

STUDY OF THE EFFECTS OF WIND POWER TO ESTABLISH FATIGUE DESIGN CRITERIA FOR HIGH-MAST POLES

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Oral Presentation



OVERVIEW OF PRESENTATION



BACKGROUND

TRANSFER SHEET

CONCLUSIONS

FUTURE WORK

RICHARD PRICE AND THE MOUNTAIN PLAINS CONSORTIUM:

Use of Wind Power Maps to Establish Fatigue Design Criteria for
Traffic Signal and High-Mast Structures

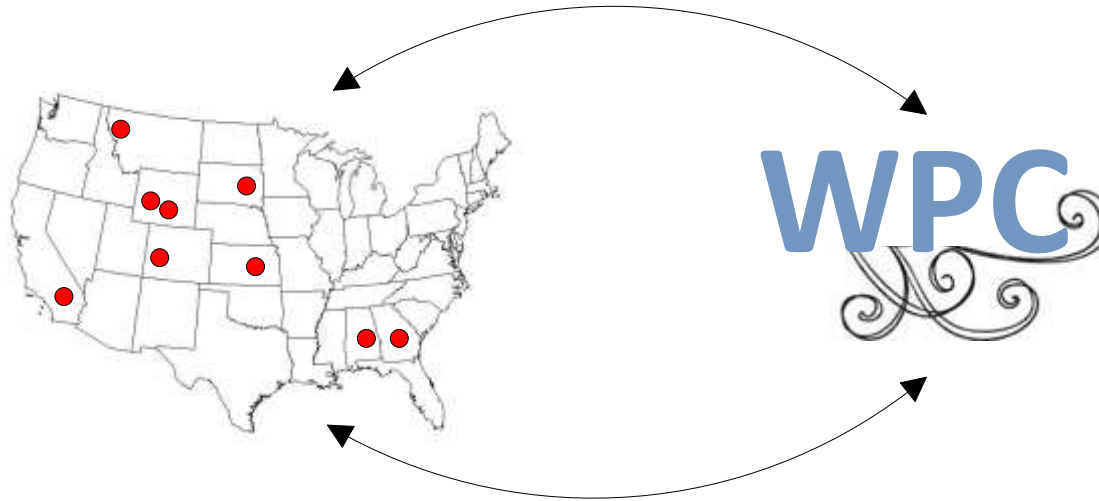
Traffic Signal Arm



High-Mast Pole



PURPOSE:



CONCLUSIONS:

TRAFFIC SIGNAL ARMS



HIGH WIND

HIGH-MAST POLES

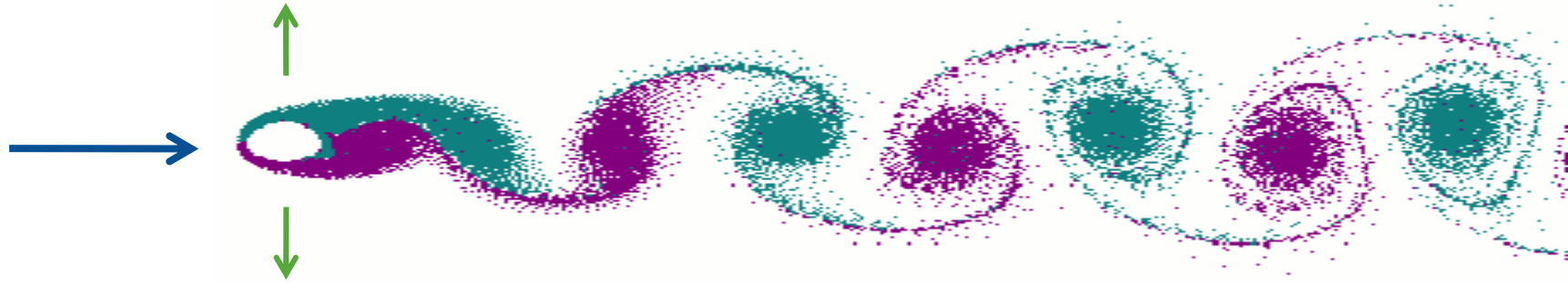


HIGH-MAST POLES



- Typically 100-120 ft tall
- Lighting device at top (Luminaire)
- Constructed of multi-sided tube steel
- Fixed to a concrete pad
- Failures

