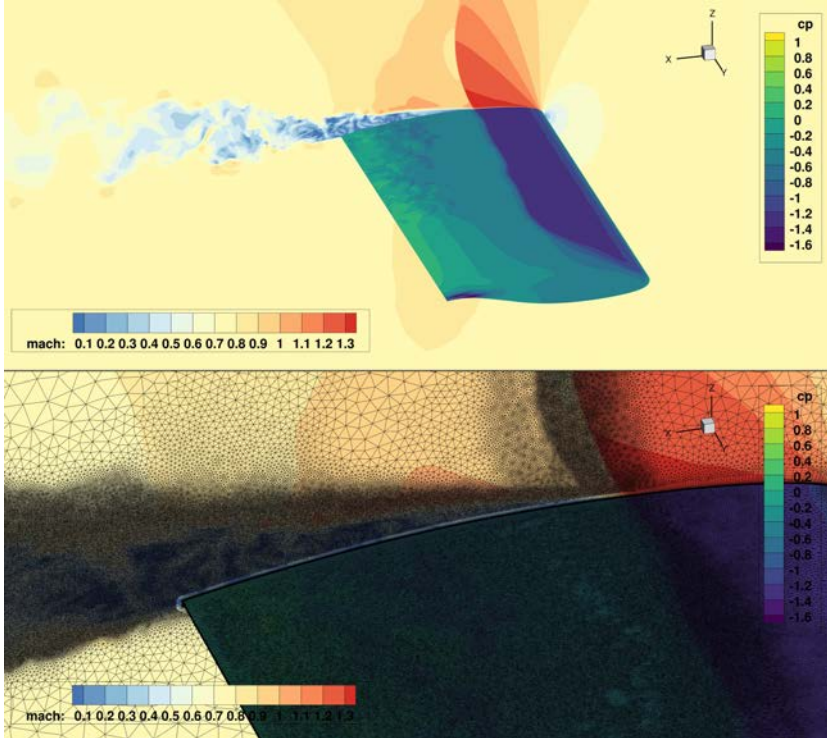


**Q = 100 psf, Mach 0.87,
AoA = -1,0,1,3,5 deg
Mean RMS plots Upper surface**

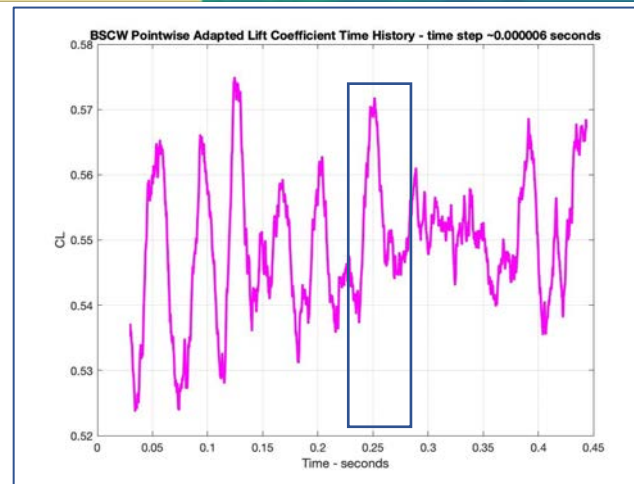


Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 1: ~31M nodes



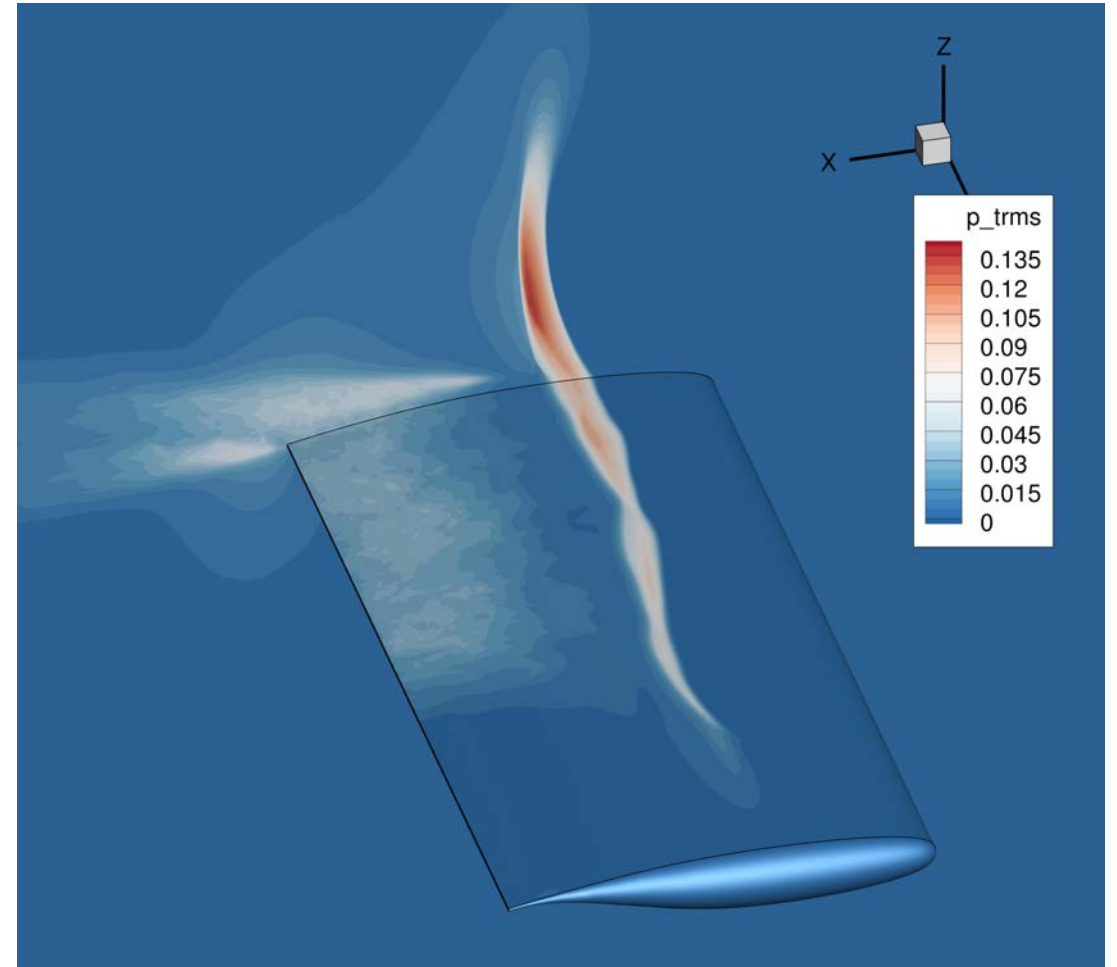
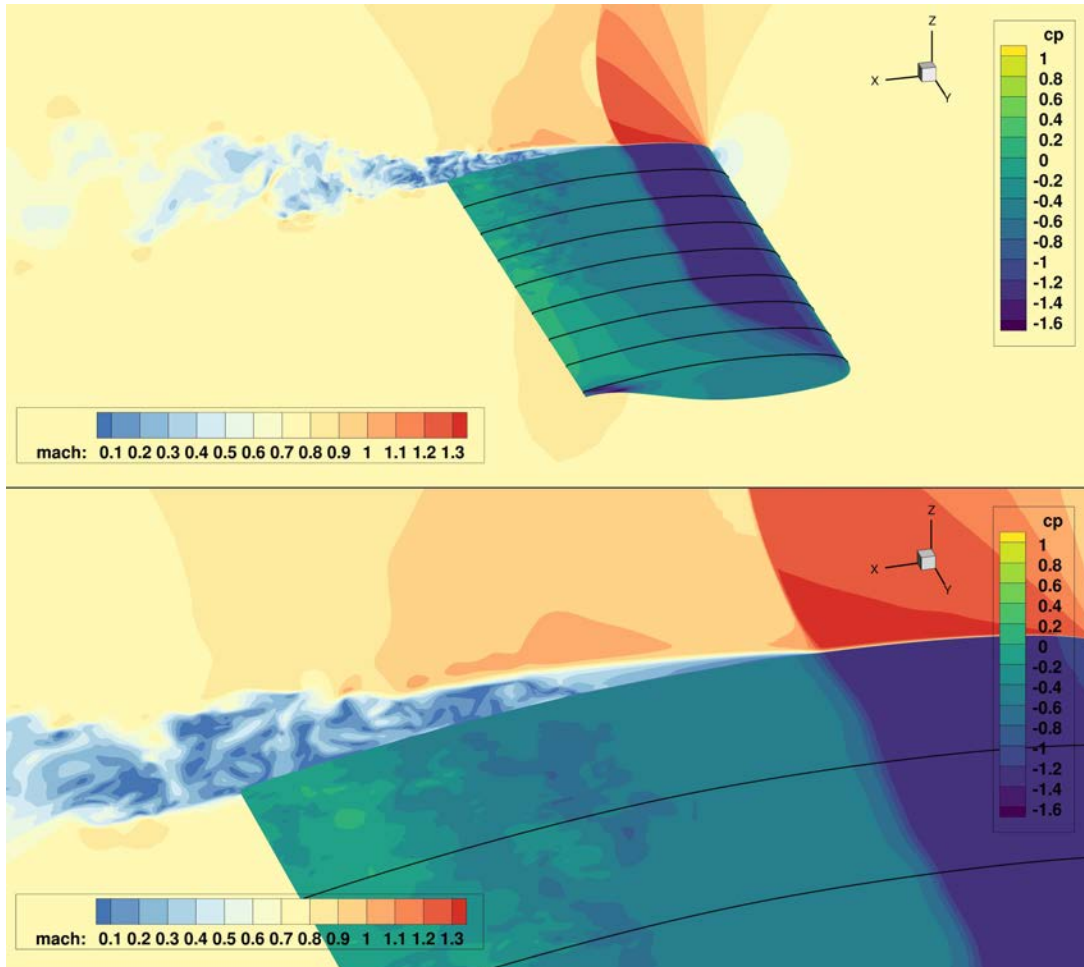
- Grid interpolation based on Pointwise isotropic point sources.
- Error is estimated by comparing the interpolated value of Mach from neighboring nodes to its actual value. Then point sources are generated requesting new grid spacing based on the estimated error.



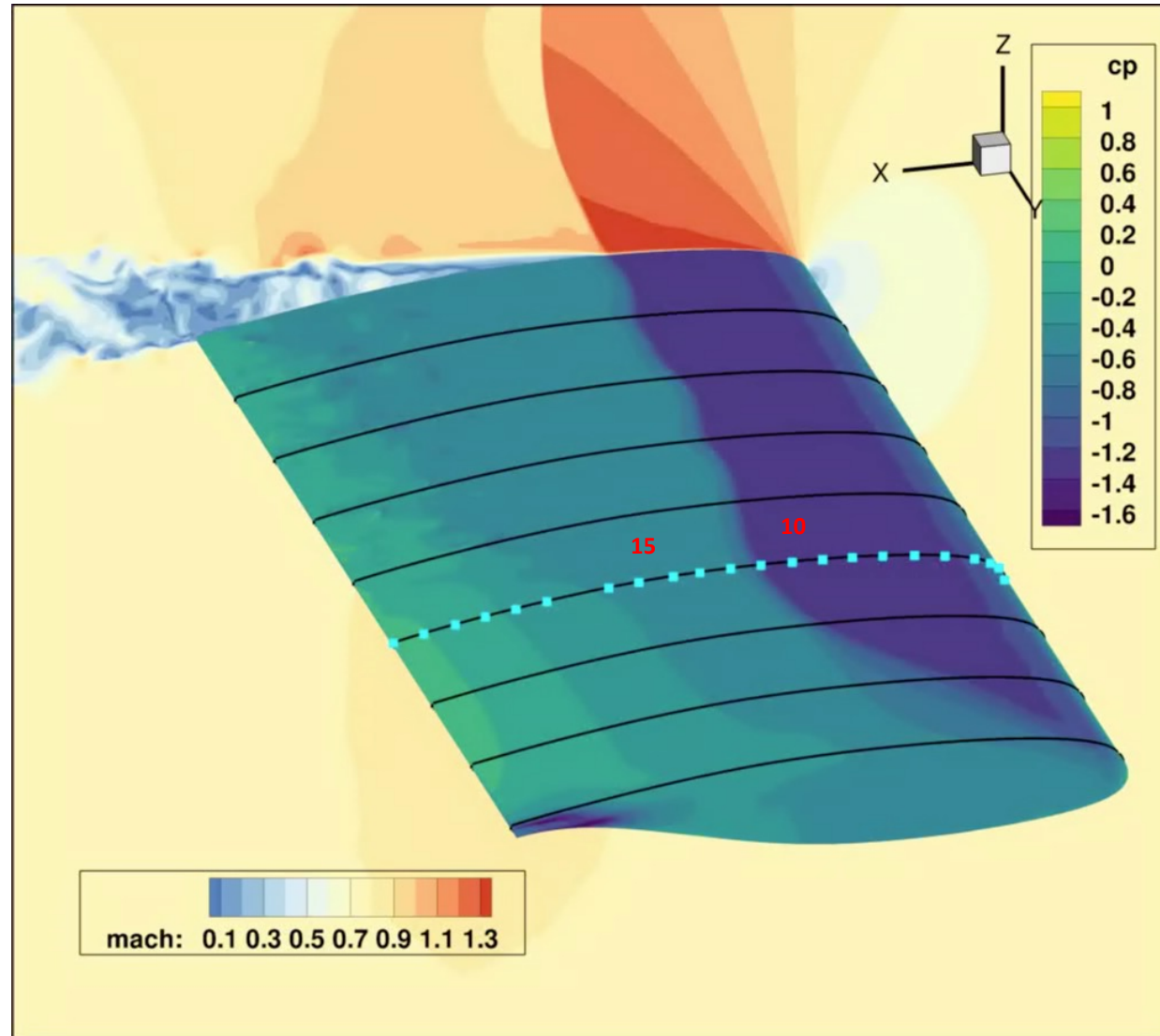
Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 1

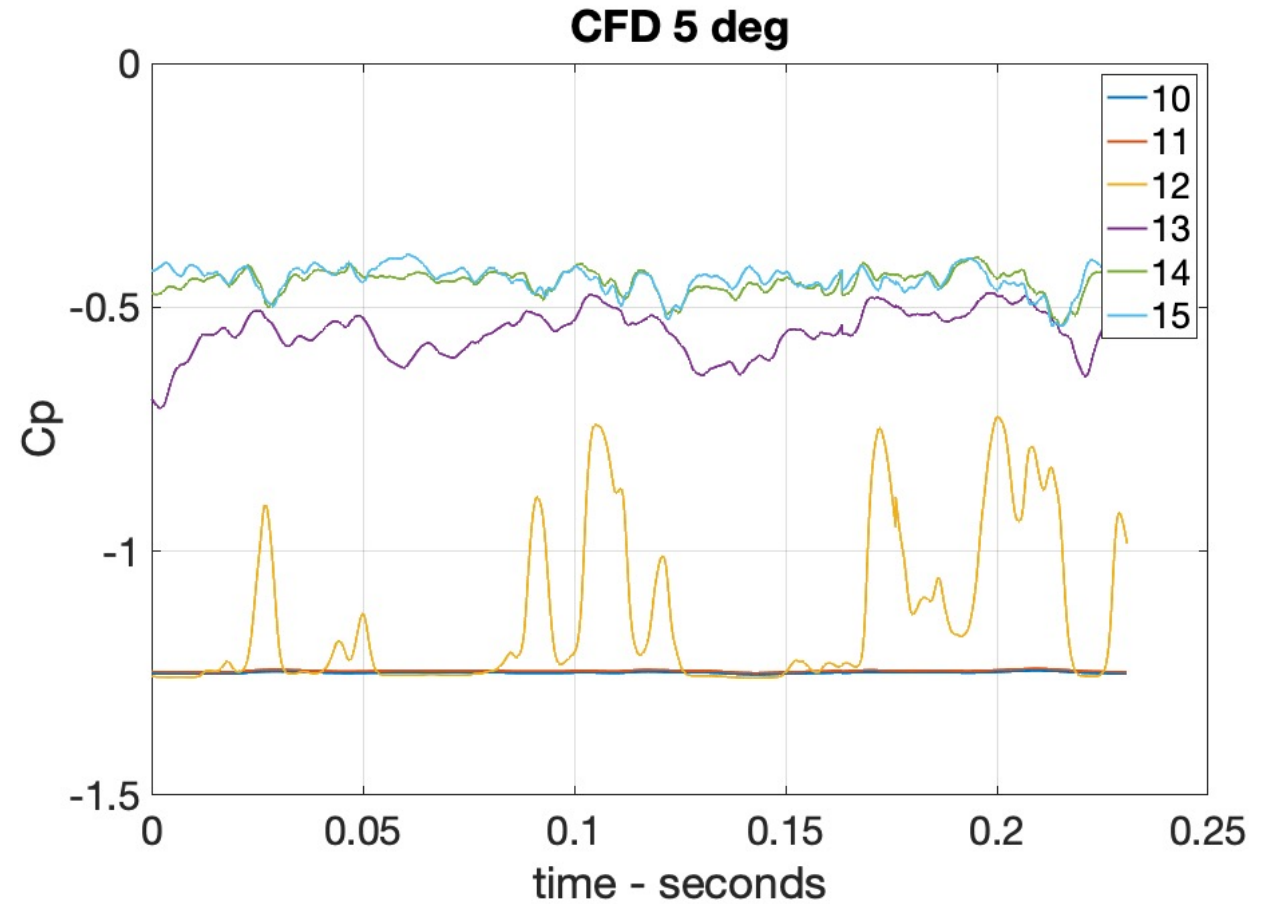
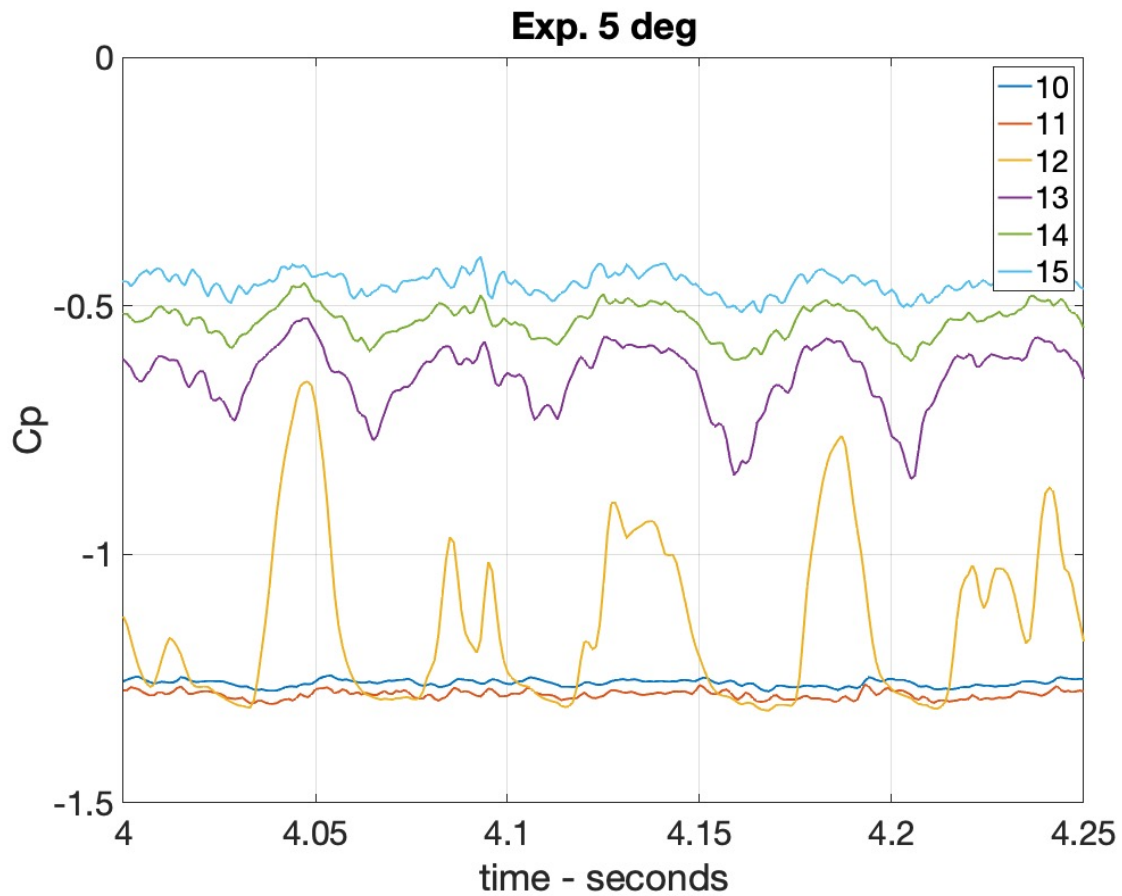
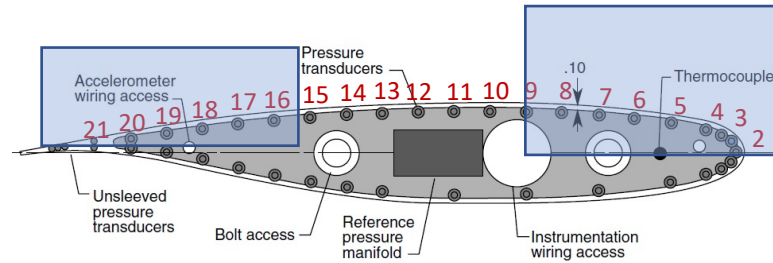
RMS-average of pressure



Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

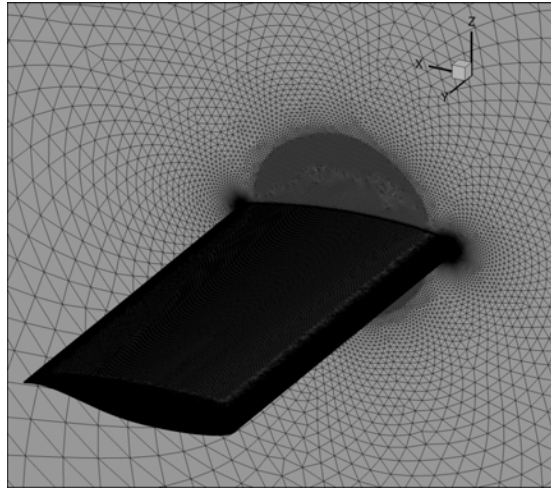


Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

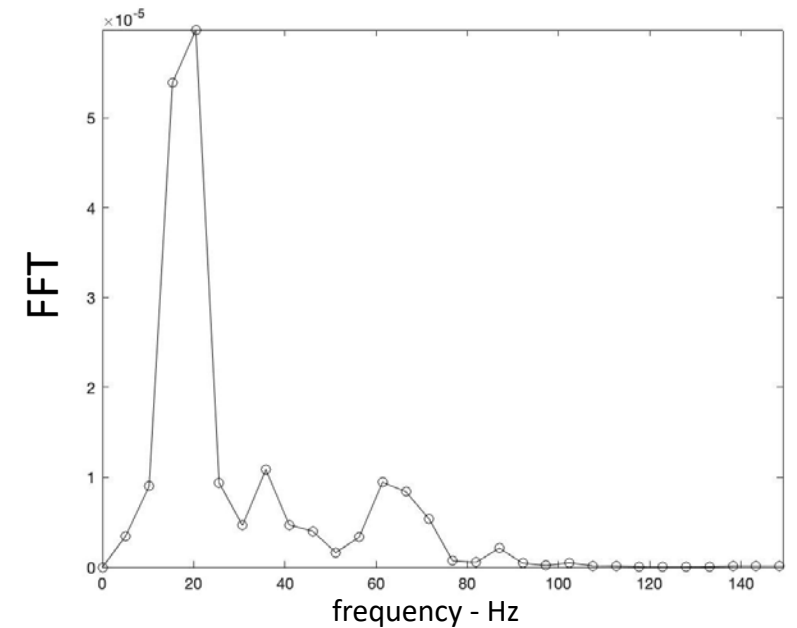
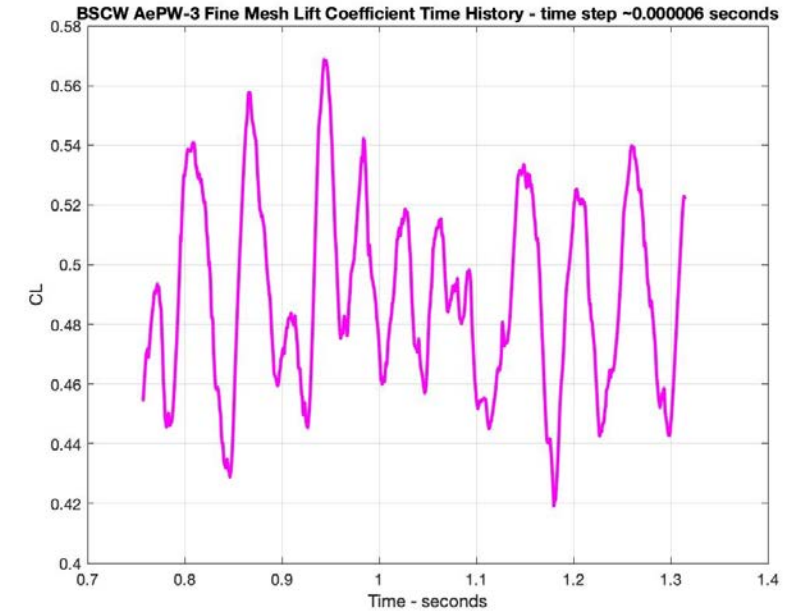
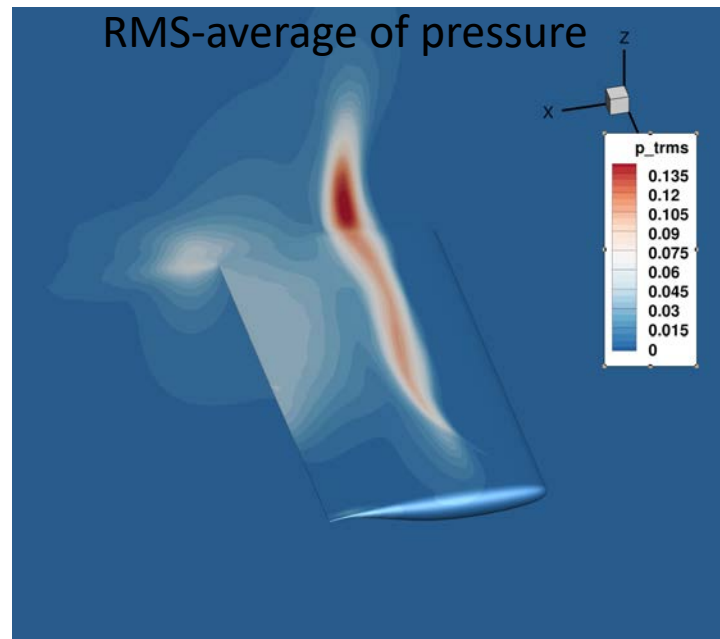
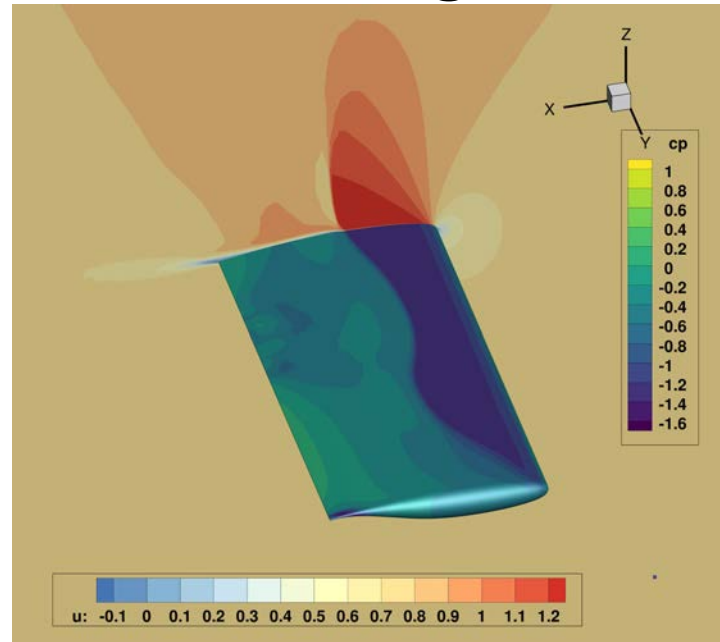


Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 3: ~27M nodes

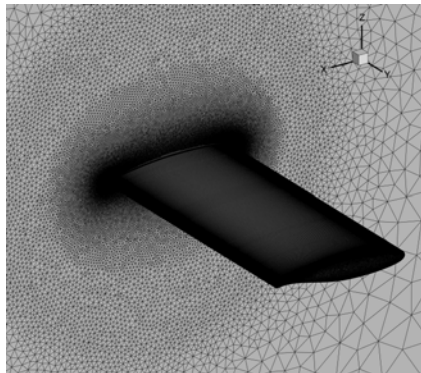
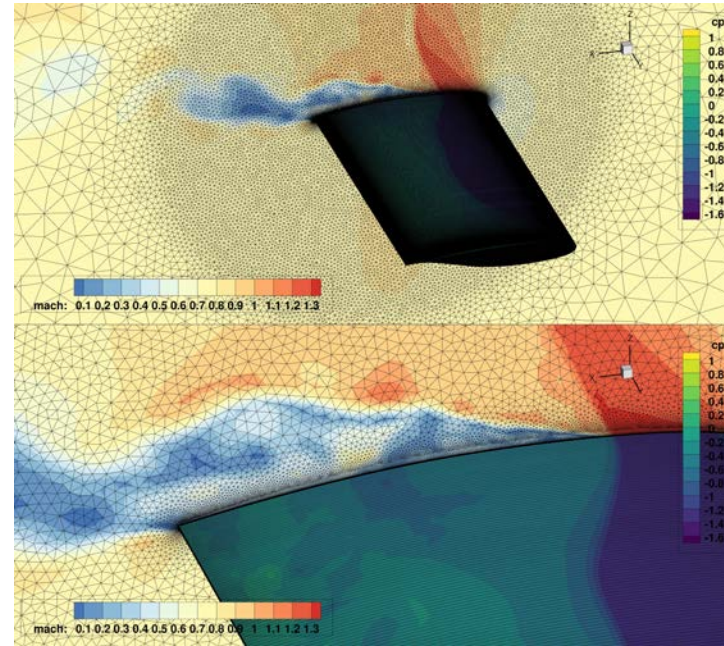
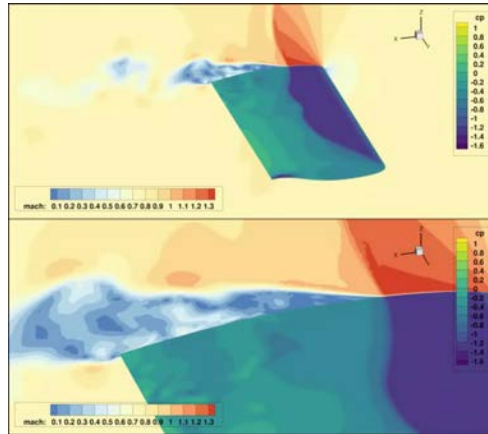
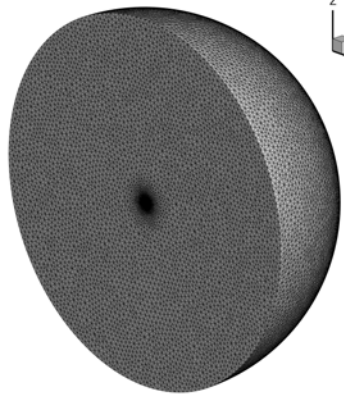


Provided Fine Mesh:
AePW-2

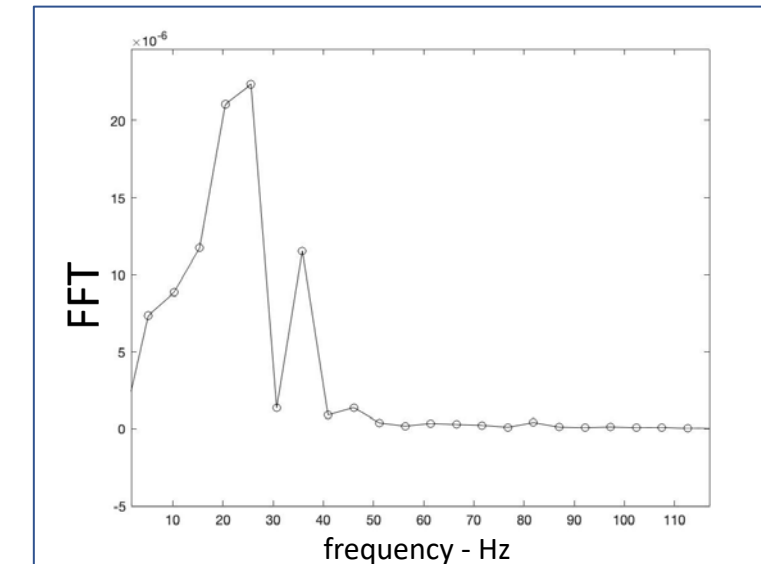
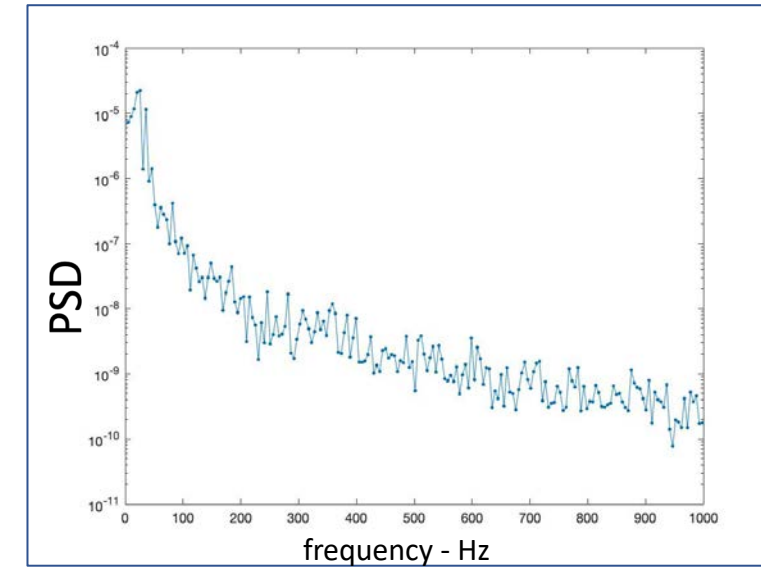
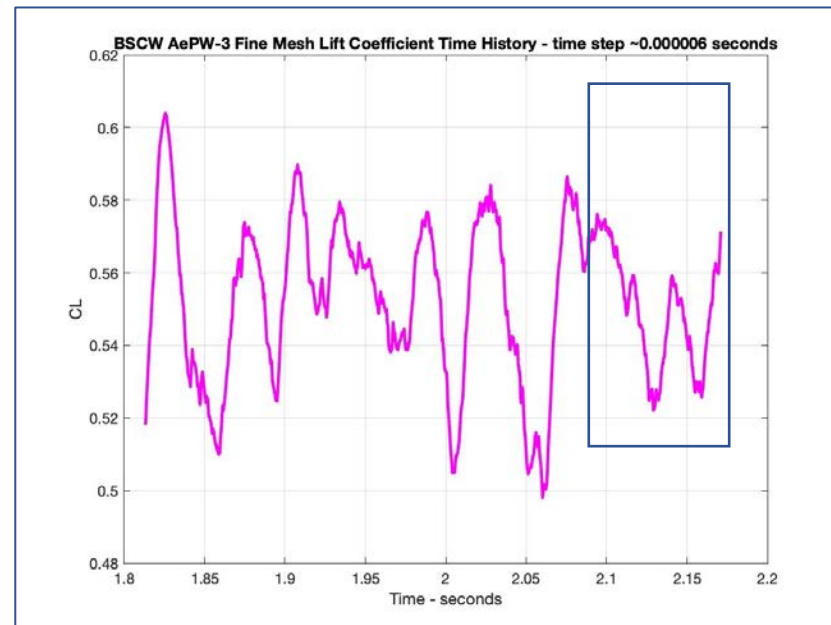


Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 2: ~23M nodes



Provided Pointwise Mesh:
Fine mesh resolution



AIAA publications only

A. NASA publications related to AePW-1, all published at the conclusion of AePW-1.

1. Overview of the Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2013-783>
2. Overview and Lessons Learned from the Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2013-1798>
3. Experimental data from the Benchmark Supercritical Wing wind tunnel test on an oscillating turntable: <https://doi.org/10.2514/6.2013-1802>
4. Analysis of Test Case Computations and Experiments for the Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2013-788>
5. FUN3D Analyses in Support of the First Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2013-785>
6. Structural Dynamics Modeling of HIRENASD in support of the Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2013-1801>
7. Lessons learned in the selection and development of test cases for the Aeroelastic Prediction Workshop: Rectangular Supercritical Wing: <https://doi.org/10.2514/6.2013-784>

B. NASA publications (published in the 1980's and 1990's) related to the experimental data used in AePW-1.

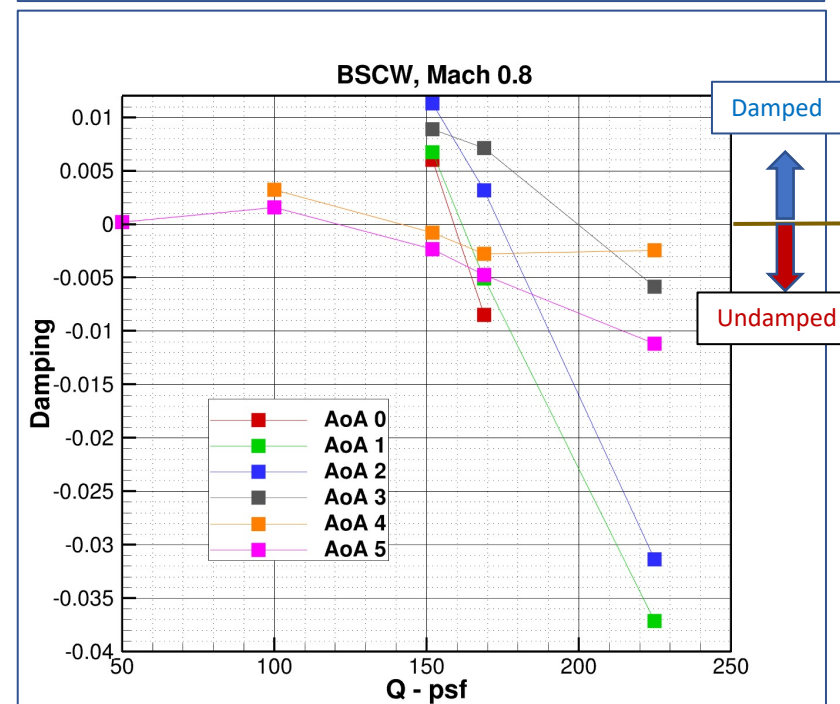
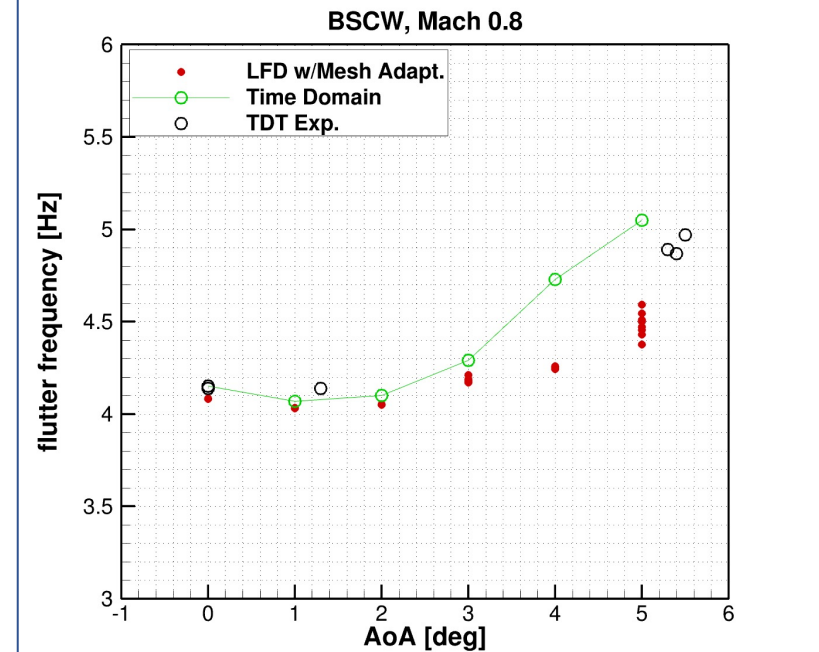
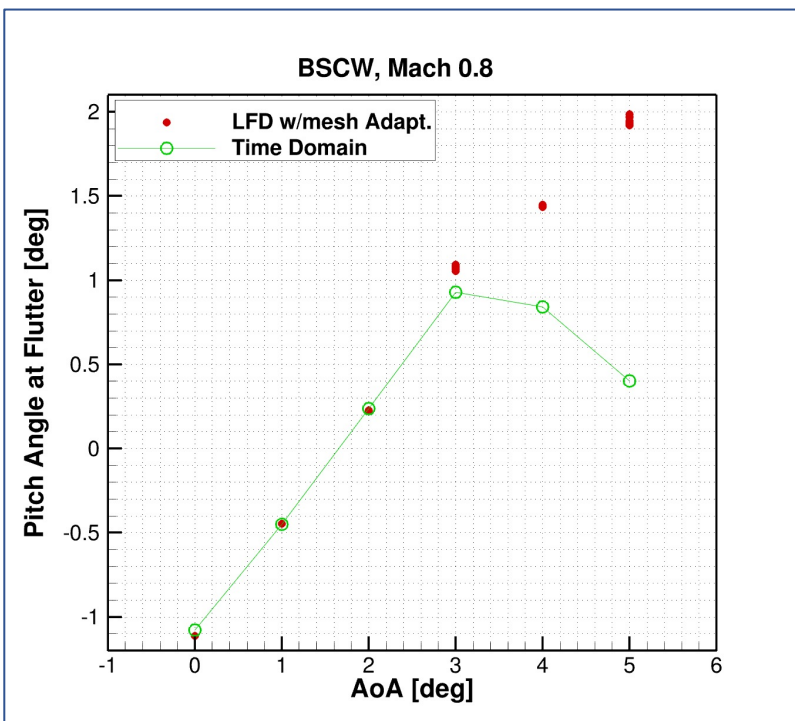
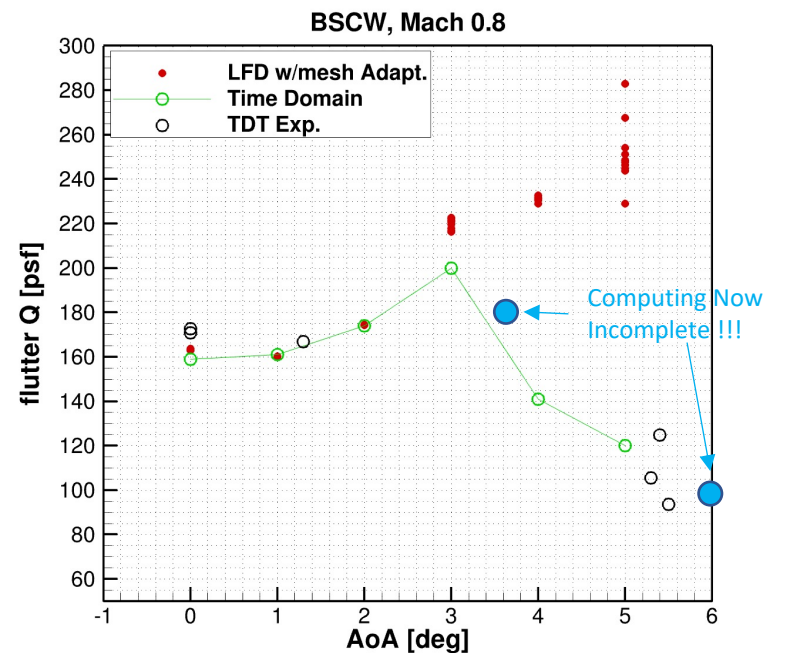
1. Dynamic characteristics of a Benchmark models program supercritical wing: <https://doi.org/10.2514/6.1992-2368>
2. Experimental Unsteady Pressures At Flutter On The Supercritical Wing Benchmark Model: <https://doi.org/10.2514/6.1993-1592>
3. Transonic pressure distributions on a rectangular supercritical wing oscillating in pitch: <https://doi.org/10.2514/6.1983-923>

C. AePW-2 NASA publications are listed below:

1. Plans and example results for the 2nd AIAA Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2015-0437>
2. Investigating the transonic flutter boundary of the Benchmark Supercritical Wing: <https://doi.org/10.2514/6.2017-0191>
3. FUN3D Analyses in Support of the Second Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2016-3122>
4. Overview and Data Comparisons from the 2nd Aeroelastic Prediction Workshop: <https://doi.org/10.2514/6.2016-3121>
5. Numerical Investigations of the Benchmark Supercritical Wing in Transonic Flow: <https://doi.org/10.2514/6.2017-0190>

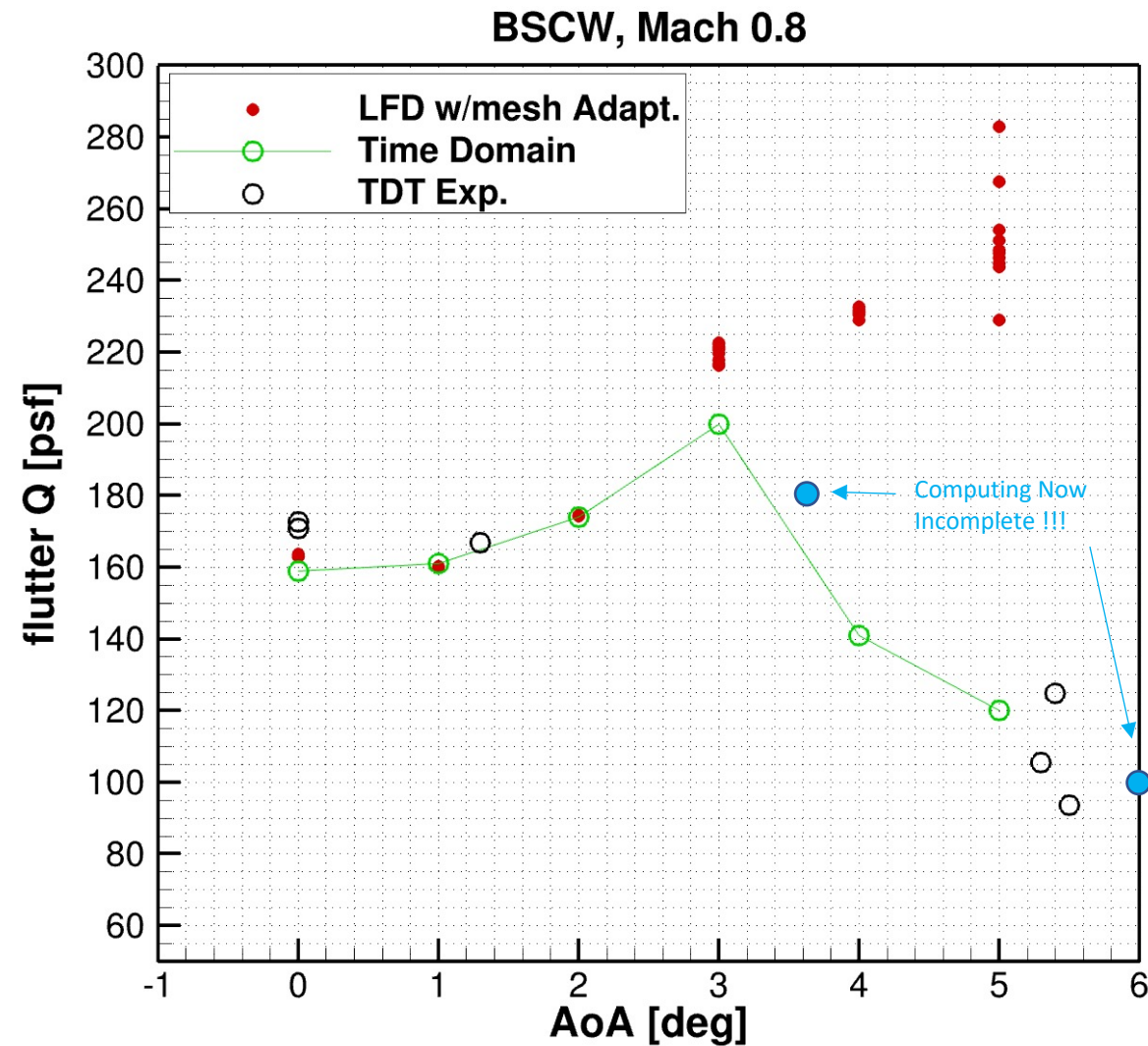
Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



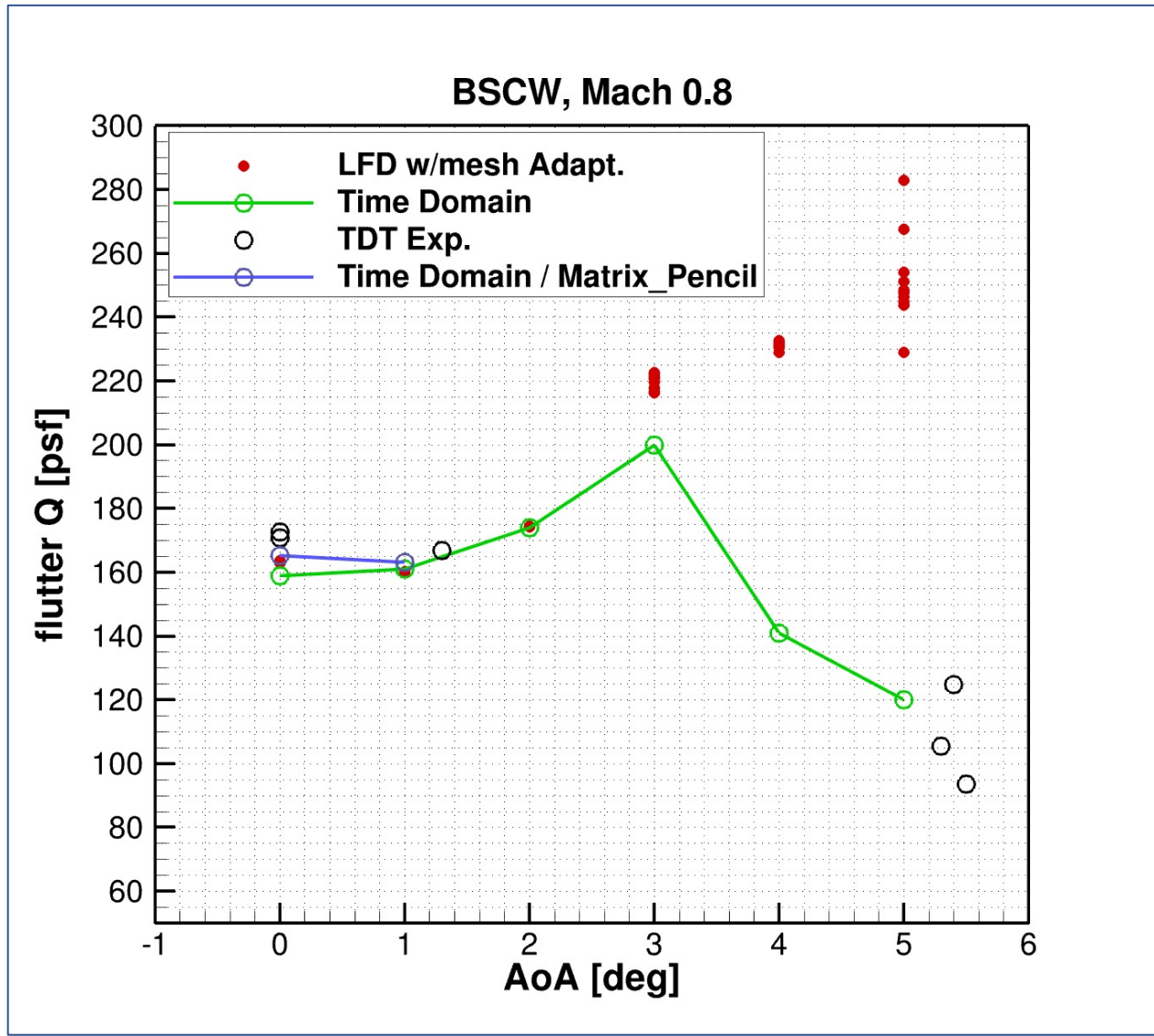
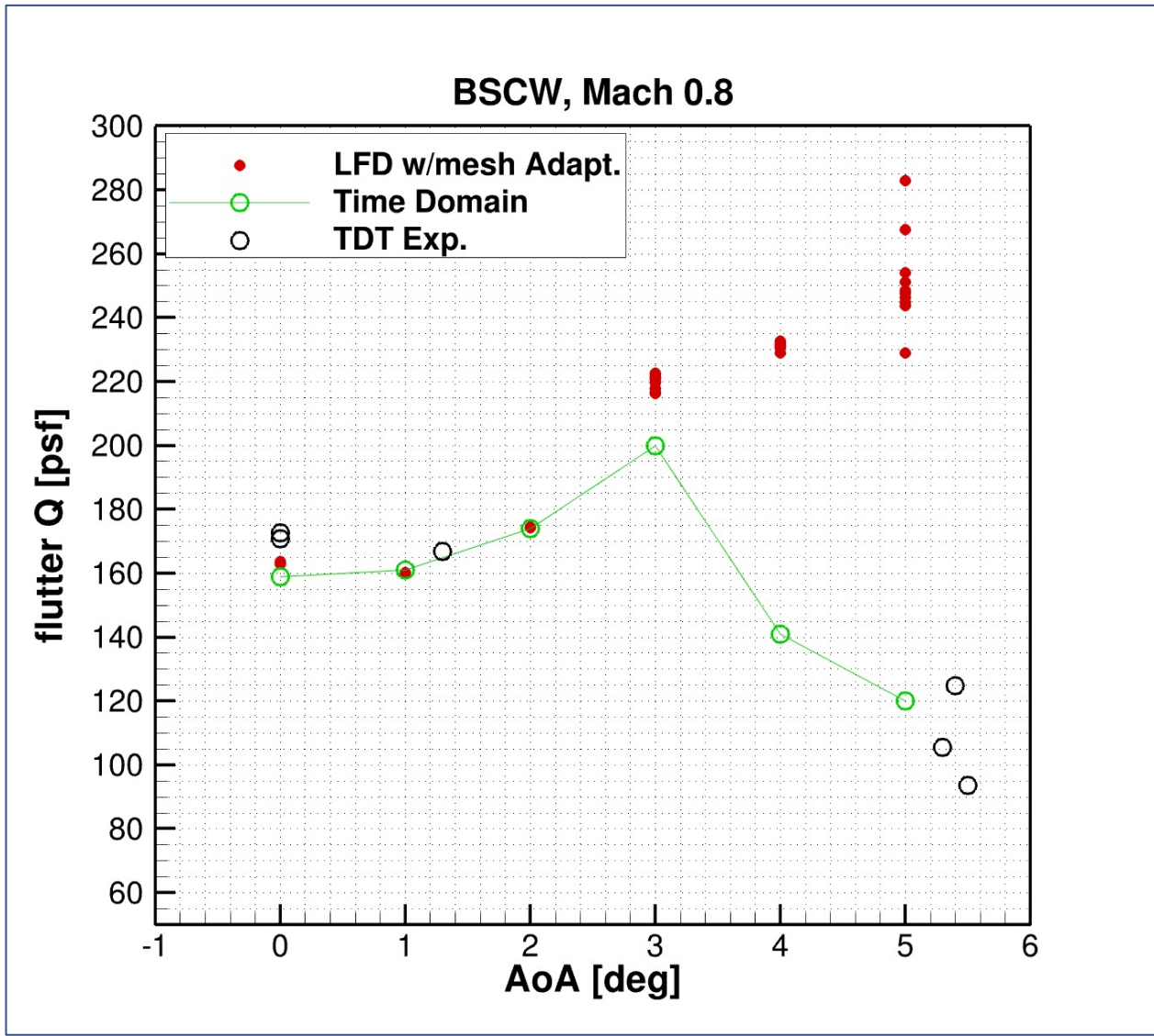
Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



Mach 0.8, AoA Sweep

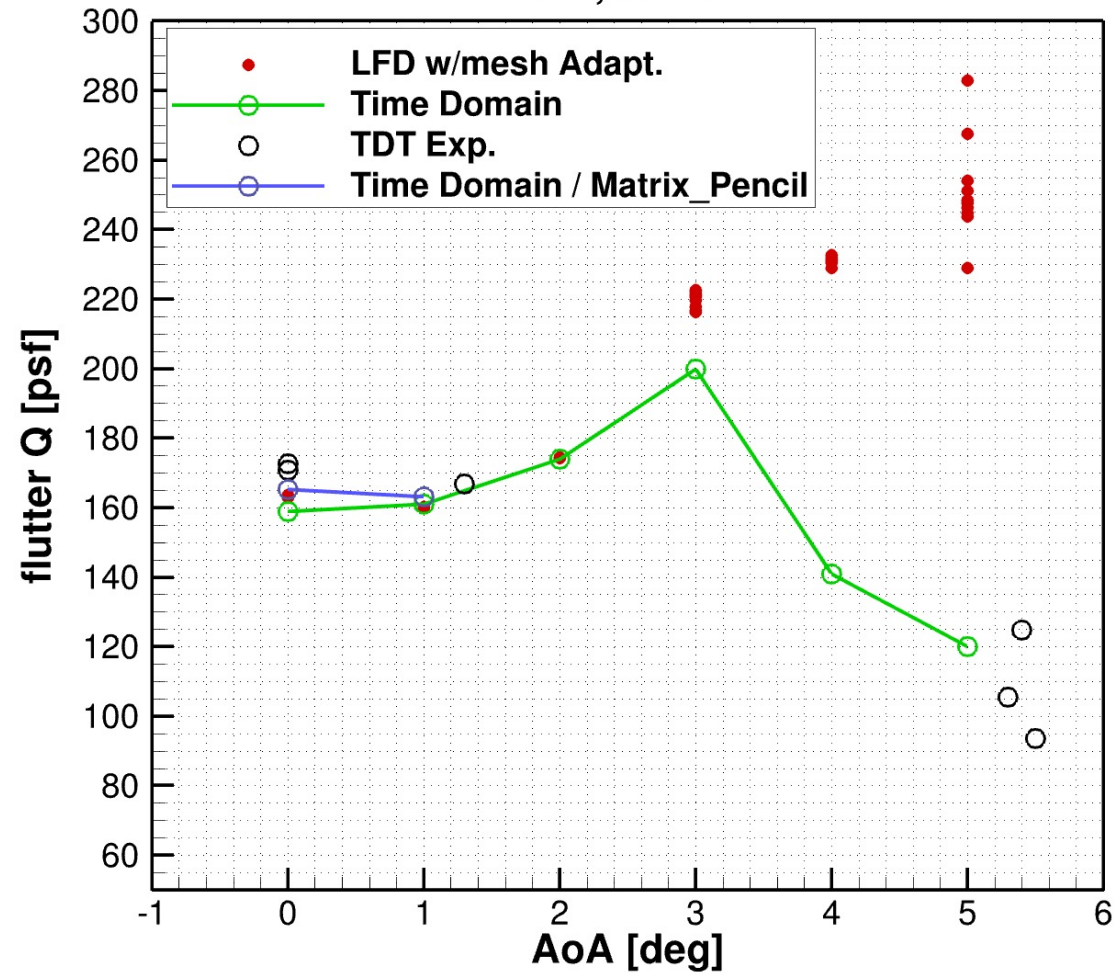
- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



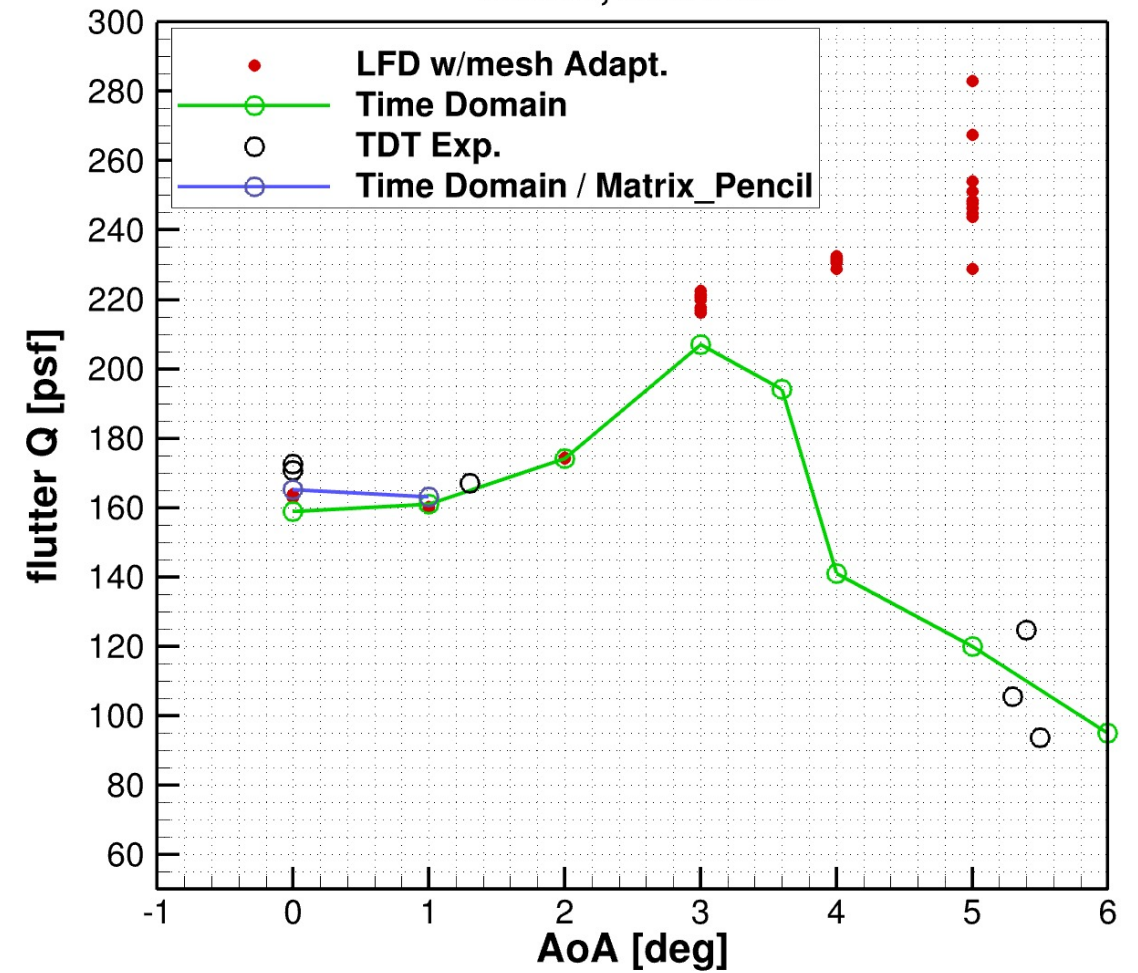
Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation

BSCW, Mach 0.8

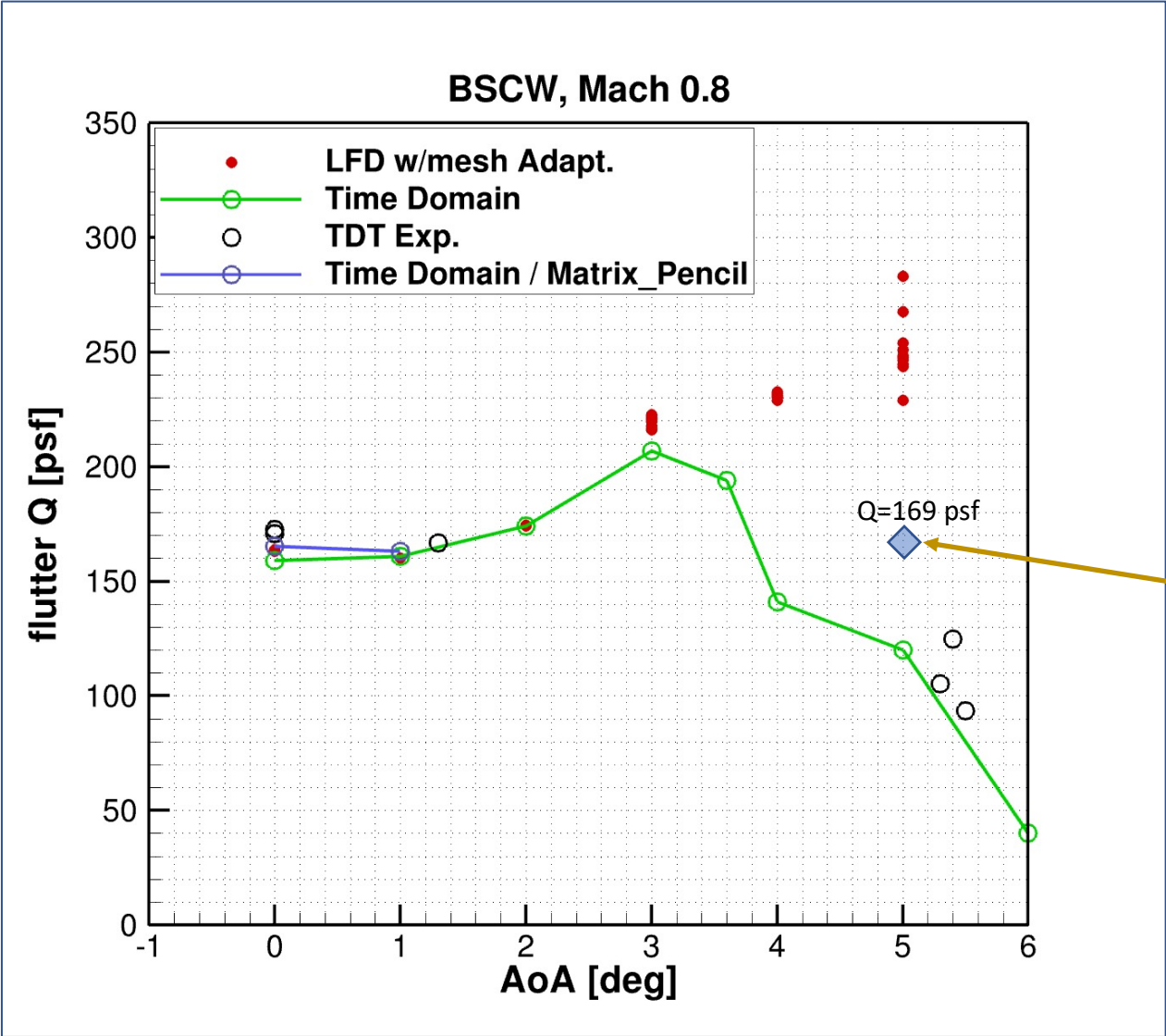


BSCW, Mach 0.8

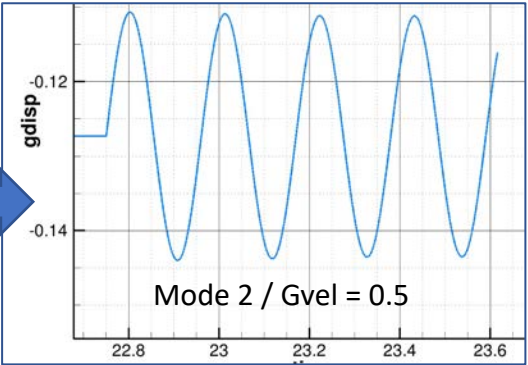


Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation

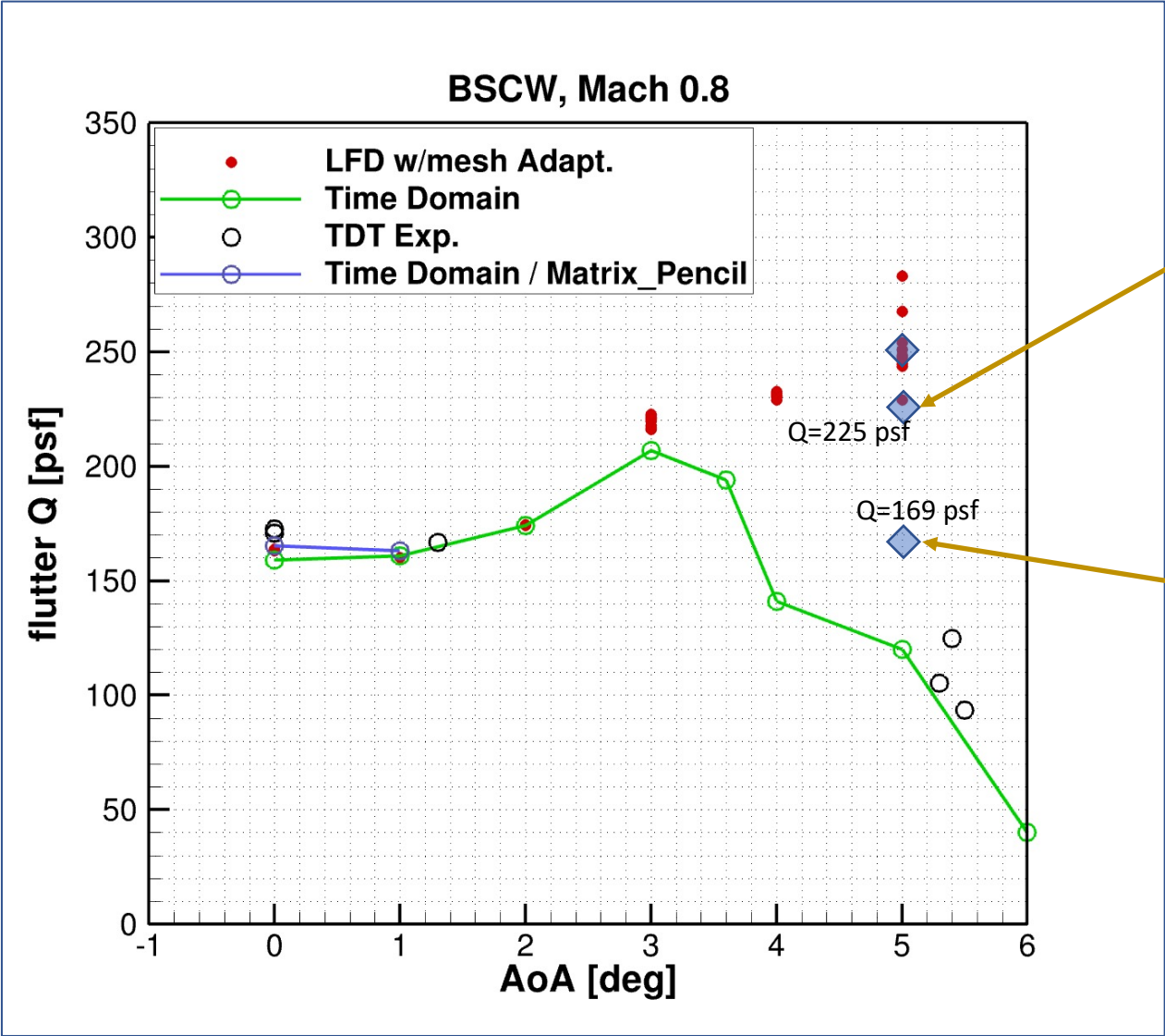


Gvel0	Damping
5	- 0.00438
0.5	0.00231
0.05	0.0098
0.005	0.0997

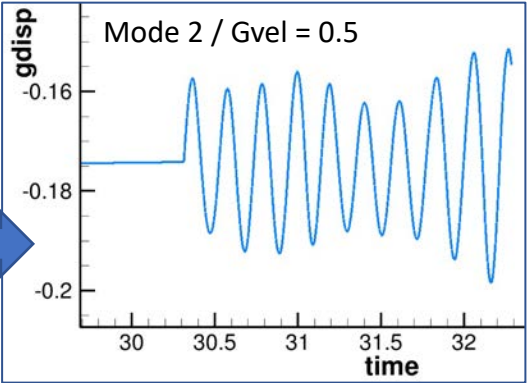


Mach 0.8, AoA Sweep

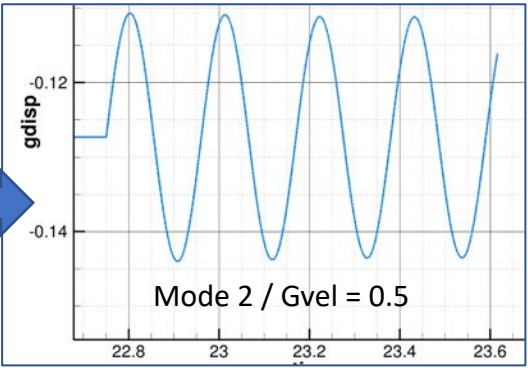
- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



Gvel0	Damping
5	- 0.00961
0.5	0.01577 0.01438 -0.067788 -0.002187 -0.0251 0.002294 0.01756

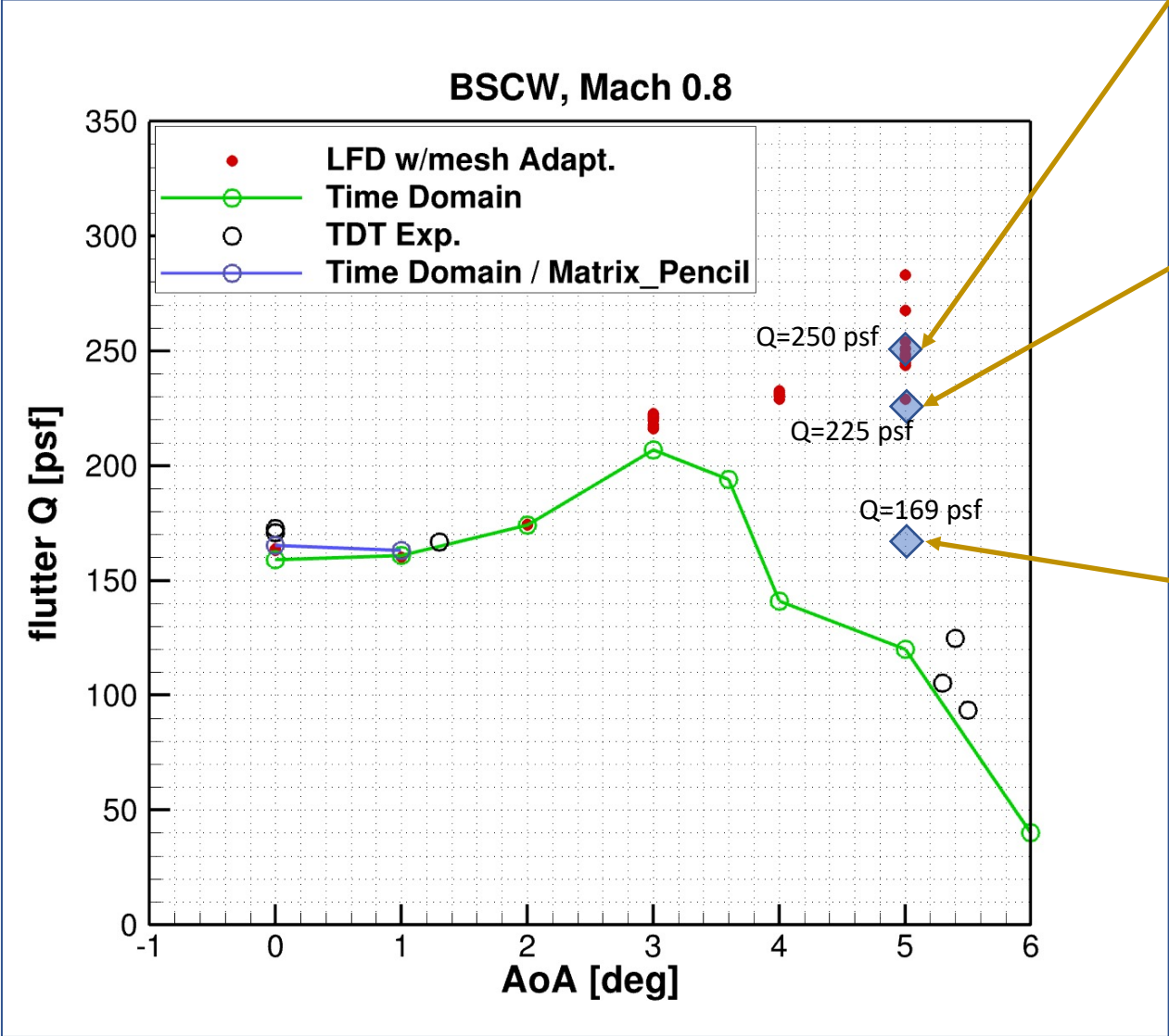


Gvel0	Damping
5	- 0.00438
0.5	0.00231
0.05	0.0098
0.005	0.0997

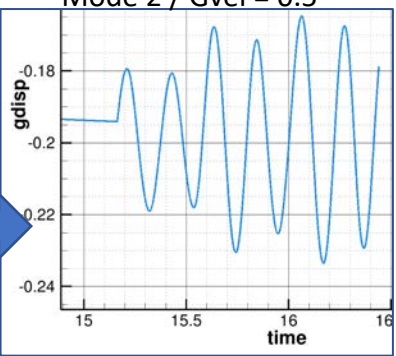


Mach 0.8, AoA Sweep

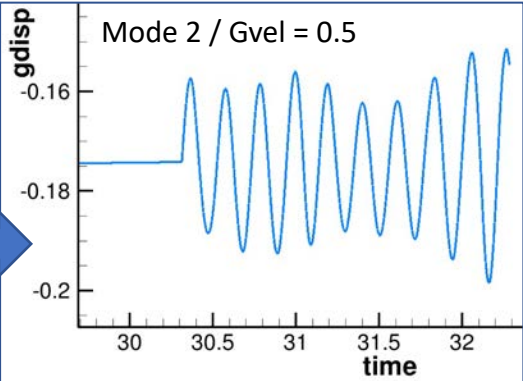
- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