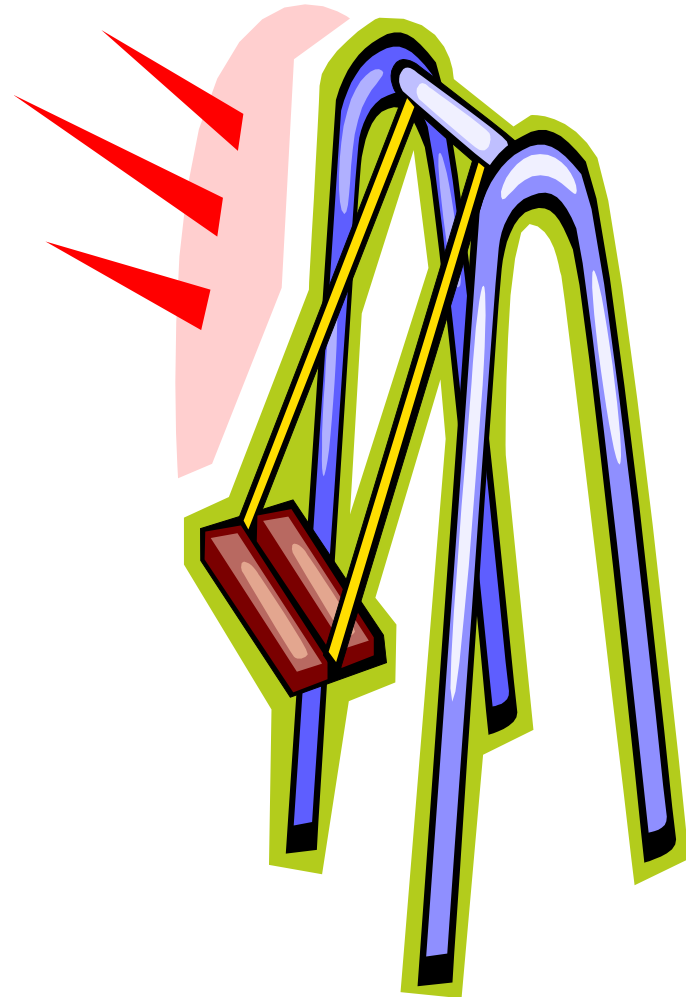
VORTEX SHEDDING



- Occurs when fluid passed over a blunt object
- Alternating pressure zones
- Across-wind movement