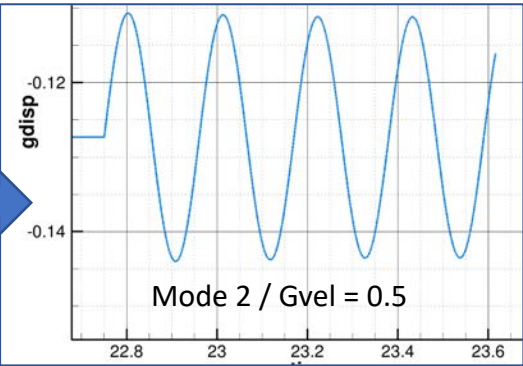
Gvel0	Damping
5	
0.5	0.00815 -0.02489 -0.03257 -0.06981



Gvel0	Damping
5	- 0.00961
0.5	0.01577 0.01438 -0.067788 -0.002187 -0.0251 0.002294 0.01756

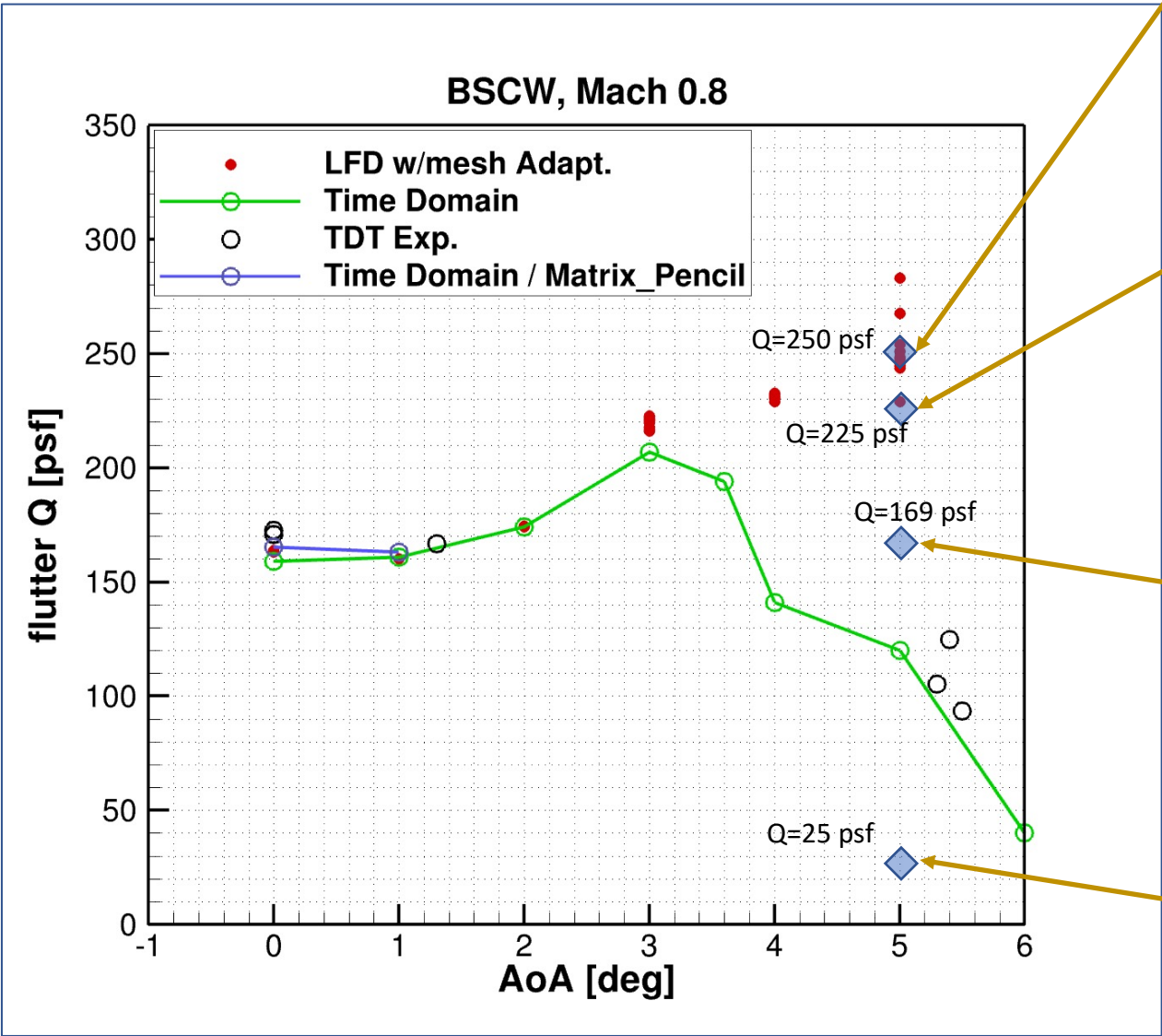


Gvel0	Damping
5	- 0.00438
0.5	0.00231
0.05	0.0098
0.005	0.0997

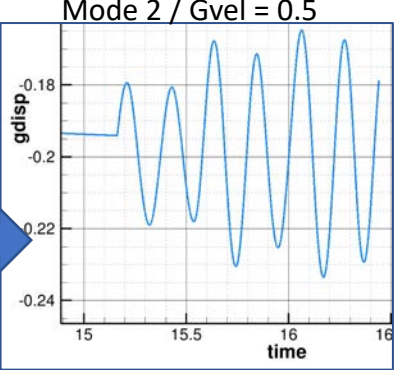


Mach 0.8, AoA Sweep

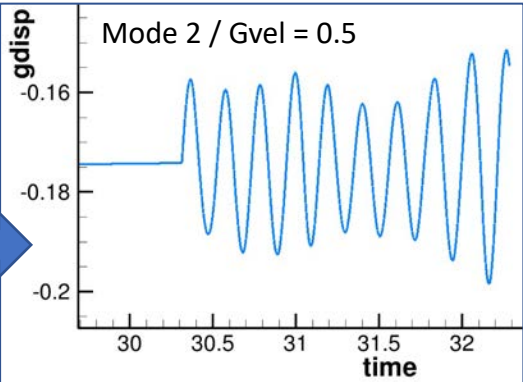
- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



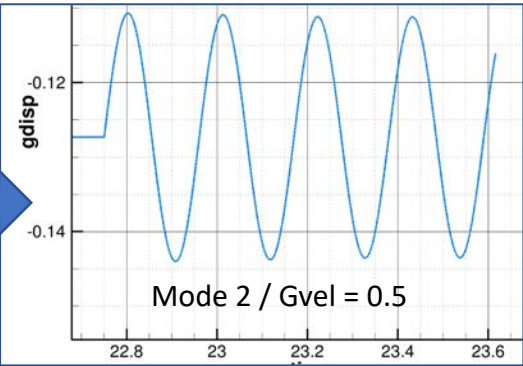
Gvel0	Damping
5	
0.5	0.00815 -0.02489 -0.03257 -0.06981



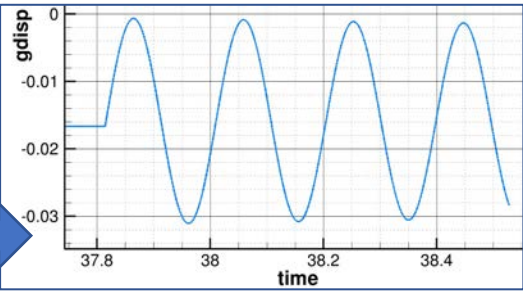
Gvel0	Damping
5	- 0.00961
0.5	0.01577 0.01438 -0.067788 -0.002187 -0.0251 0.002294 0.01756



Gvel0	Damping
5	- 0.00438
0.5	0.00231
0.05	0.0098
0.005	0.0997

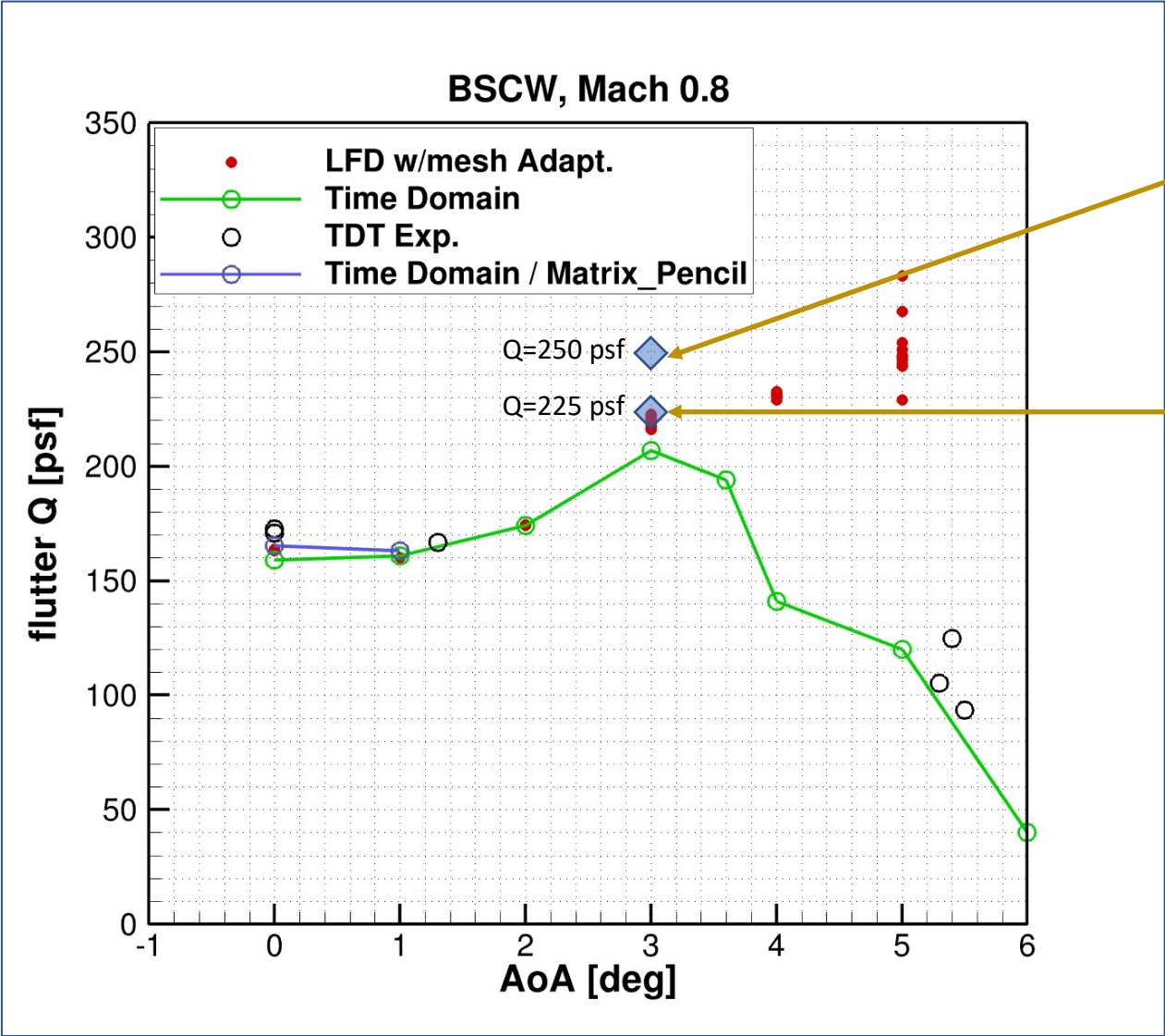


Gvel0	Damping
5	0.00257
0.5	0.00815

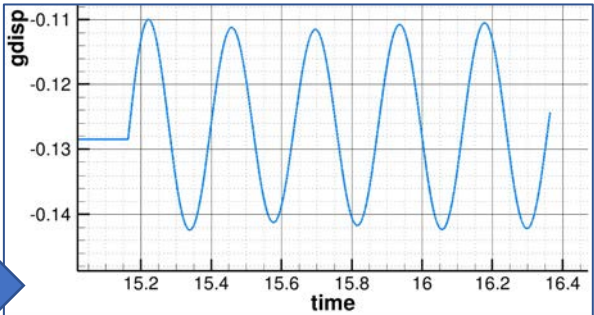


Mach 0.8, AoA Sweep

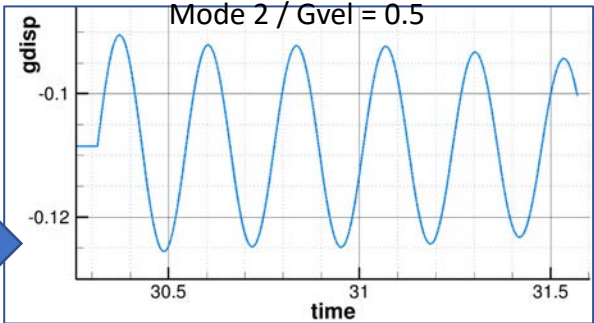
- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



Gvel0	Damping
5	
0.5	0.05485 0.00837

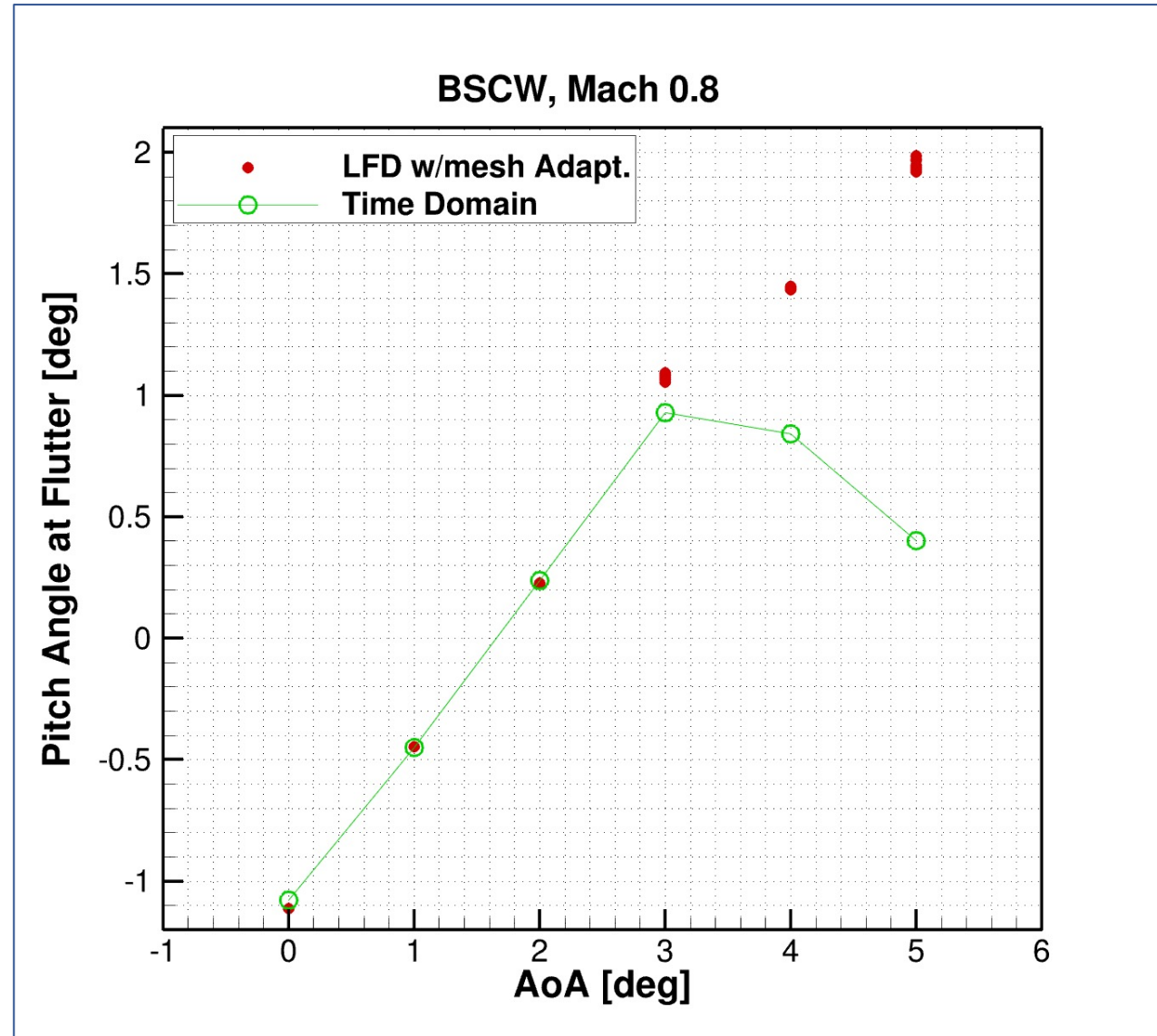


Gvel0	Damping
5	- 0.005006
0.5	0.05186 0.00679



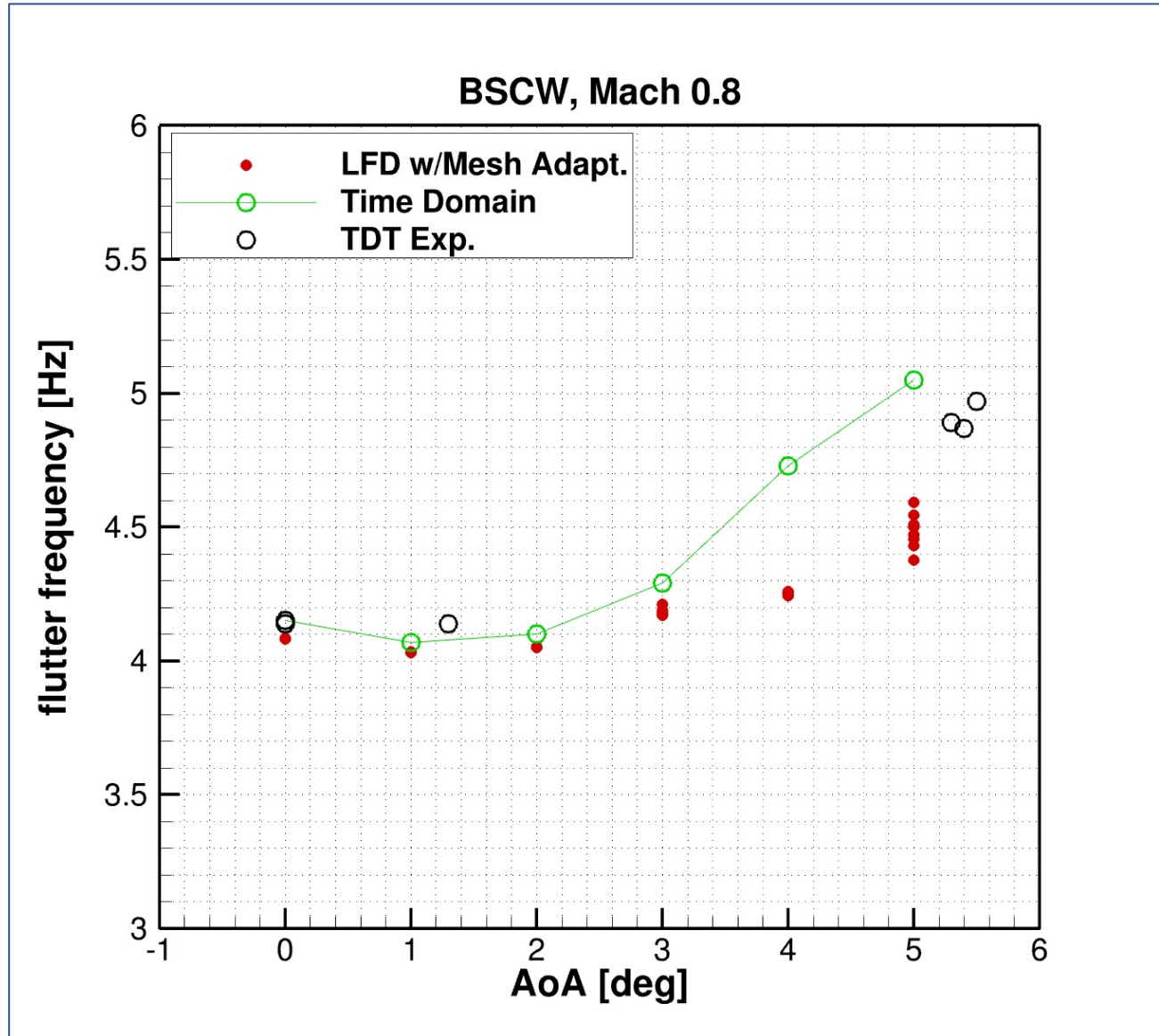
Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



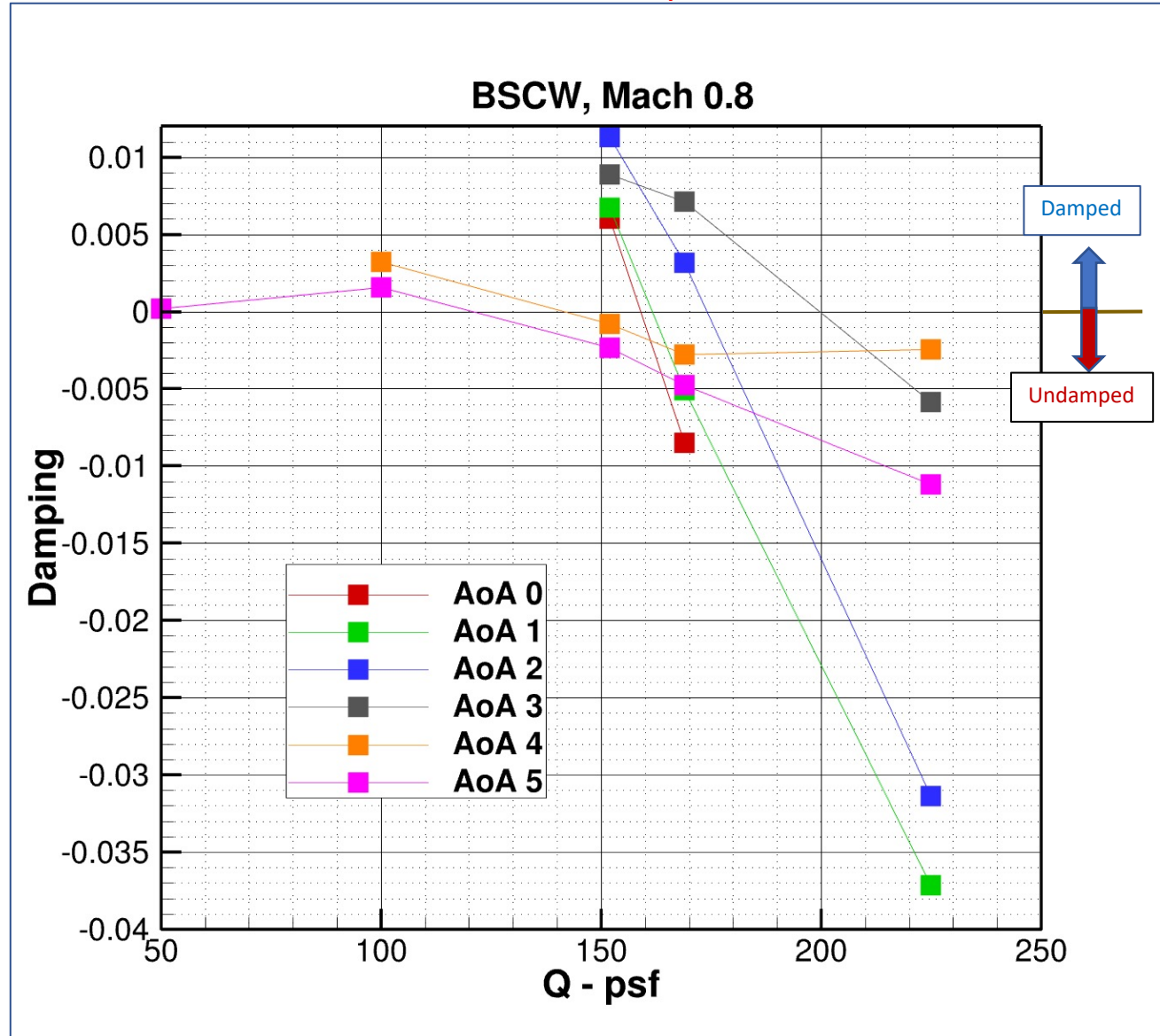
Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



Mach 0.8, AoA Sweep

- Time Domain: AePW-2 Fine Mesh, URANS
- LFD w/Mesh Adaptation



Old slides - backup

High AoA Working Group, August 26, 2021

SciTech 2022

Pawel Chwalowski

Lior Poplingher, Wrik Mallik, Daniella Raveh

Adam Jirasek

Nicholas Giannelis

IFASD 2022

Abstracts due November 30, 2021

Giampaolo Pagliuca

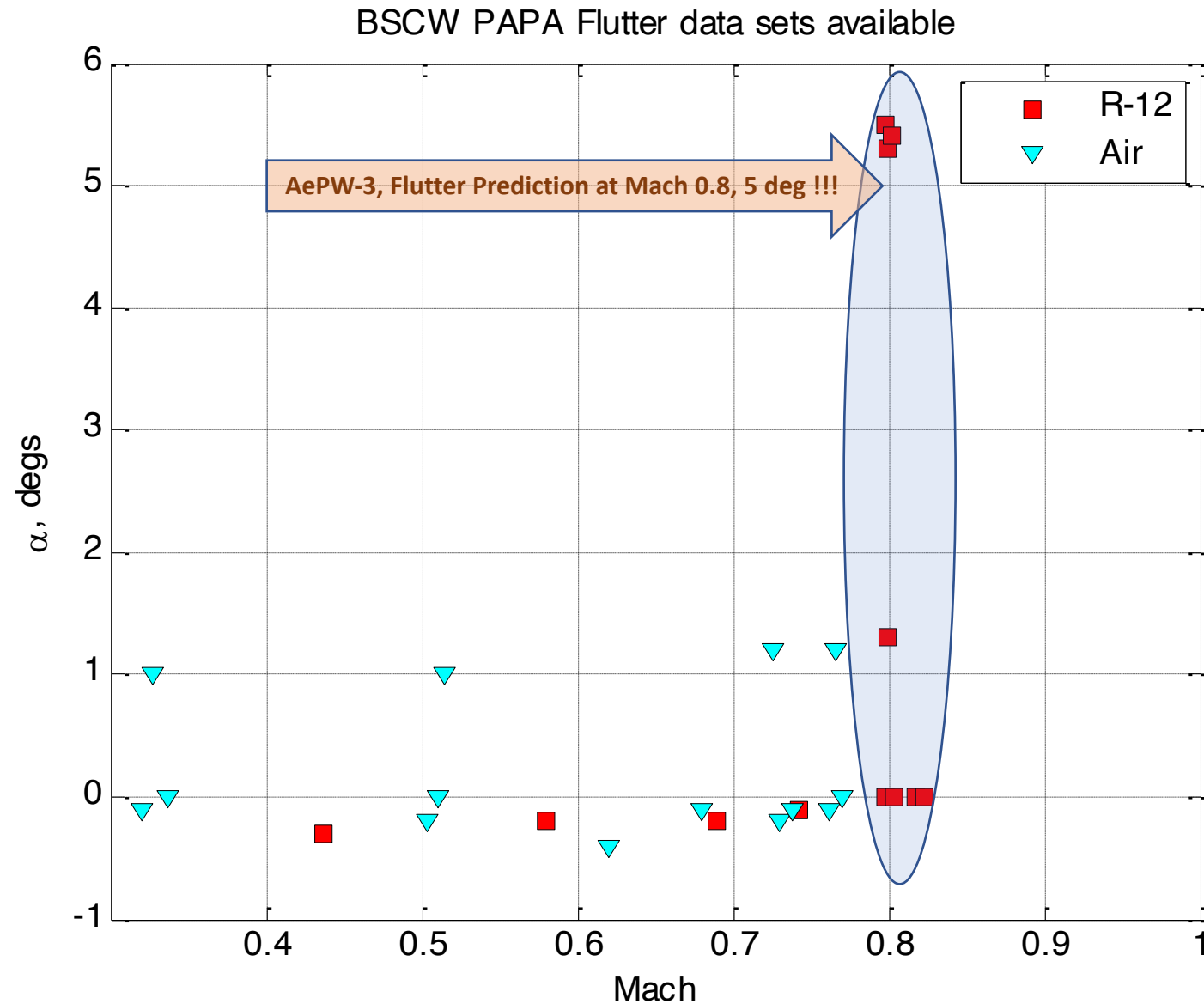
Lior Poplingher, Wrik Mallik, Daniella Raveh

Pawel Chwalowski

Antoine De Blois

Kartik Venkatraman

Experimental flutter points



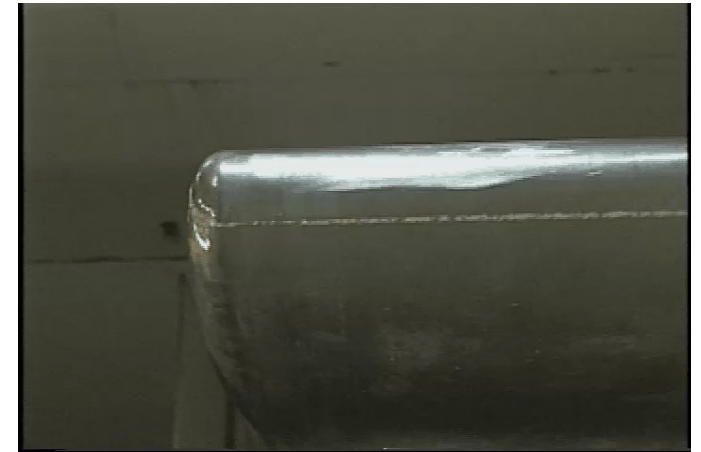
Transition strip information
Is not separated out in this plot.

- Buffet analysis at Mach 0.8, AoA = 5deg, rigid wing, unsteady flow

Experimental Data ?

Oscillating Turn Table run logs indicate that 'steady' data were collected at:

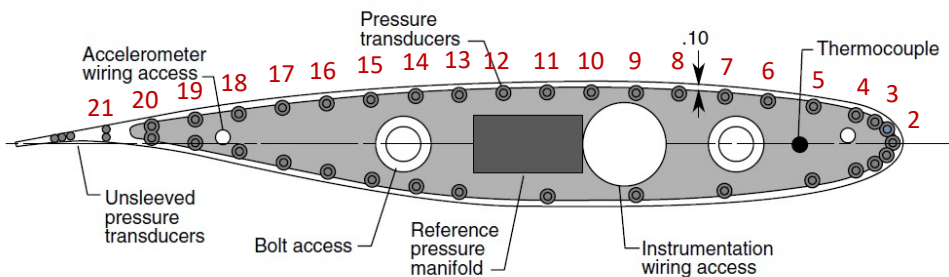
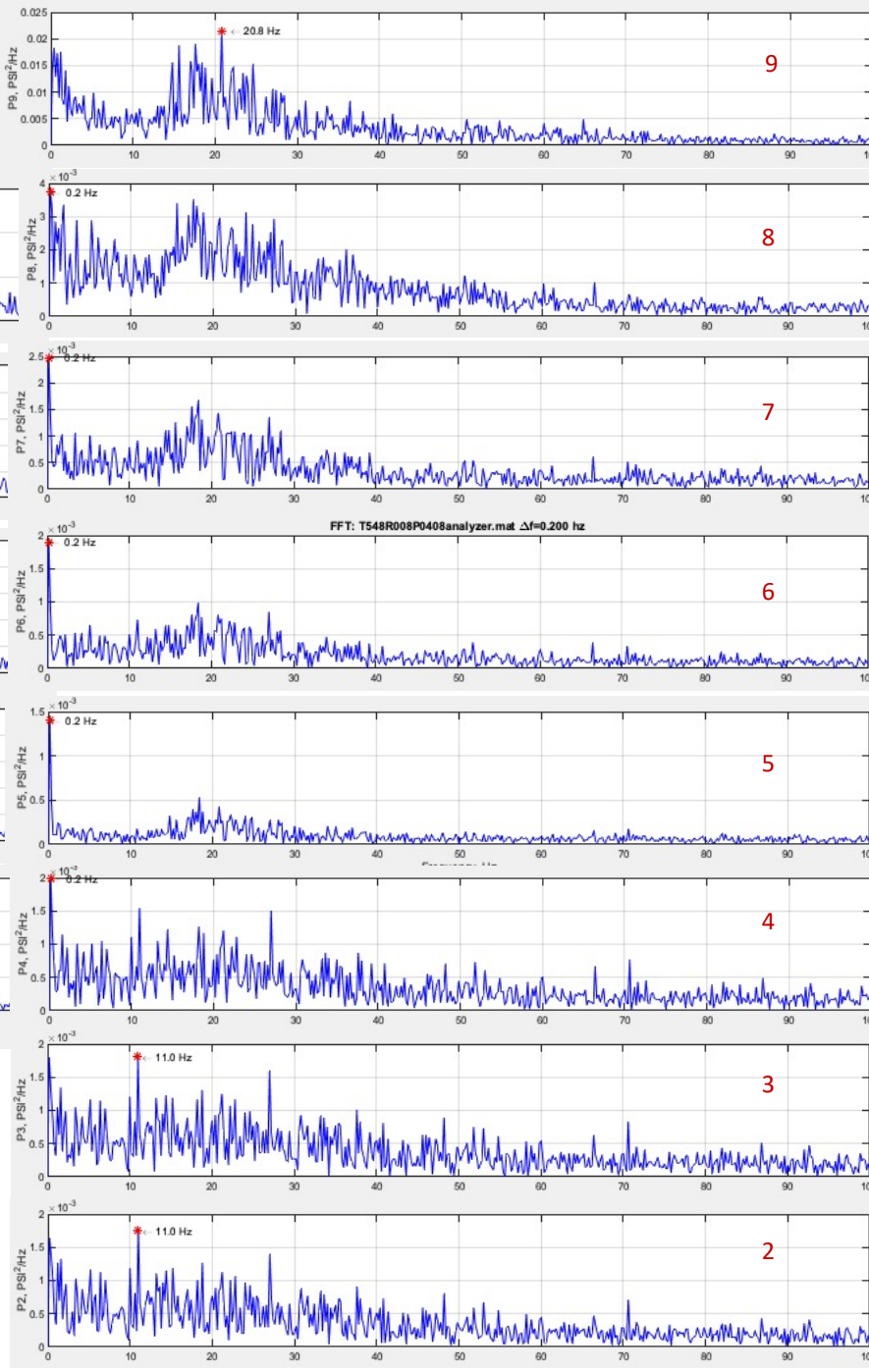
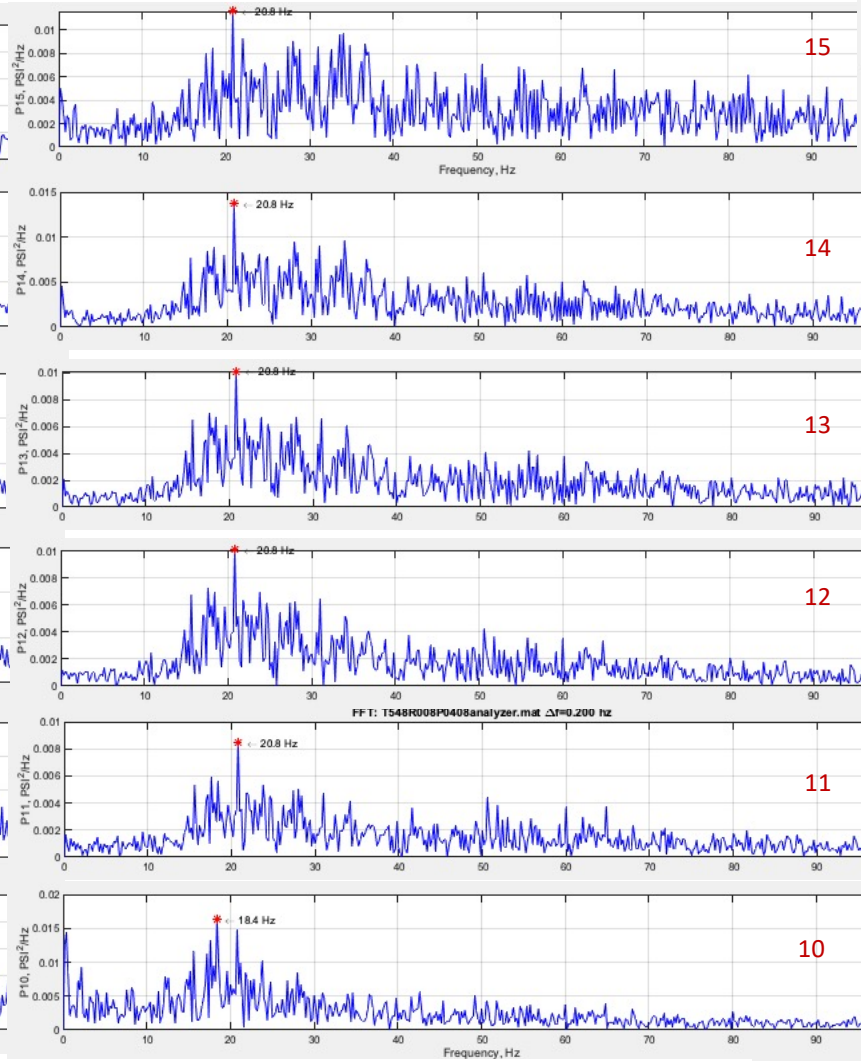
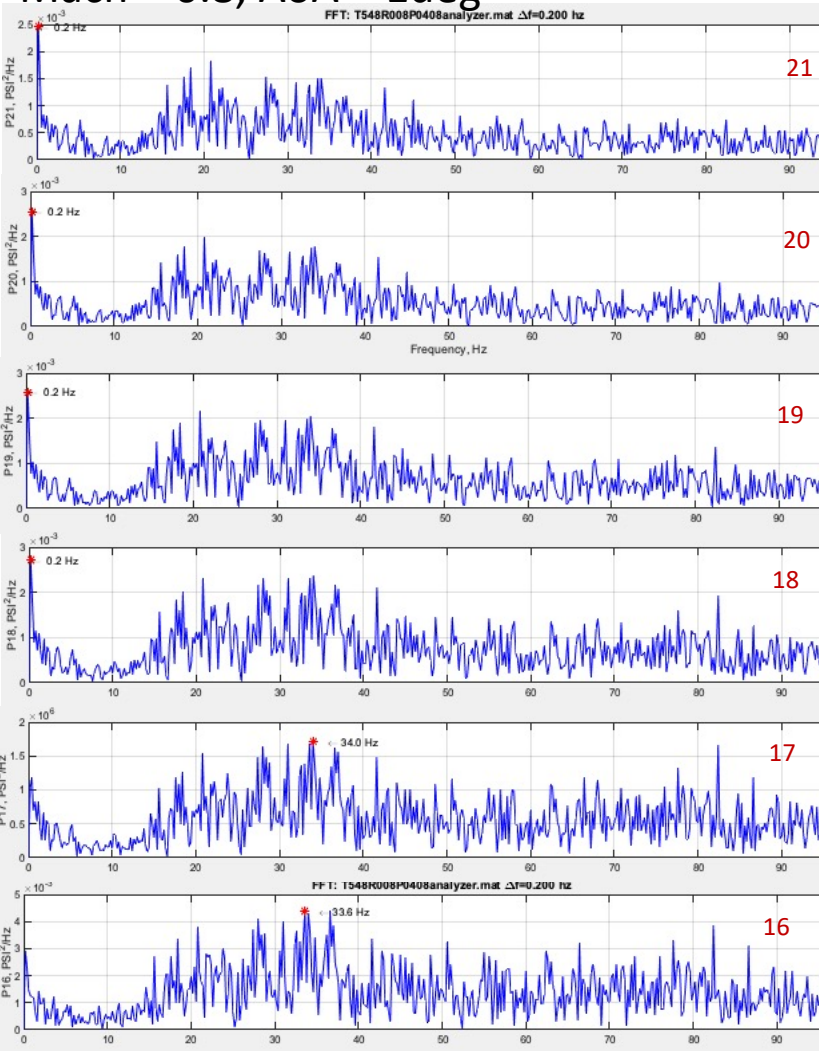
- Mach 0.8, $Q = 100$ psf, AoA = 5, 3, 2, 1, 0, -1 deg
- Mach 0.8, $Q = 170$ psf, AoA = 5, 3, 2, 1, 0, -1 deg
- Mach 0.7, 0.85, 0.87



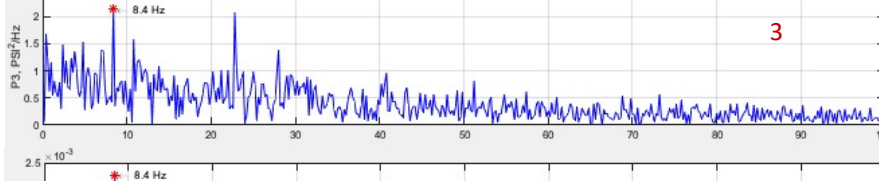
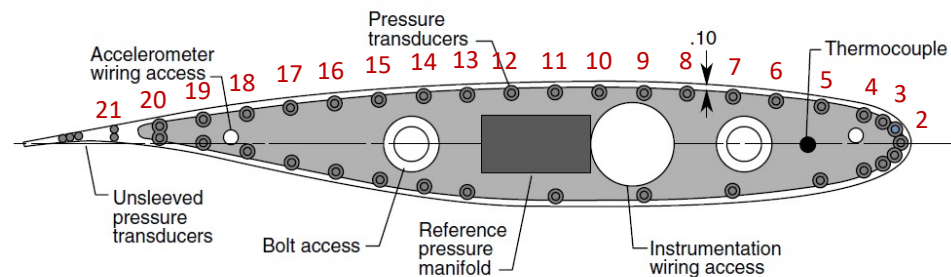
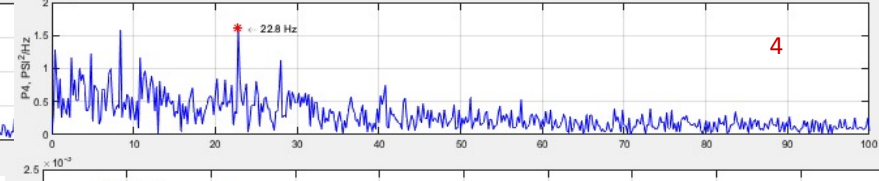
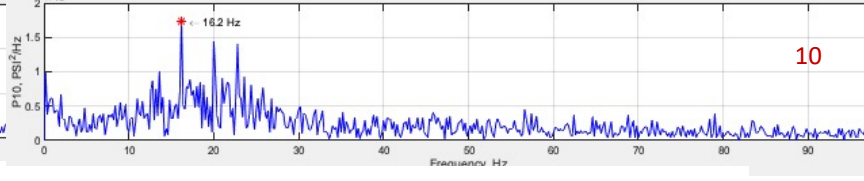
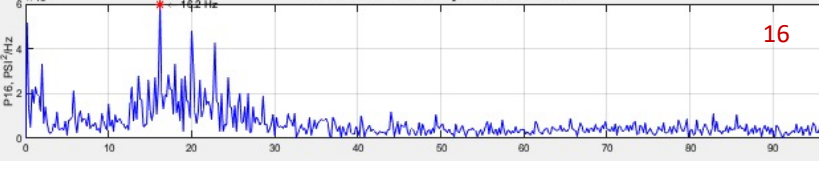
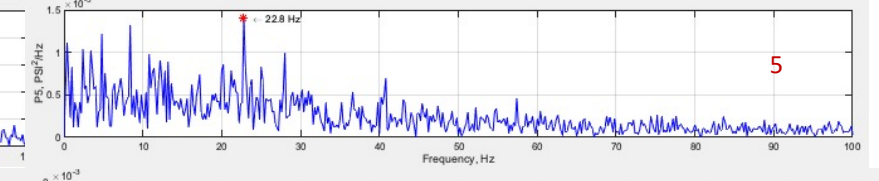
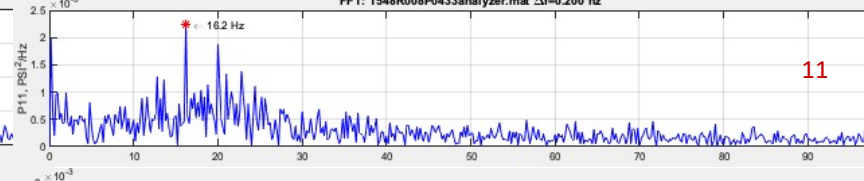
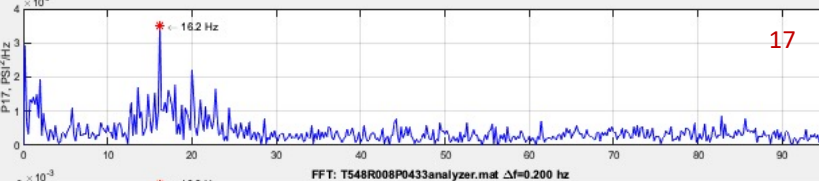
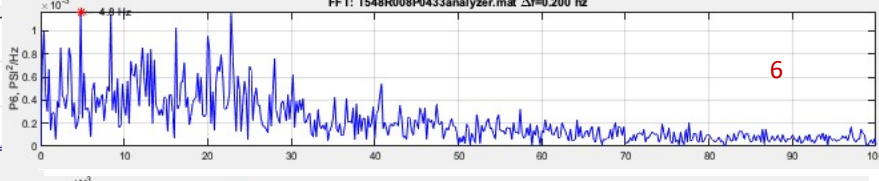
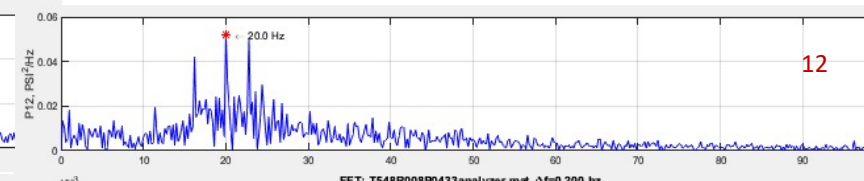
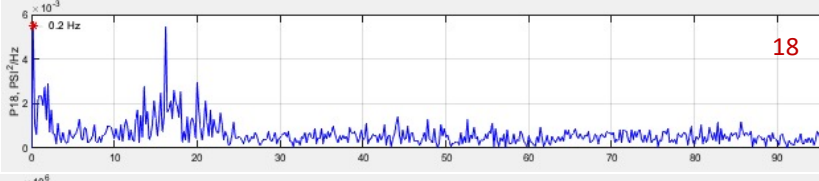
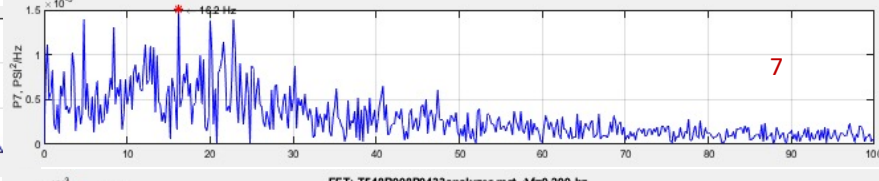
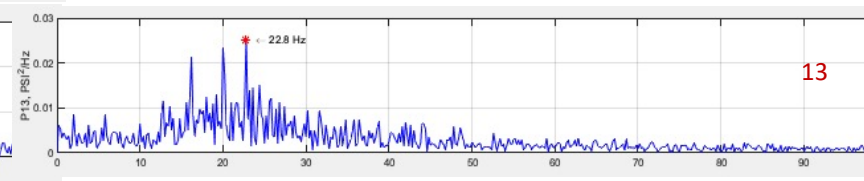
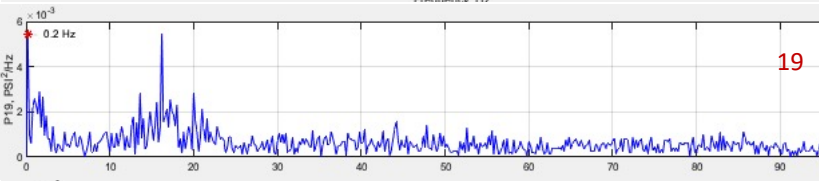
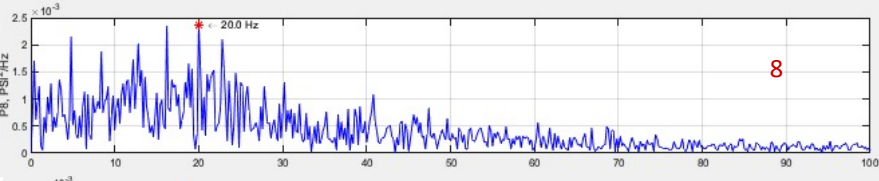
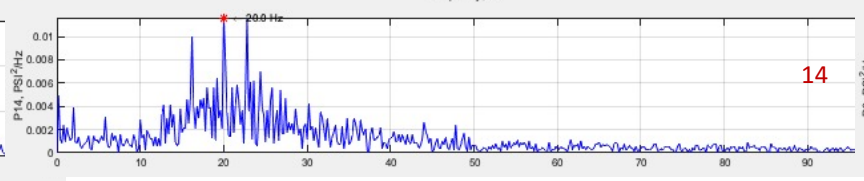
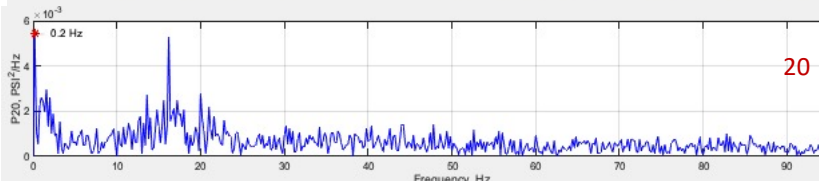
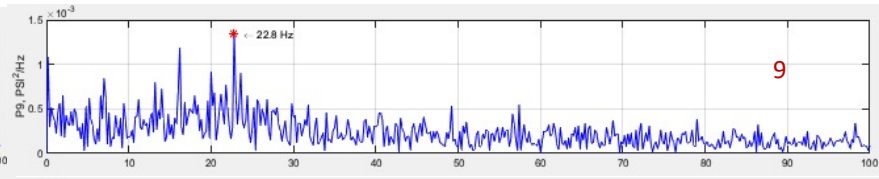
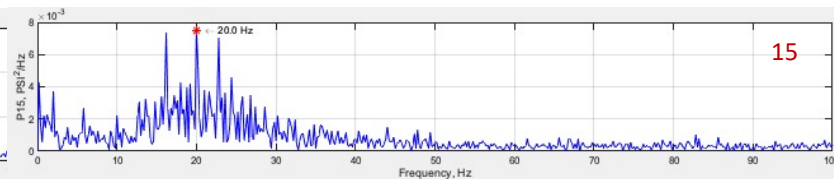
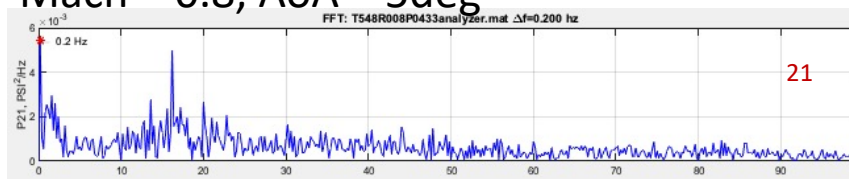
Future Experimental Data - Flutter !!!