VORTEX SHEDDING

- Natural Frequency
- Critical Velocity
- Lock-in



VORTEX SHEDDING



First Mode



Second Mode



Third Mode



Increasing
Frequency



BACKGROUND

TRANSFER SHEET

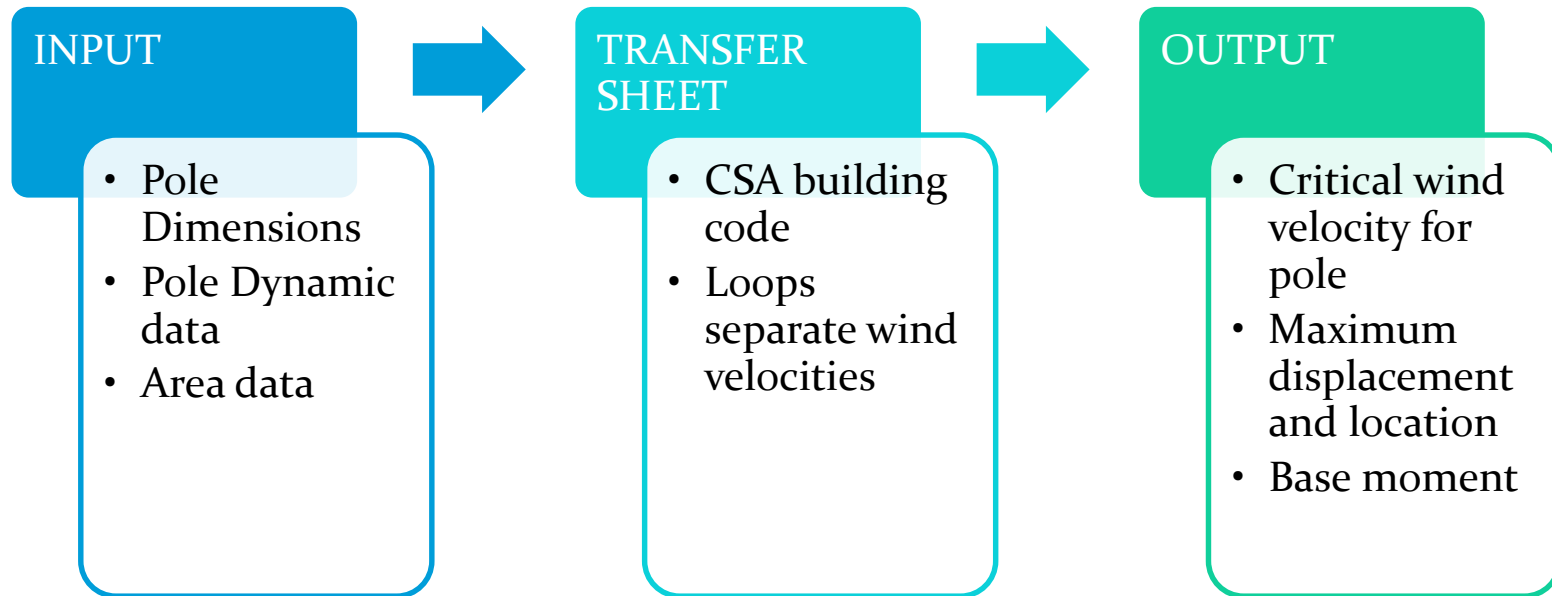


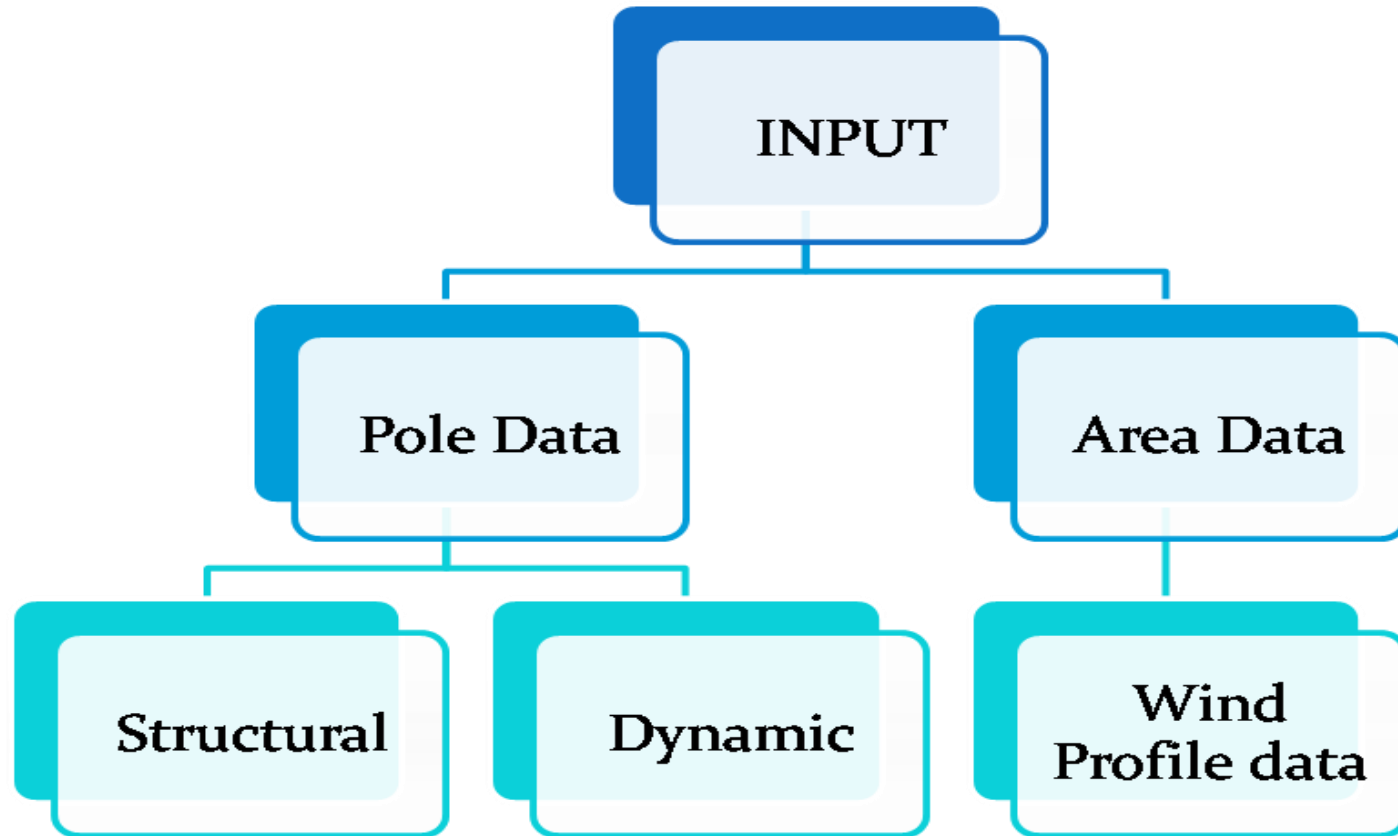
CONCLUSIONS

FUTURE WORK

WHY A TRANSFER SHEET?

- Purpose – easy prediction of high-mast results
- Why it is called a transfer sheet