- BSCW for the 2022 TDT entry to obtain a more complete validation set for computational benchmarking
 - Most of the BSCW test configuration was successfully set up in the TDT in March 2021, to better ensure a smooth tunnel entry in 2022
 - Build-up of the splitter plate, a panel offset from the tunnel wall with struts, to keep the BSCW away from the boundary layer along the wall.
 - Build-up of the PAPA (pitch-and-plunge apparatus) mechanism into the wall turntable and splitter plate.
 - Attachment of a flutter-stopper mechanism, used to arrest unstable flutter growth instability.

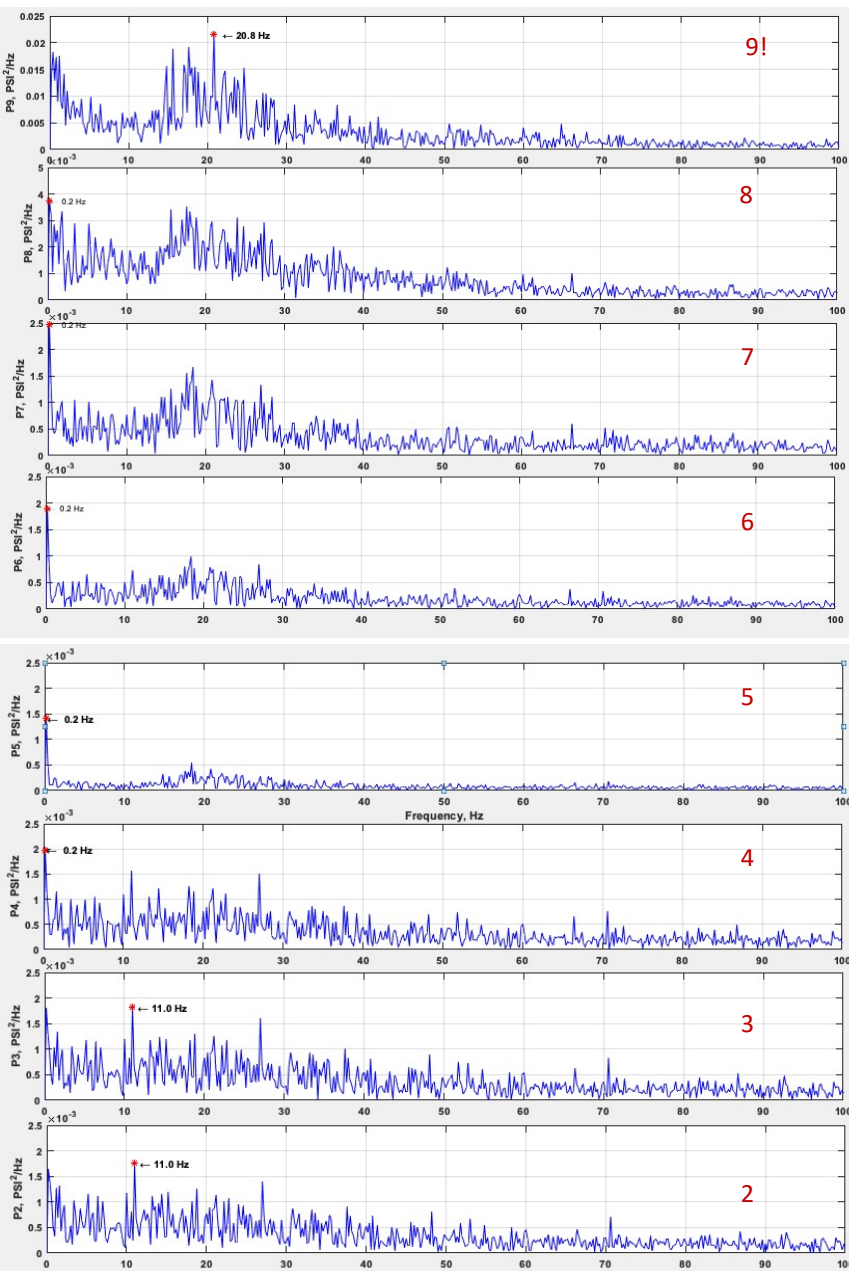
Mach = 0.8, AoA = 1deg



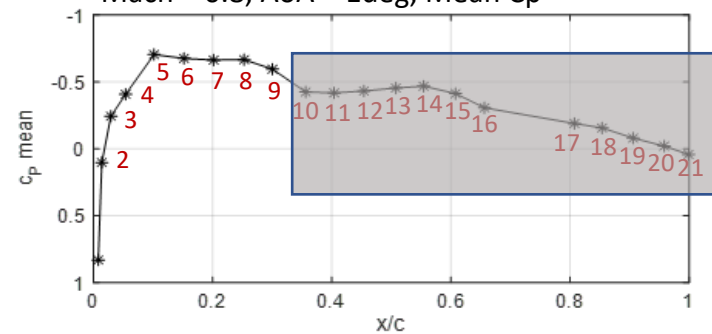
Mach = 0.8, AoA = 5deg



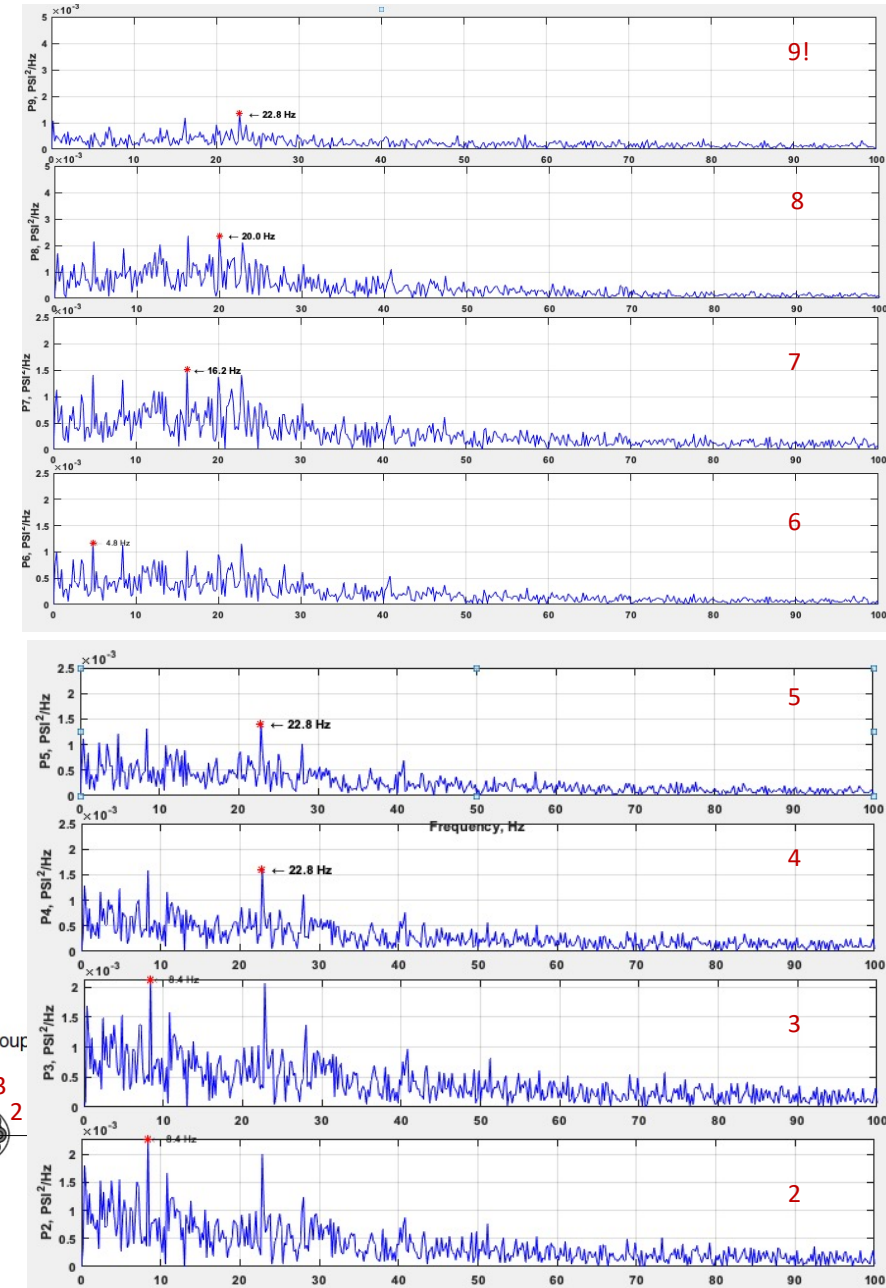
Mach = 0.8, AoA = 1deg



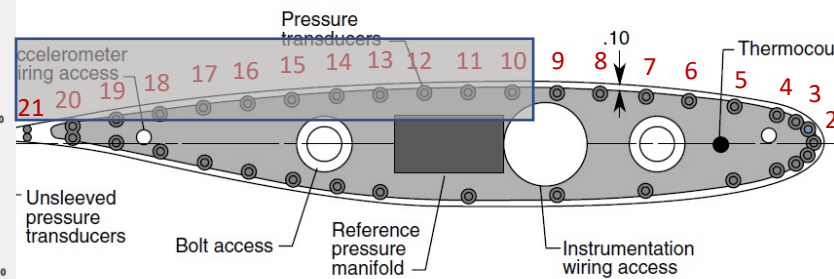
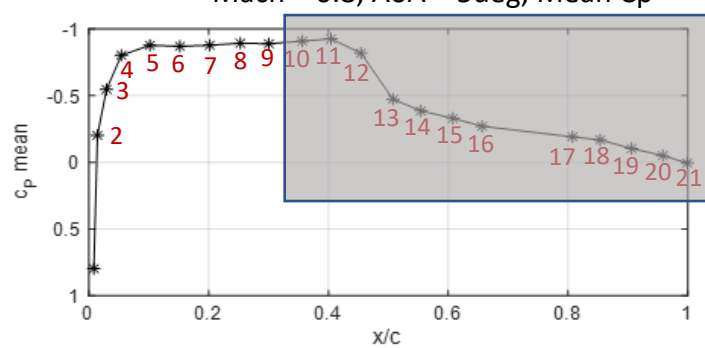
Mach = 0.8, AoA = 1deg, Mean Cp



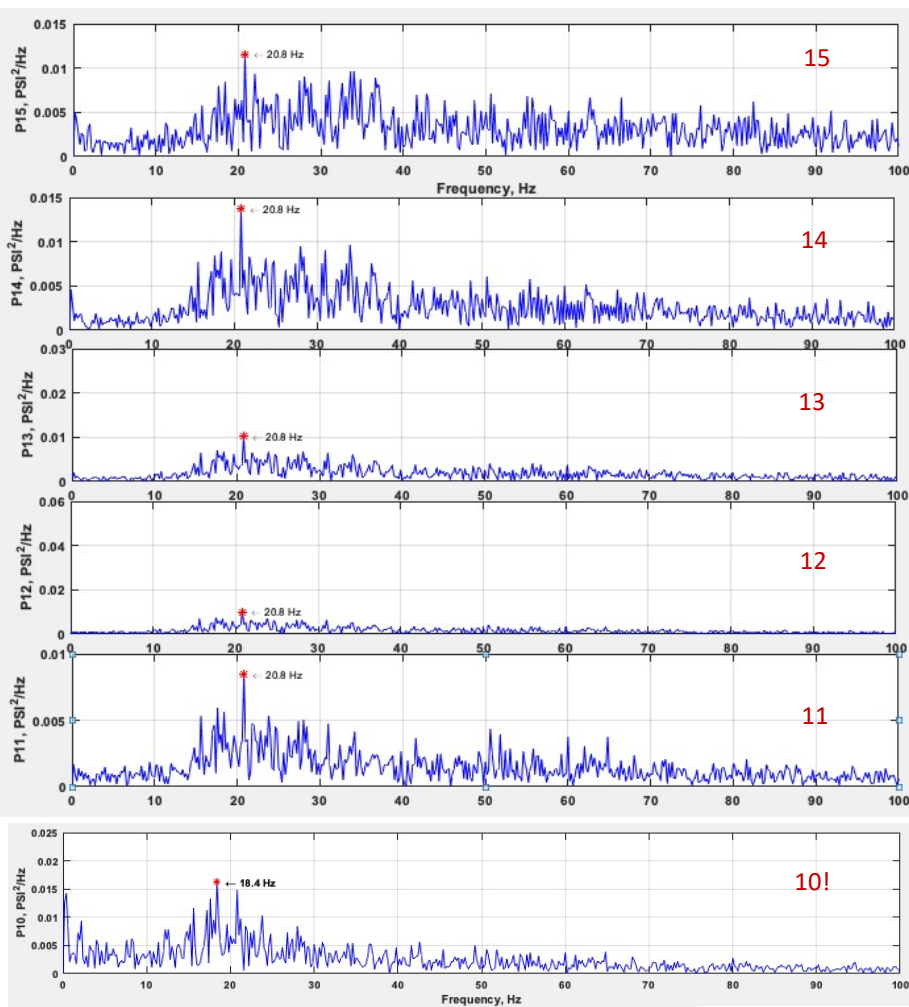
Mach = 0.8, AoA = 5deg



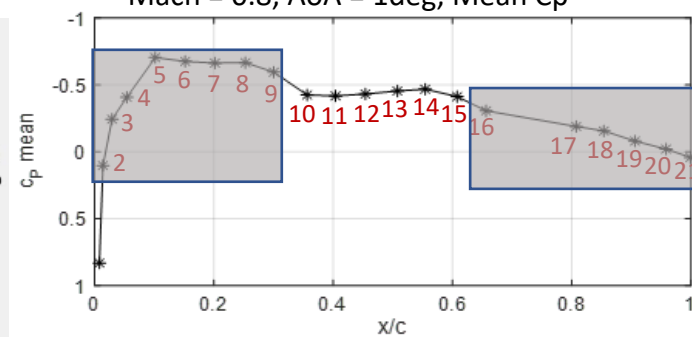
Mach = 0.8, AoA = 5deg, Mean Cp



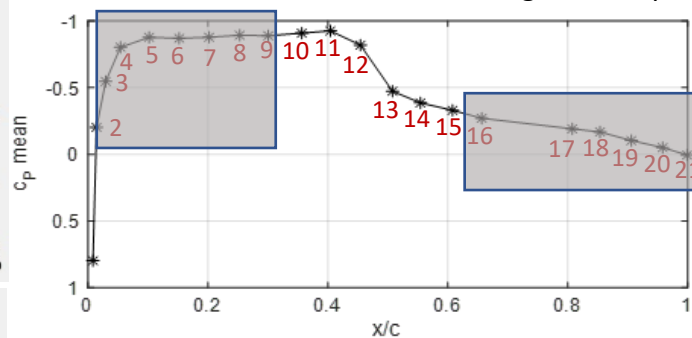
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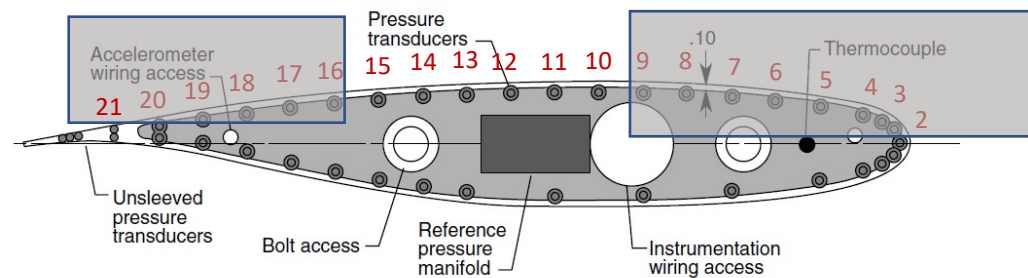
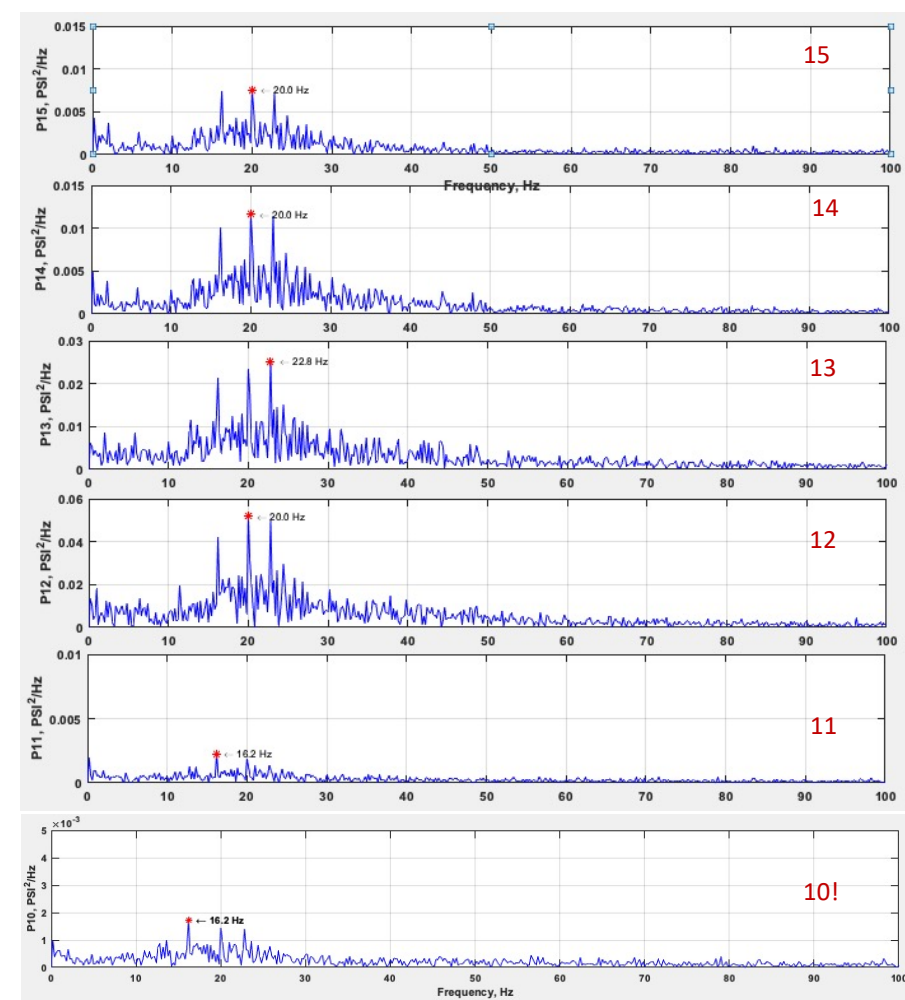
Mach = 0.8, AoA = 1deg, Mean Cp



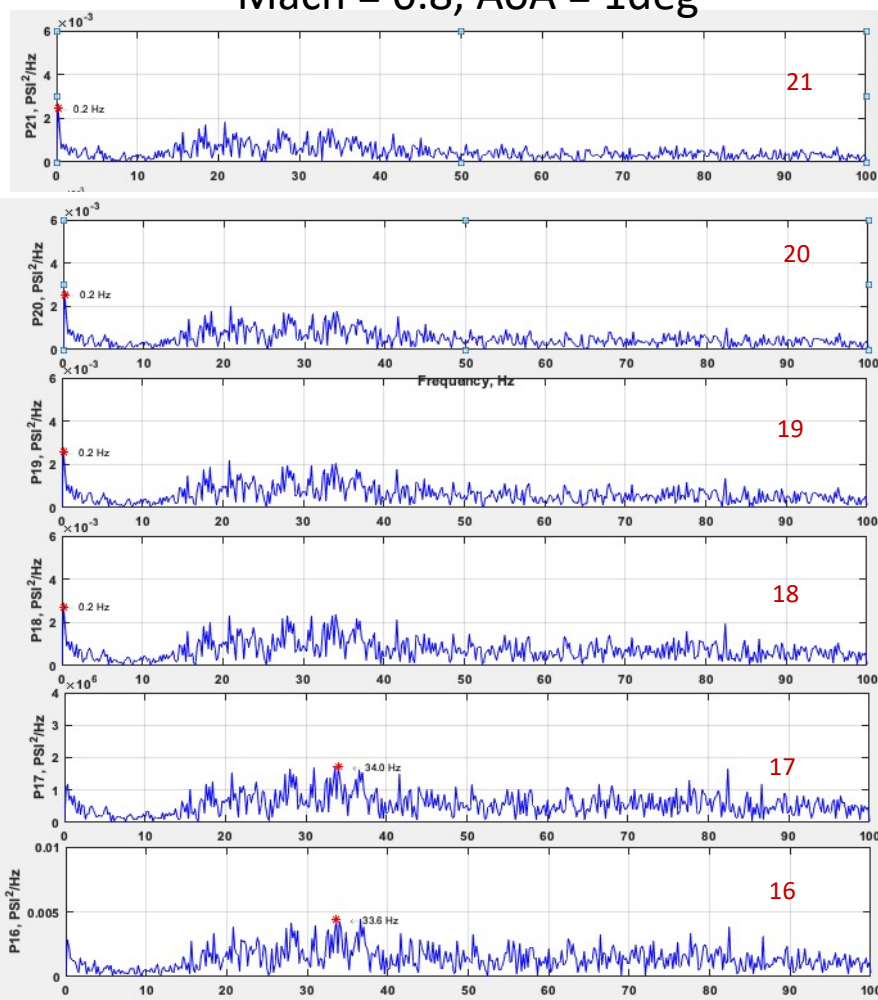
Mach = 0.8, AoA = 5deg, Mean Cp



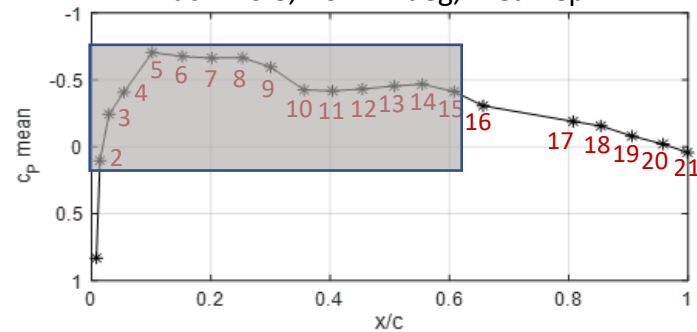
Mach = 0.8, AoA = 5deg



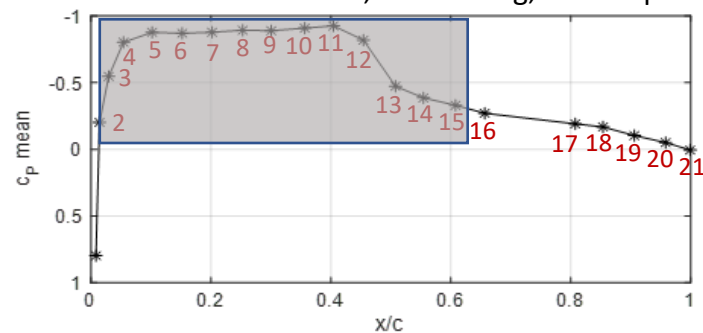
Mach = 0.8, AoA = 1deg



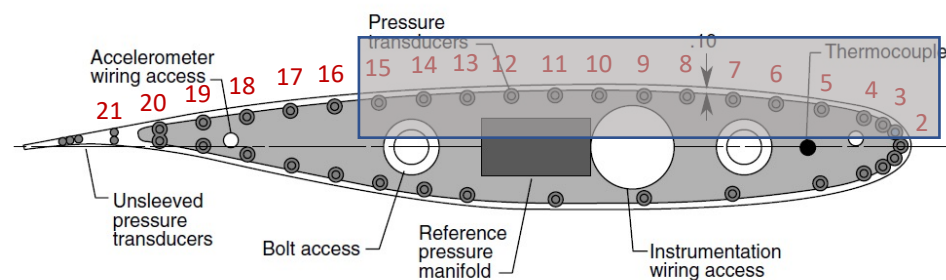
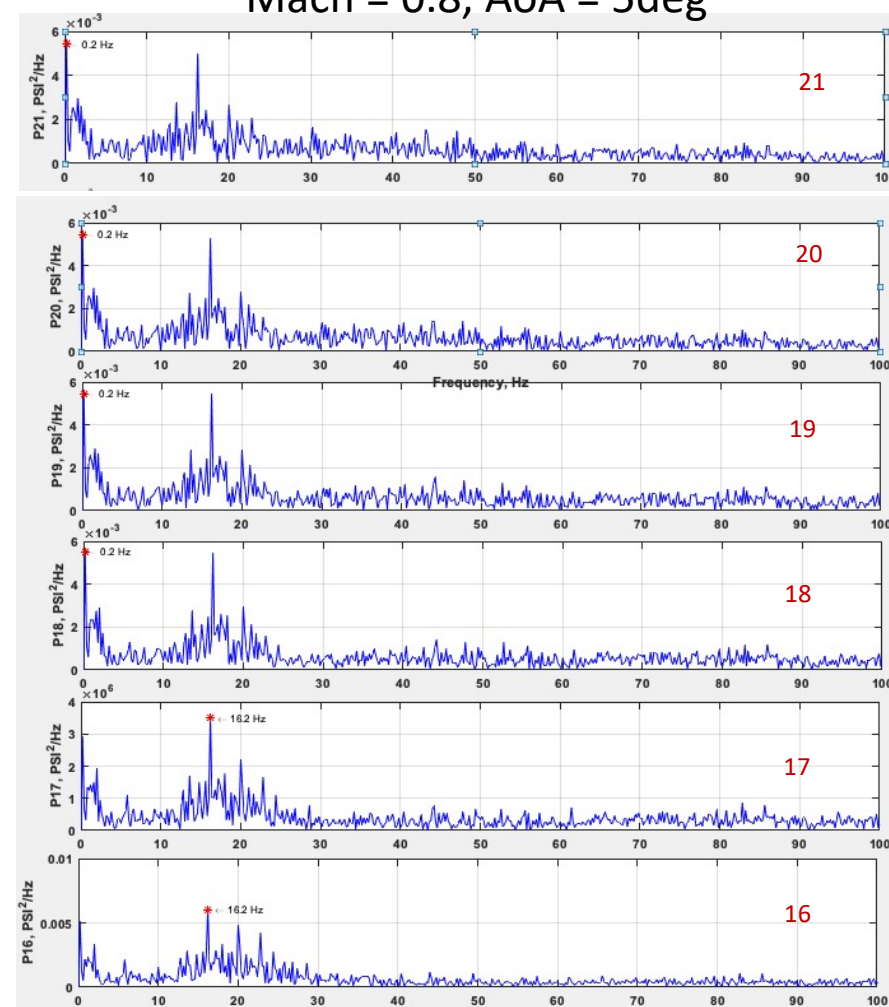
Mach = 0.8, AoA = 1deg, Mean Cp