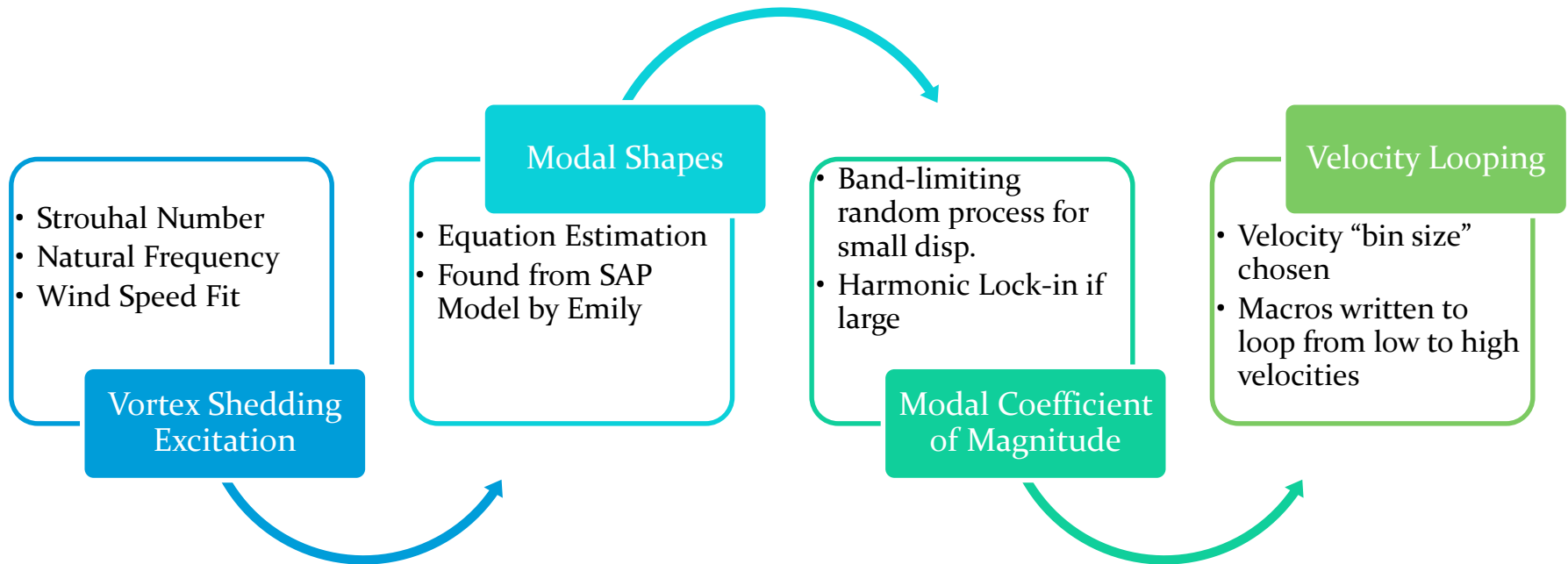
EMILY AHEARN:
REDUCTION OF WIND-INDUCED VIBRATIONS IN
HIGH-MAST LIGHT POLES



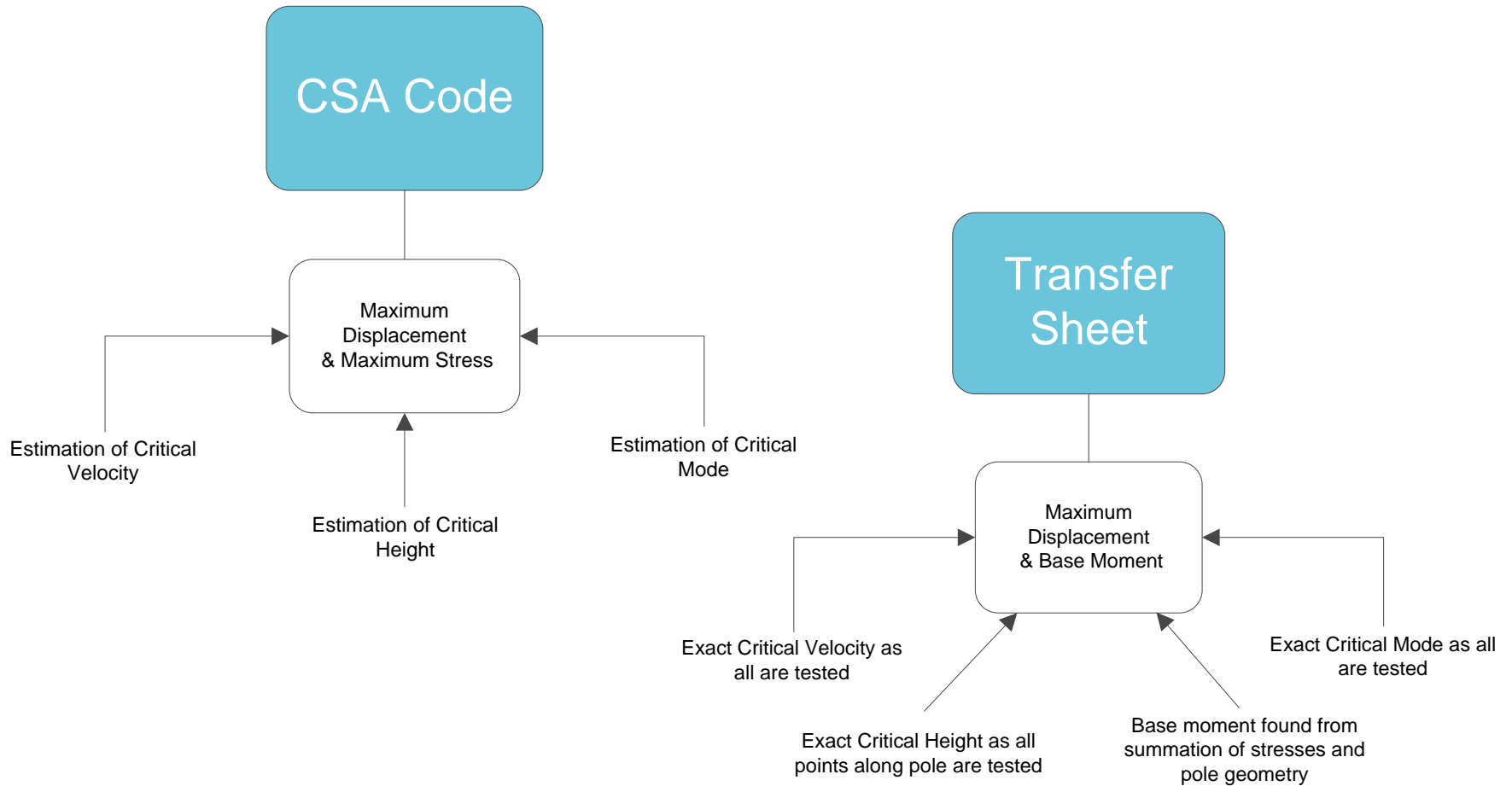
HIGH-MAST POLE LOCATION



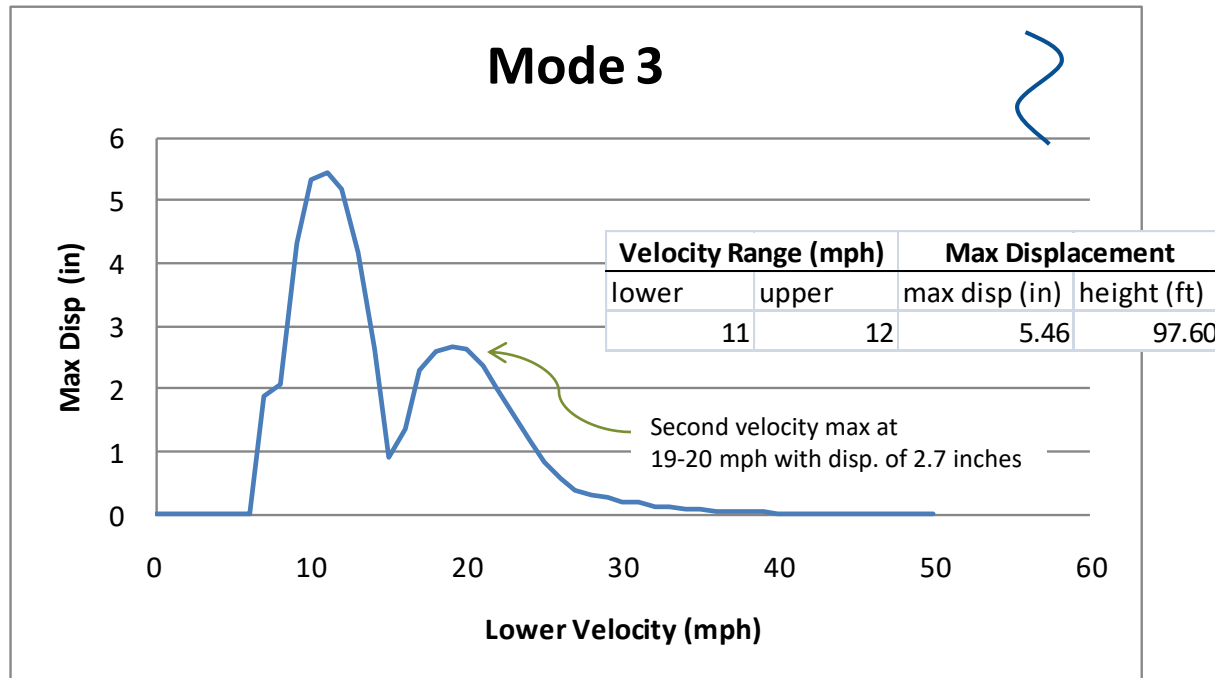