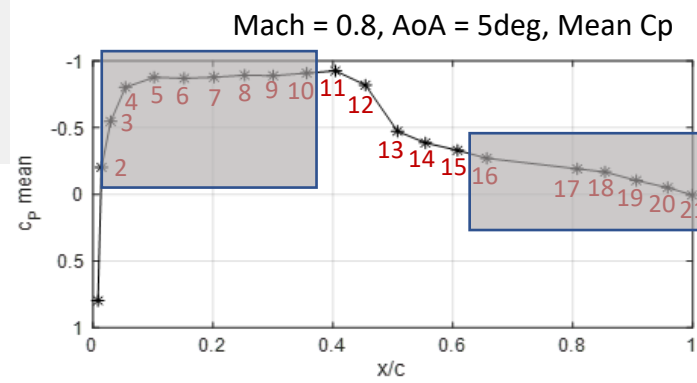
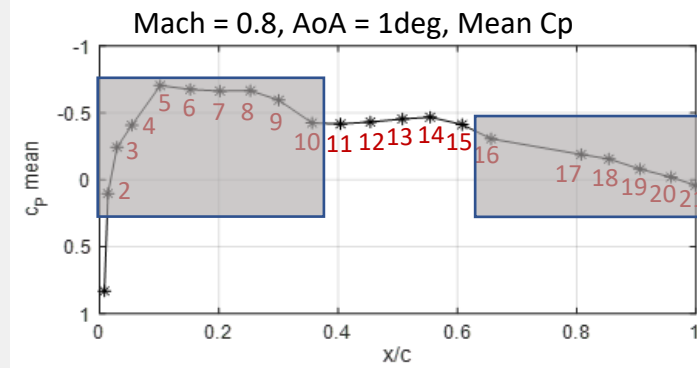
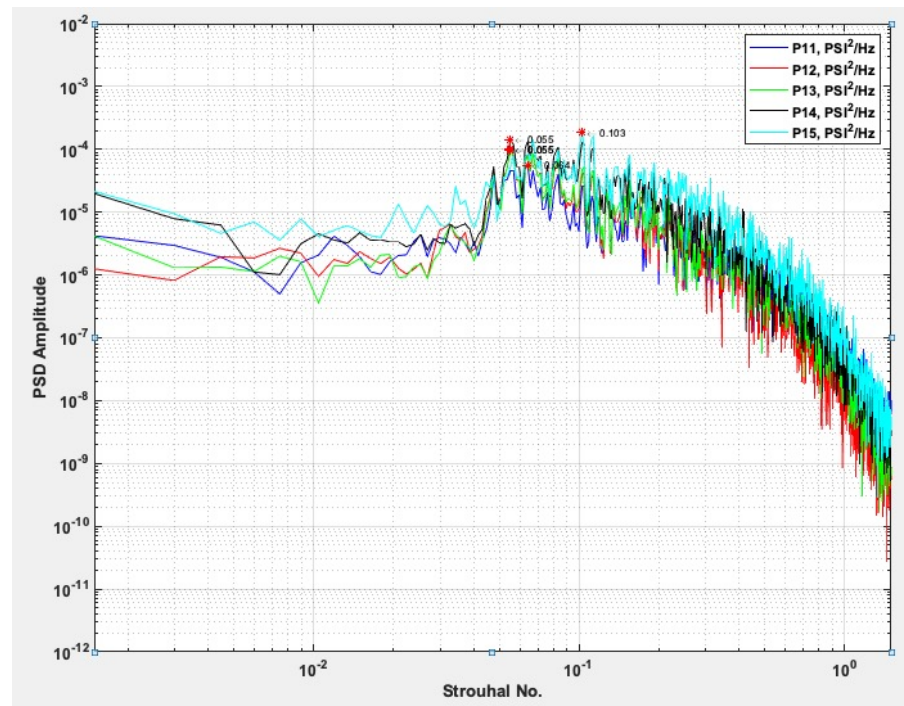
Mach = 0.8, AoA = 5deg, Mean Cp



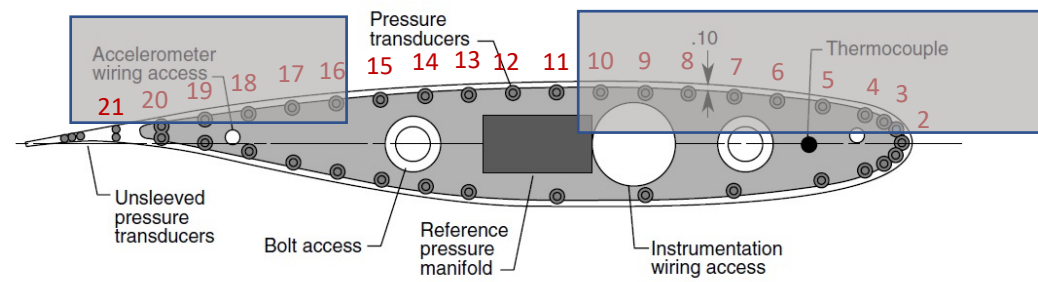
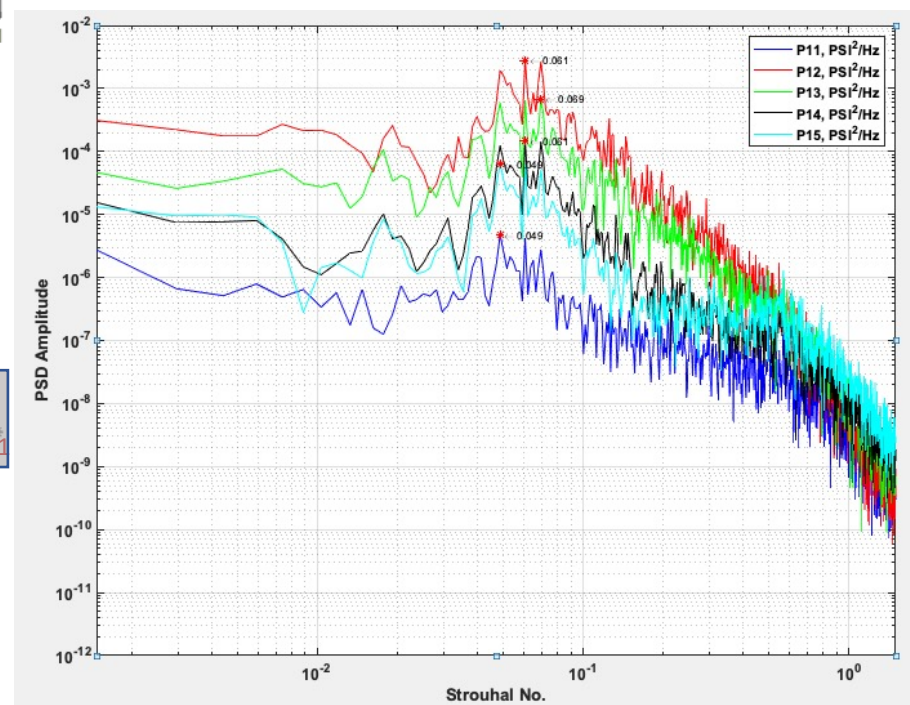
Mach = 0.8, AoA = 5deg



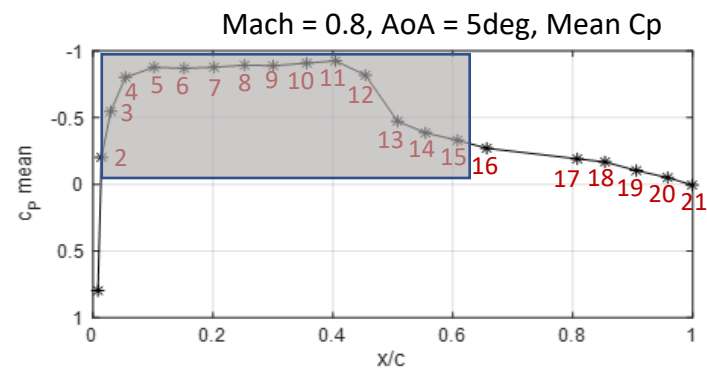
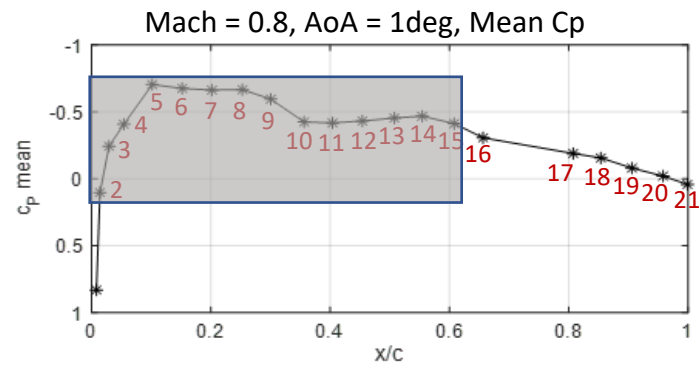
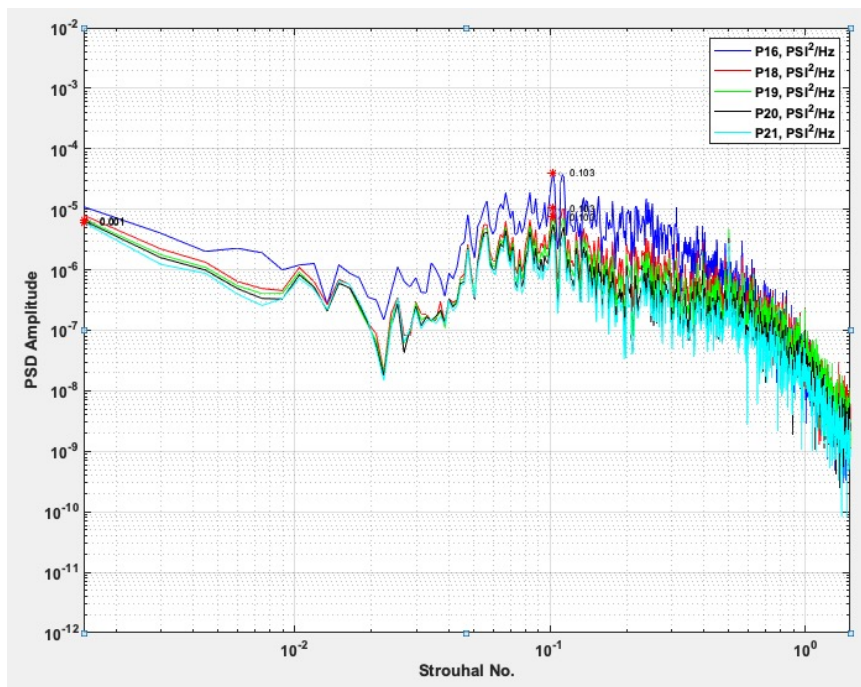
Mach = 0.8, AoA = 1deg



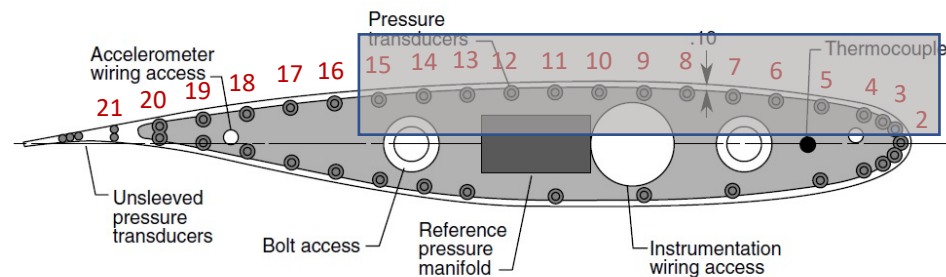
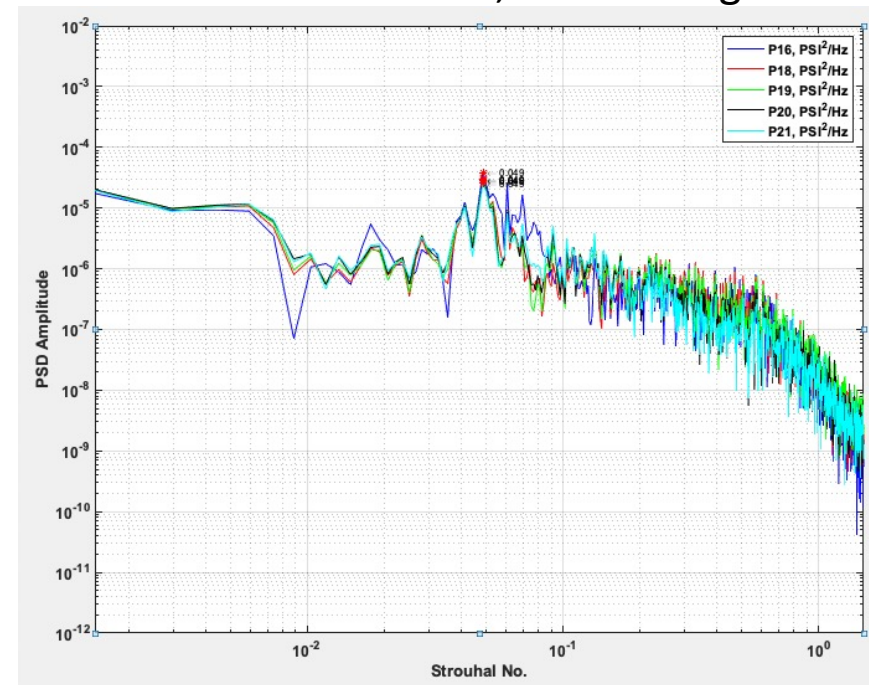
Mach = 0.8, AoA = 5deg



Mach = 0.8, AoA = 1deg



Mach = 0.8, AoA = 5deg



- FUN3D workflow

Mode shapes (2) from
NASTRAN interpolated
onto CFD grid

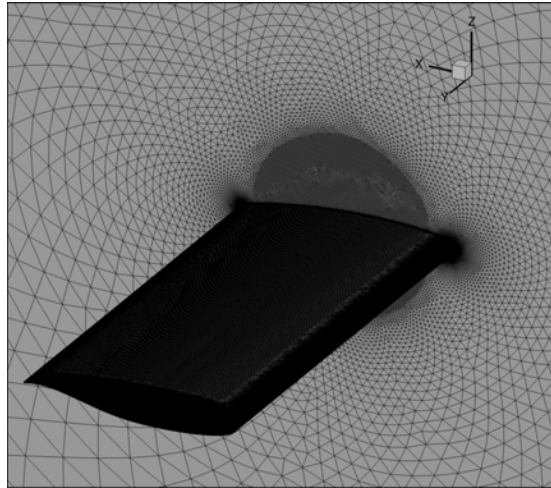
Unforced steady
state solution

Static aeroelastic solution,
coupled unsteady solution with
large structural damping value
(0.999)

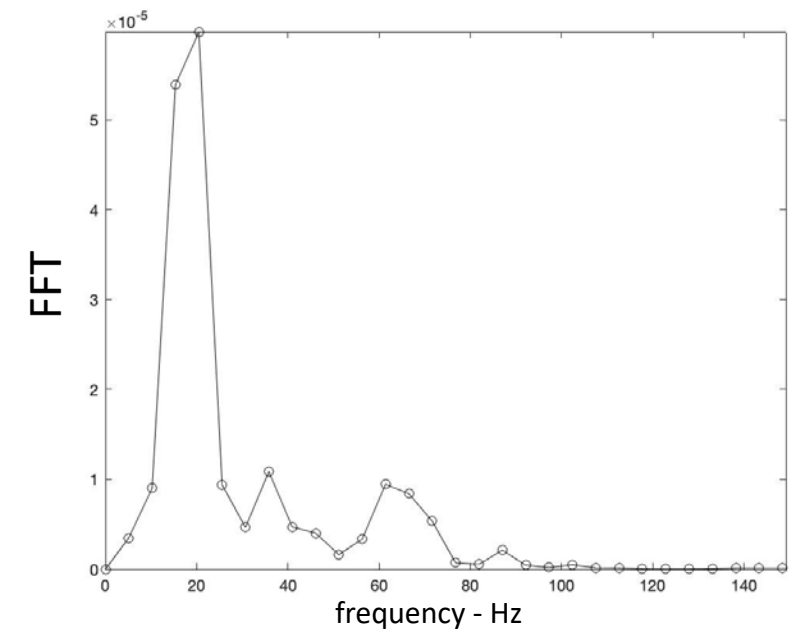
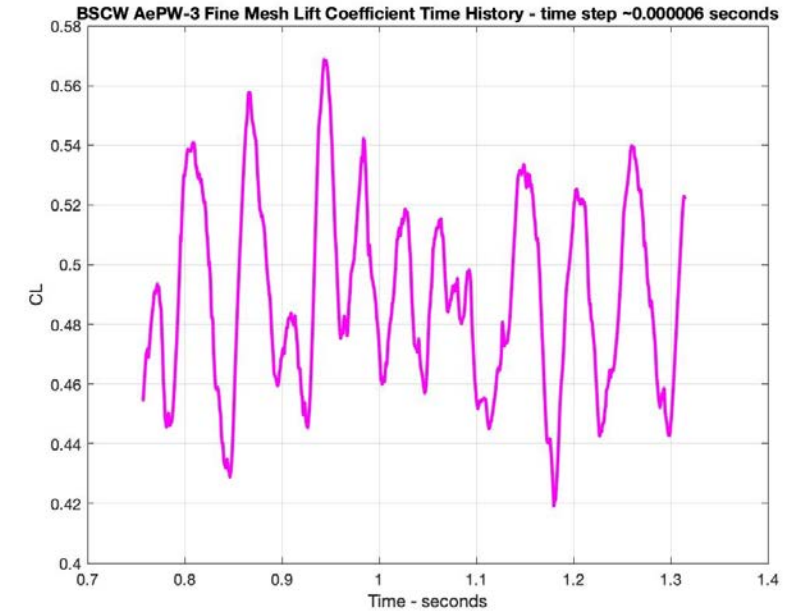
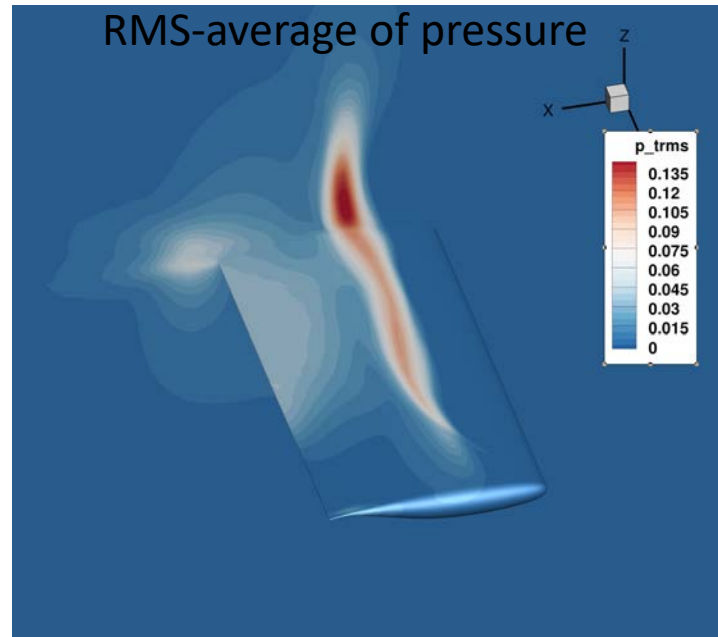
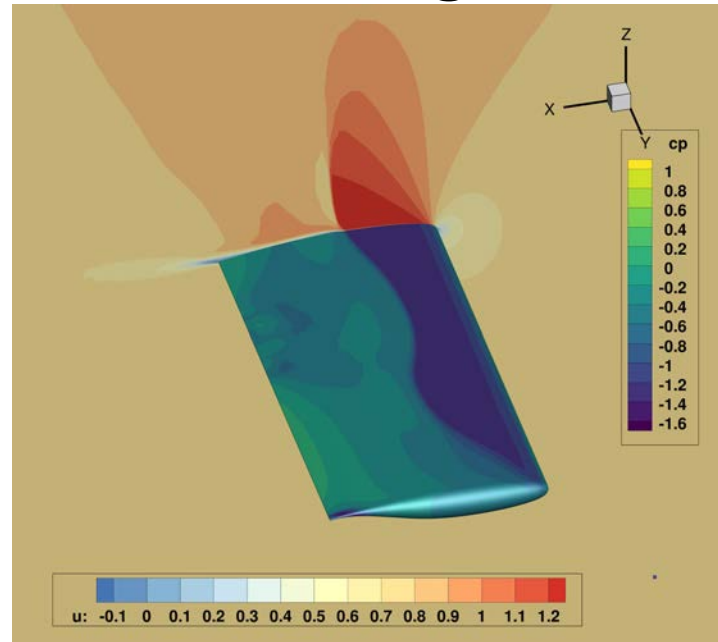
Dynamic aeroelastic solution: flutter
solutions (coupled unsteady solution with
small structural damping value (0.0) and
initial generalized vel.)

Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 3: ~27M nodes

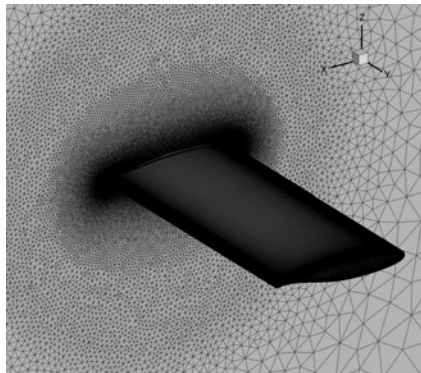
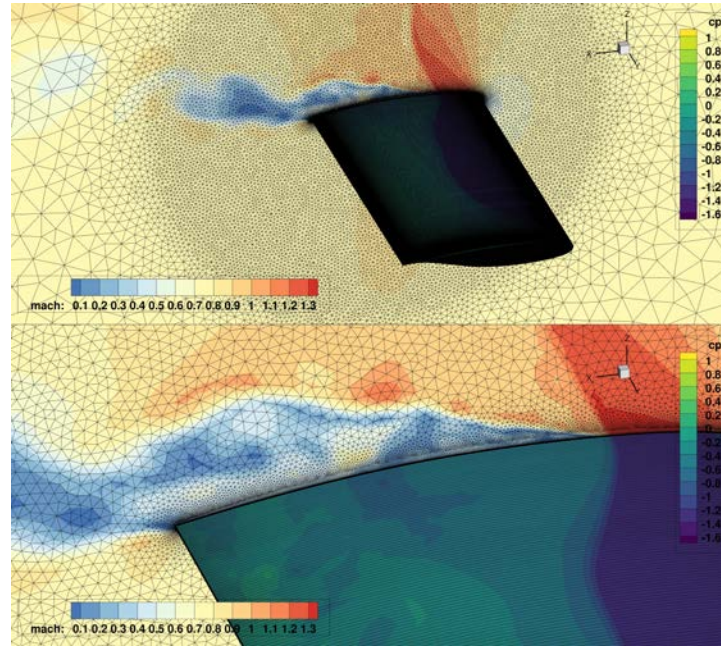
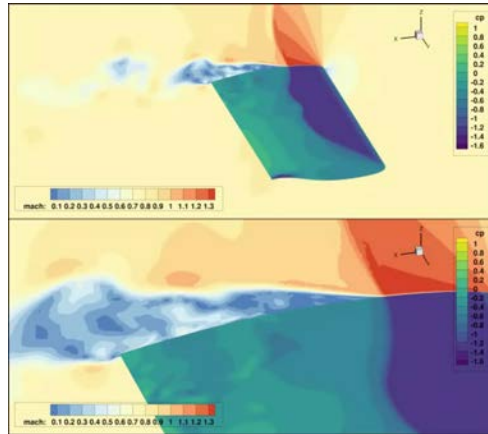
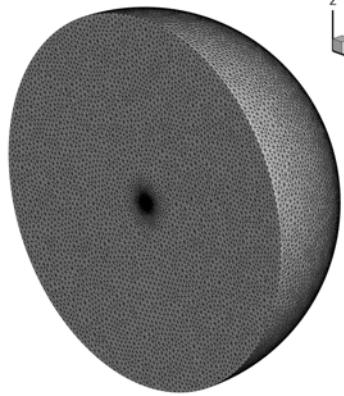


Provided Fine Mesh:
AePW-2

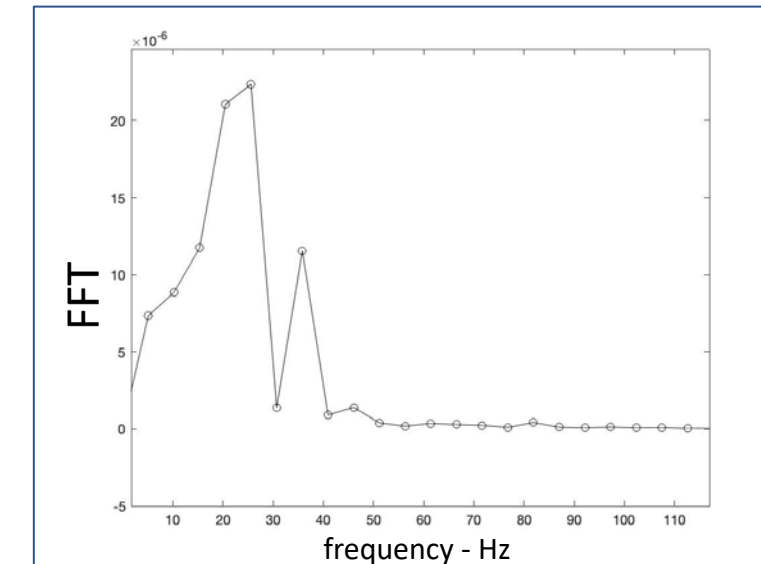
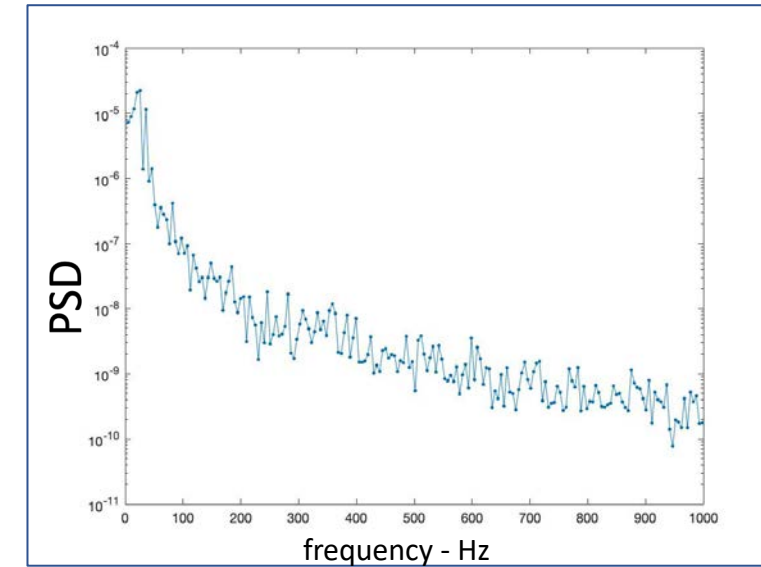
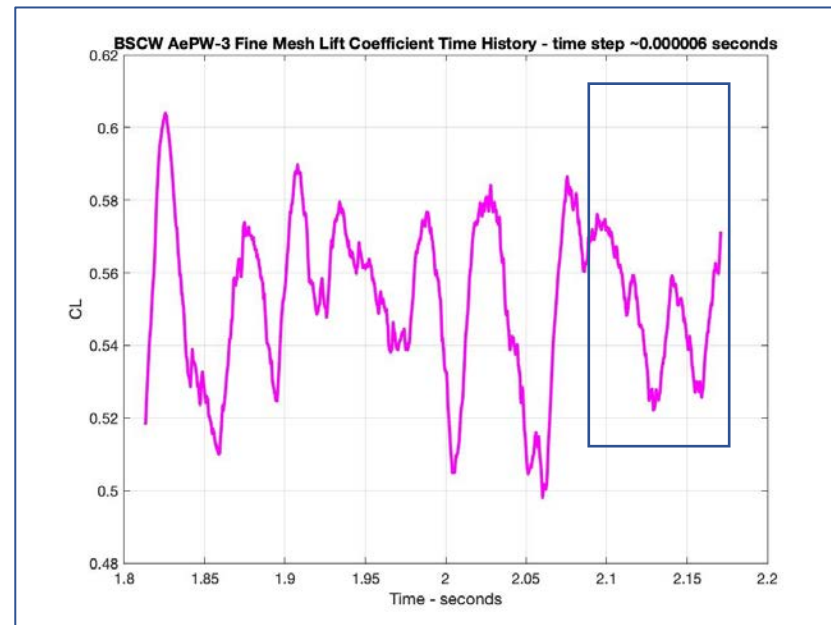


Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 2: ~23M nodes

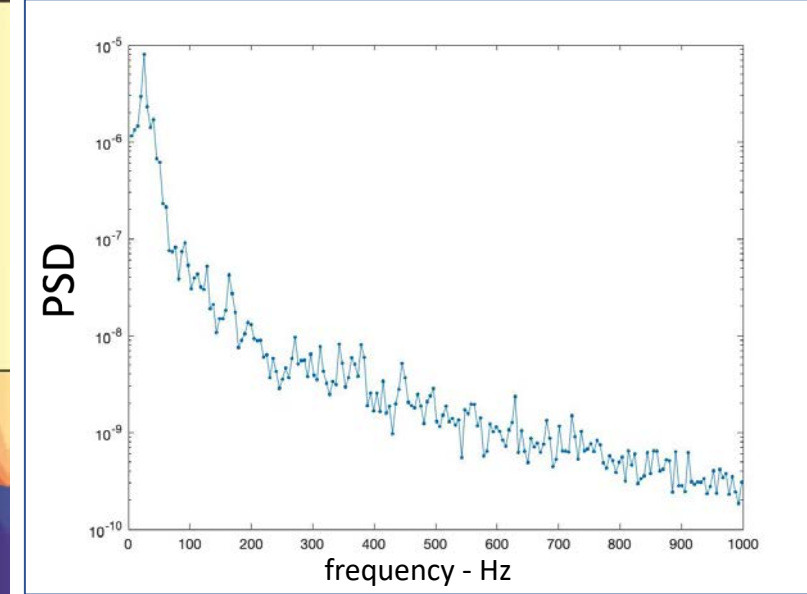
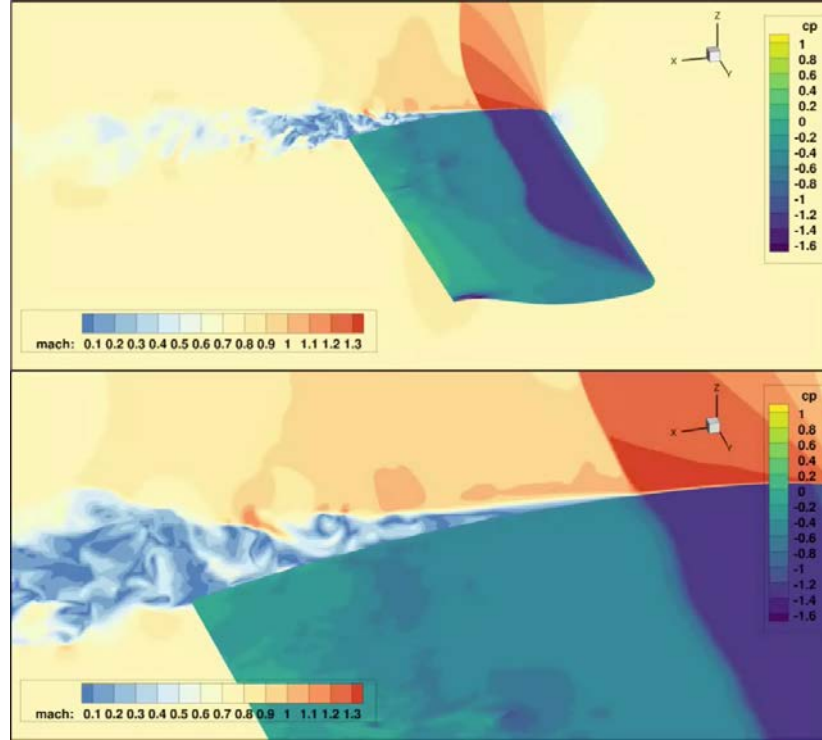
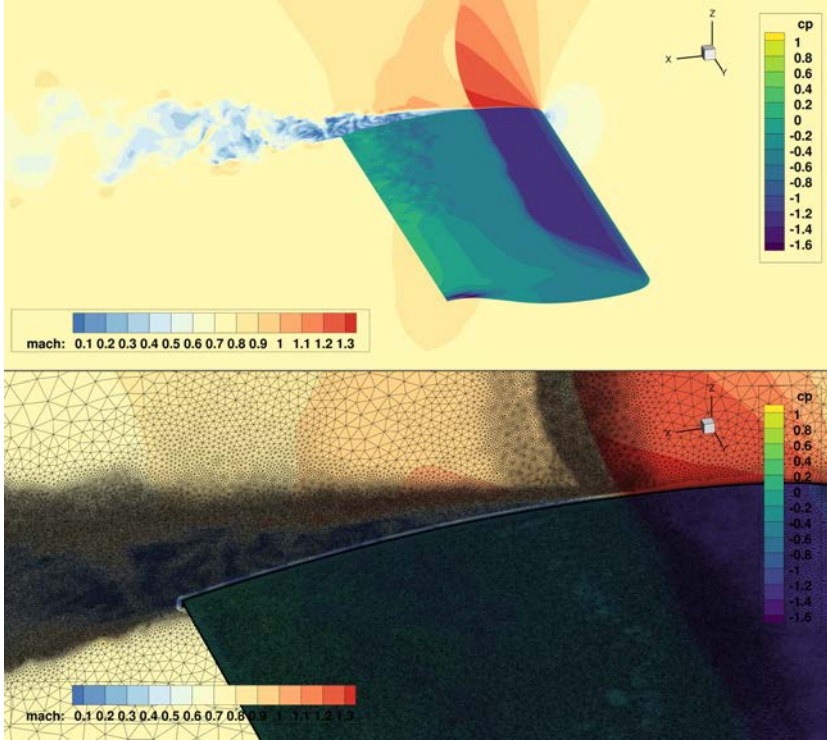


Provided Pointwise Mesh:
Fine mesh resolution

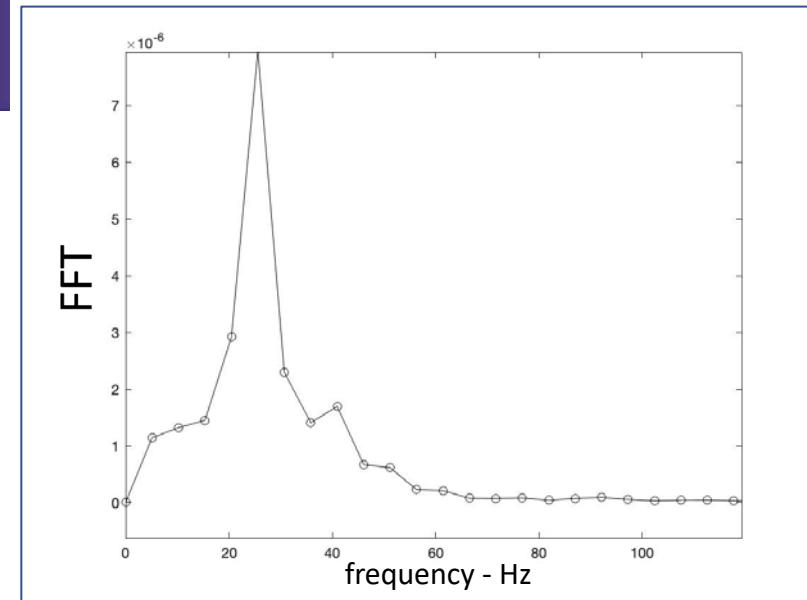
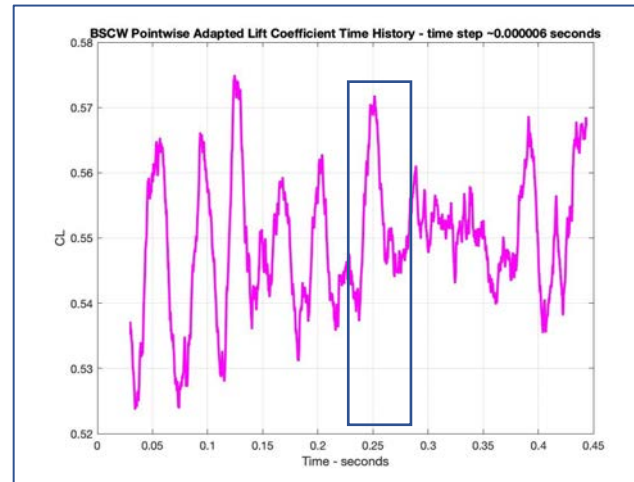


Mach 0.8, AoA = 5deg Preliminary Buffet Analysis

Case 1: ~31M nodes

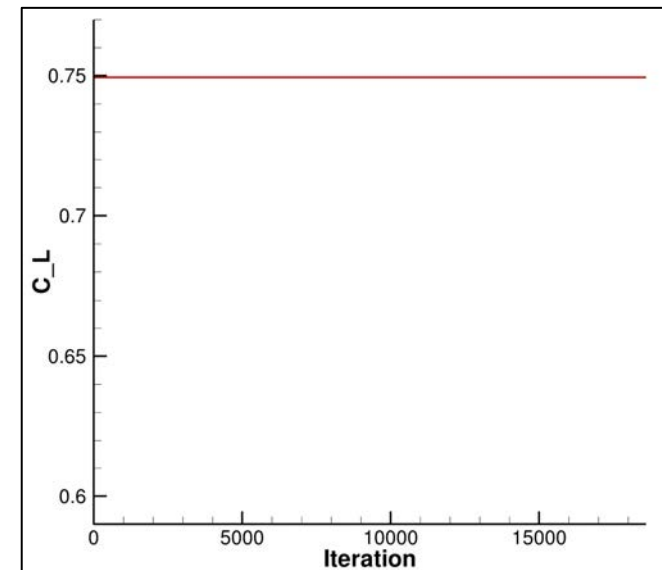
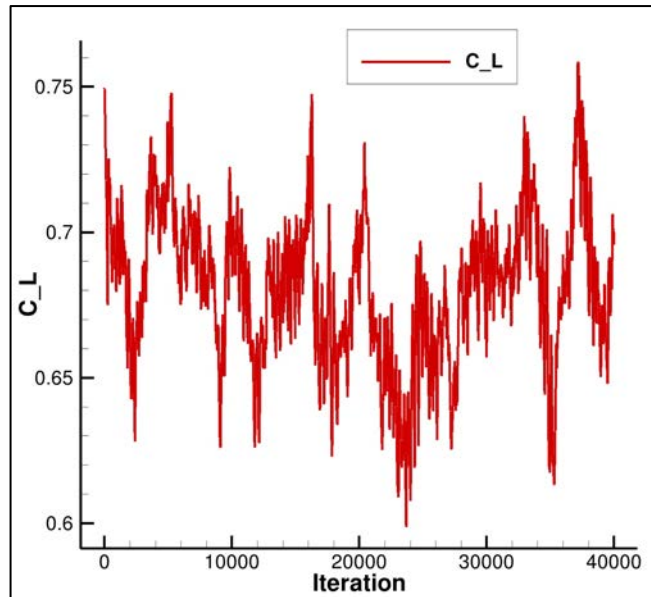
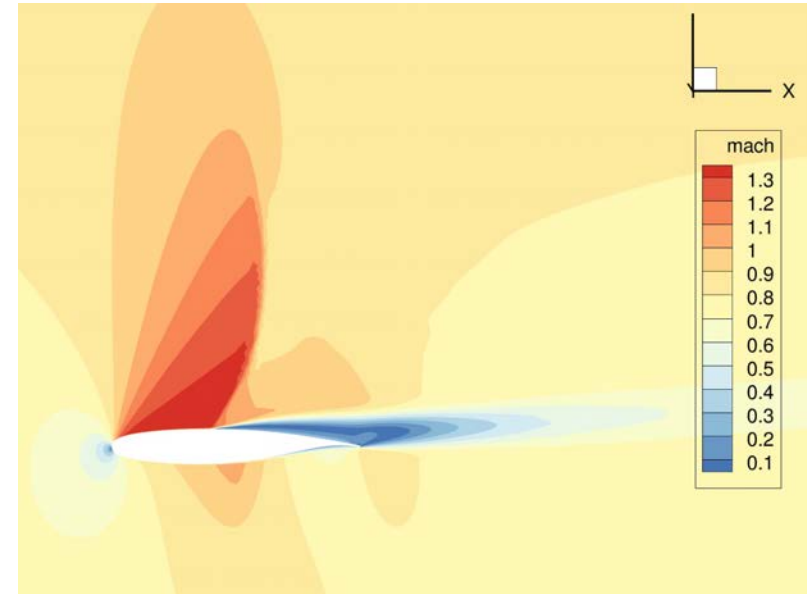
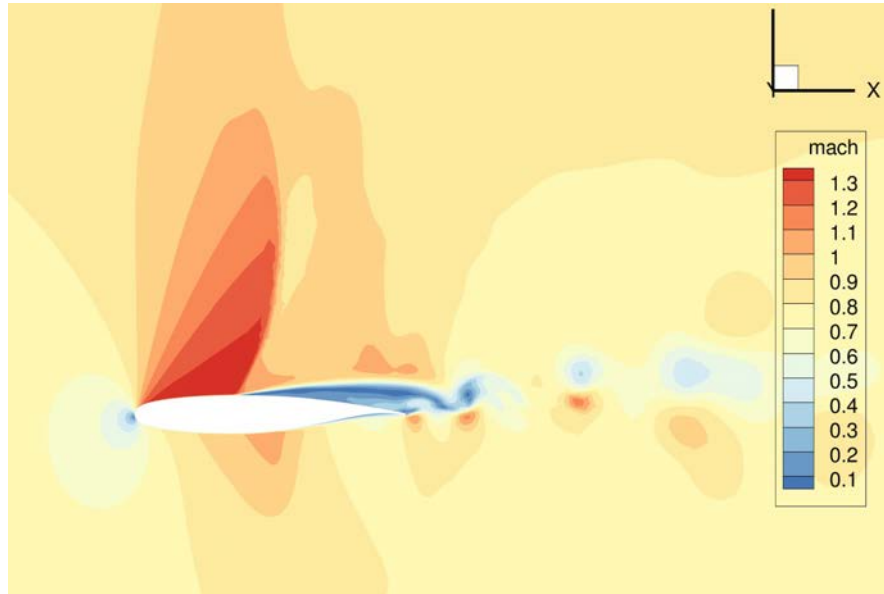


- Grid interpolation based on Pointwise isotropic point sources.
- Error is estimated by comparing the interpolated value of Mach from neighboring nodes to its actual value. Then point sources are generated requesting new grid spacing based on the estimated error.



BSCW 2D Buffet Analysis, Mach 0.8, AoA = 5deg

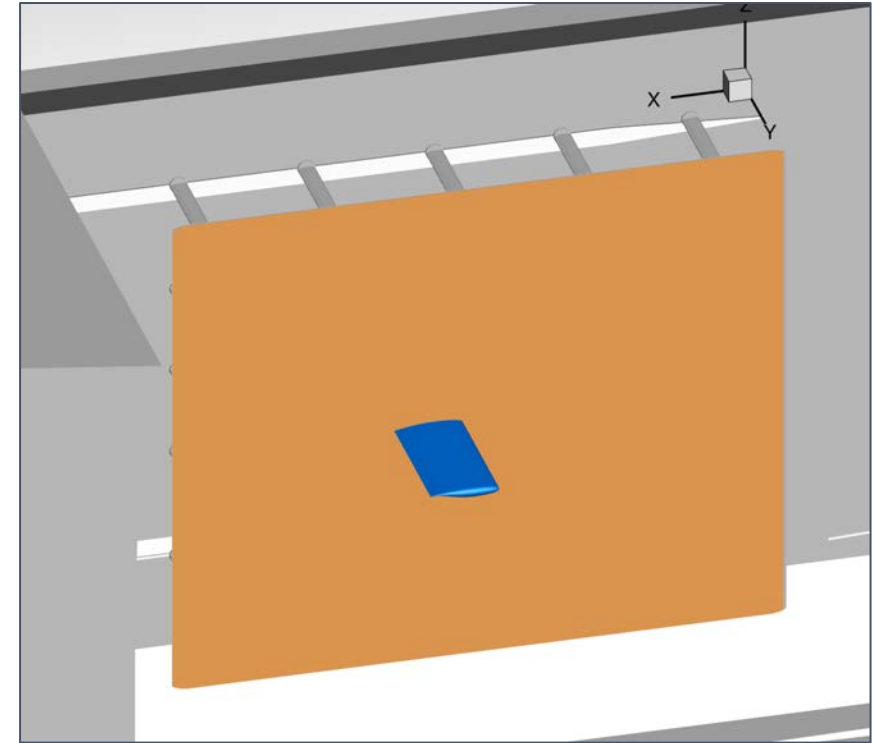
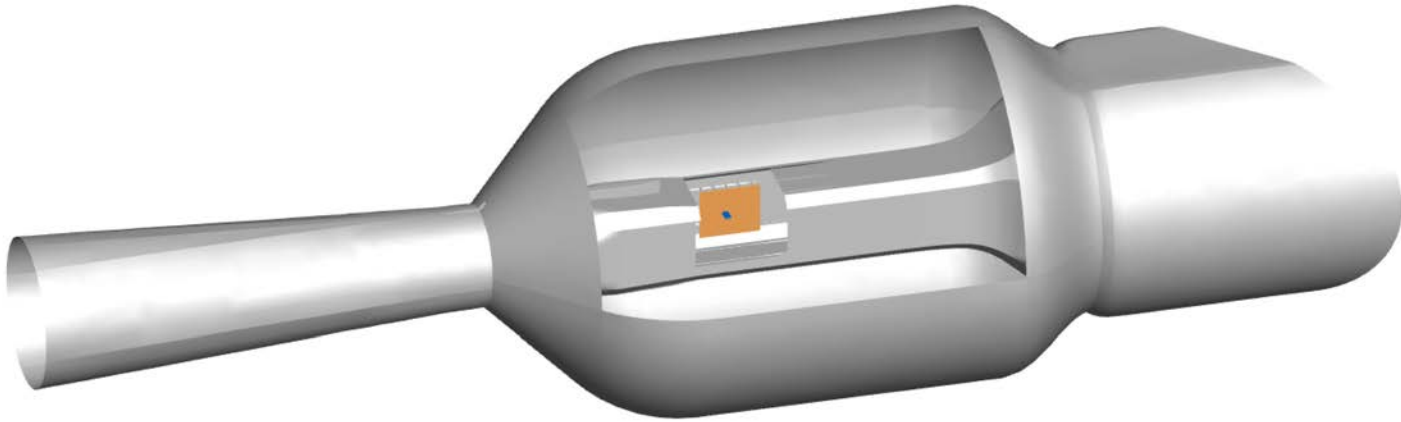
DDES



Objectives of the Aeroelastic Prediction Workshop

- **Assess the goodness** of computational tools for predicting aeroelastic response, including flutter
- **Understand why** our tools don't always produce successful predictions
 - Which aspects of the physics are we falling short of predicting correctly?
 - What about our methods causes us to fall short of successful predictions?
- Establish **uncertainty bounds** for computational results
- Establish **best practices** for using tools
- Explicitly **illustrate the specific needs** for validation experimentation- i.e. why what we have isn't good enough
- Establish **community** for leveraging experiences and processes

BSCW Wing + Splitter Plate + Transonic Dynamics Tunnel



Working Groups

Large
Deformation

Aeroelasticity from a
Flight Test Perspective

High
Angle of Attack

Hypersonics