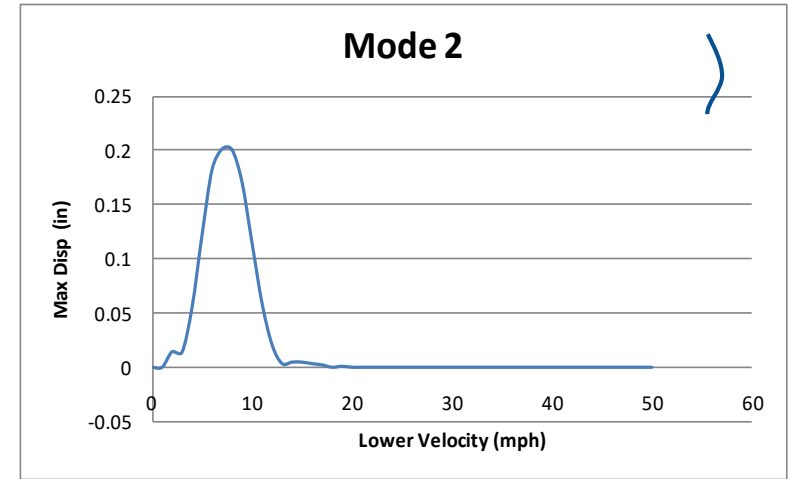
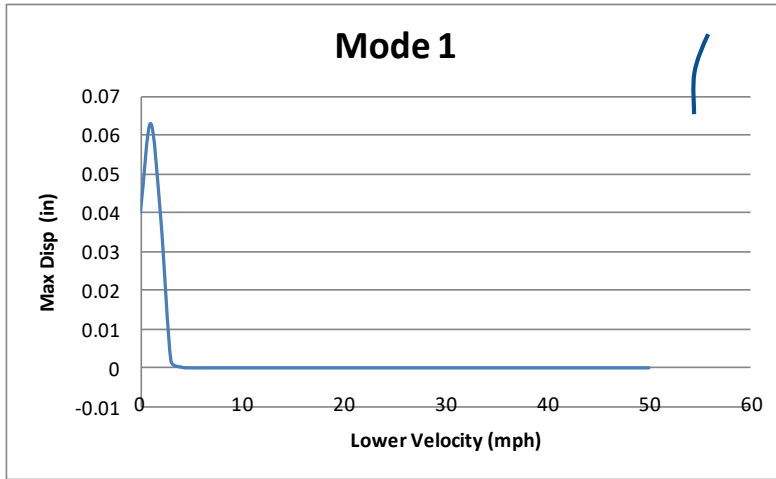
TRANSFER PROCESS



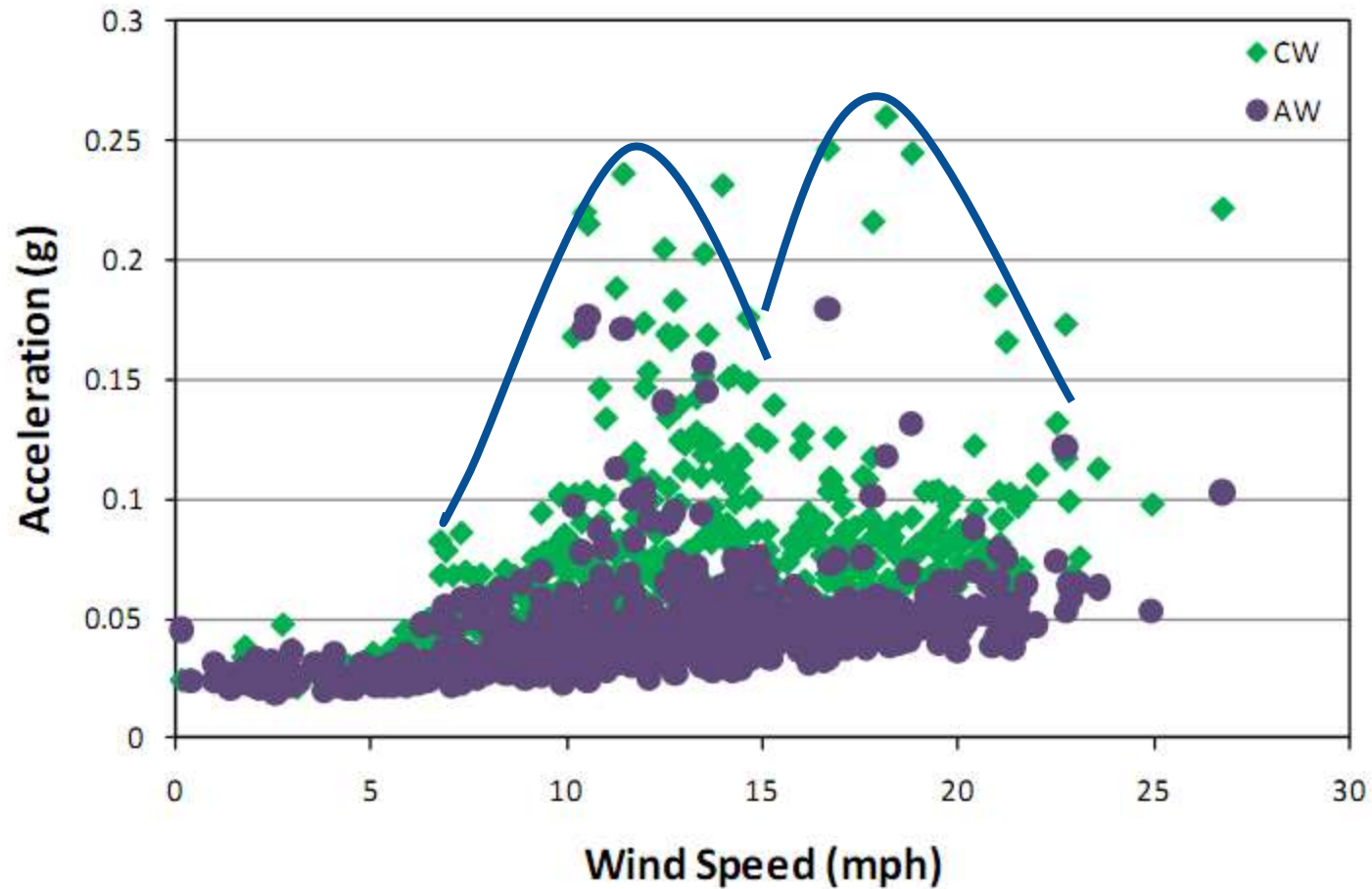
MORE ON TRANSFER SHEET "LOOPING"



TRANSFER SHEET OUTPUT



COMPARISON OF OUTPUT TO FIELD DATA



BACKGROUND

TRANSFER SHEET

CONCLUSIONS



FUTURE WORK

- EFFECTIVENESS OF THE TRANSFER SHEET
 - Estimation of Critical Velocity
 - Estimation of Critical Mode Shape
 - Estimation of Critical Height and Displacement

- POSSIBLE FLAWS
 - Magnitude of base moment predicted

BACKGROUND

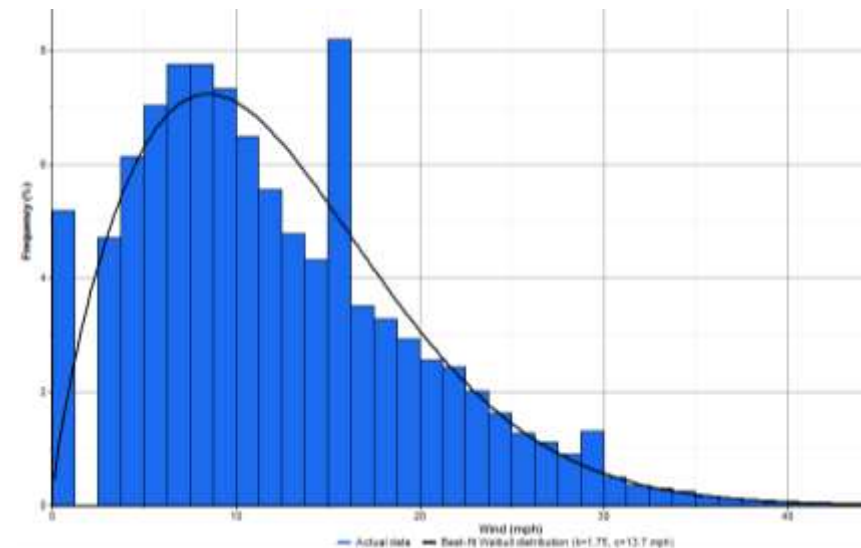
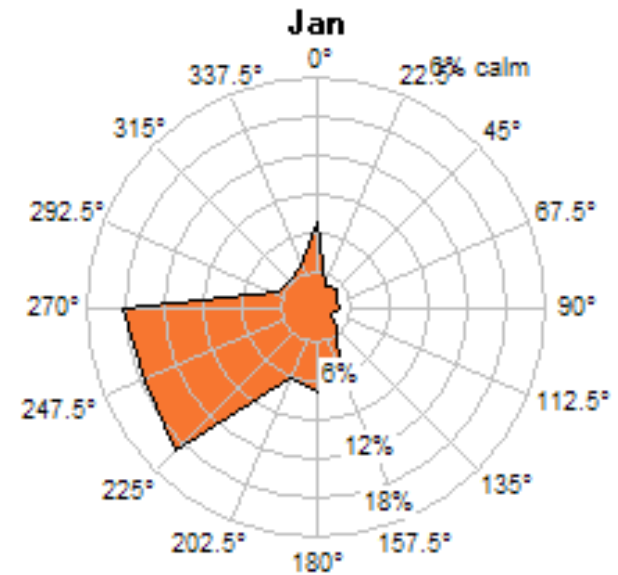
TRANSFER SHEET

CONCLUSIONS

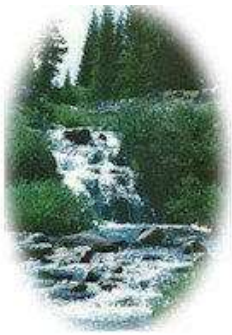
FUTURE WORK



- COLLECTION OF MORE FIELD DATA
- DYNAMIC VARIABLES
- ADDITION OF WIND VARIABLES
 - Wind direction
- INPUT OF ACTUAL WIND DATA
 - Airport reports or WPC maps
- CAFL COMPARISONS
- STATE-ENGINEER DATA COLLECTION



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QUESTIONS?