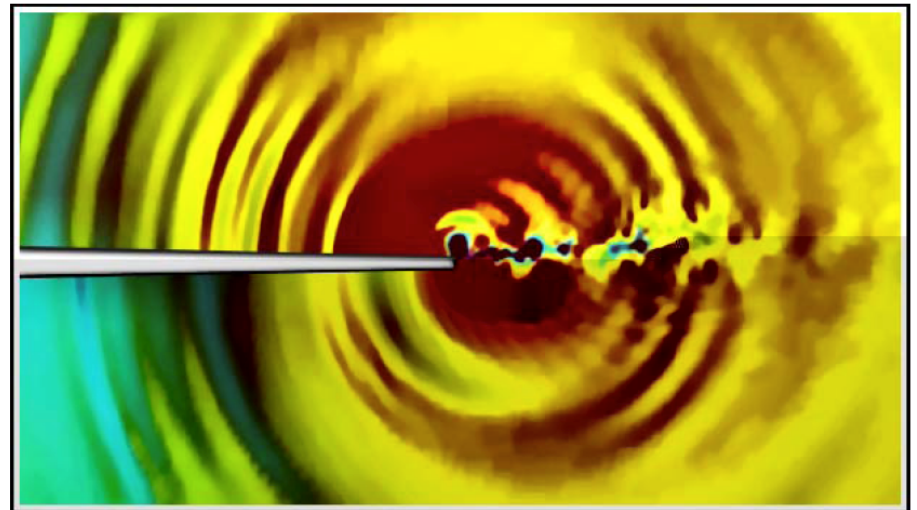
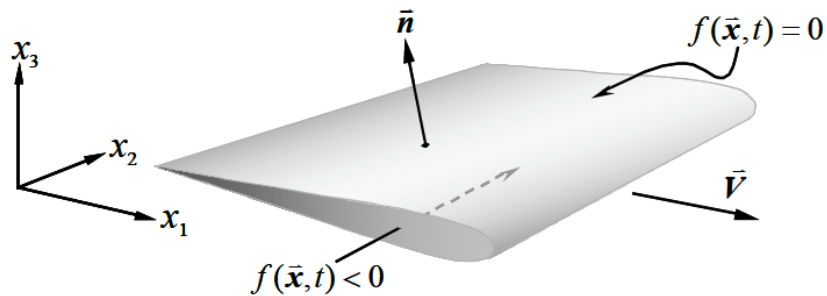


Considerations for Propagation Category of the BANC-II Workshop

Leonard Lopes (NASA)

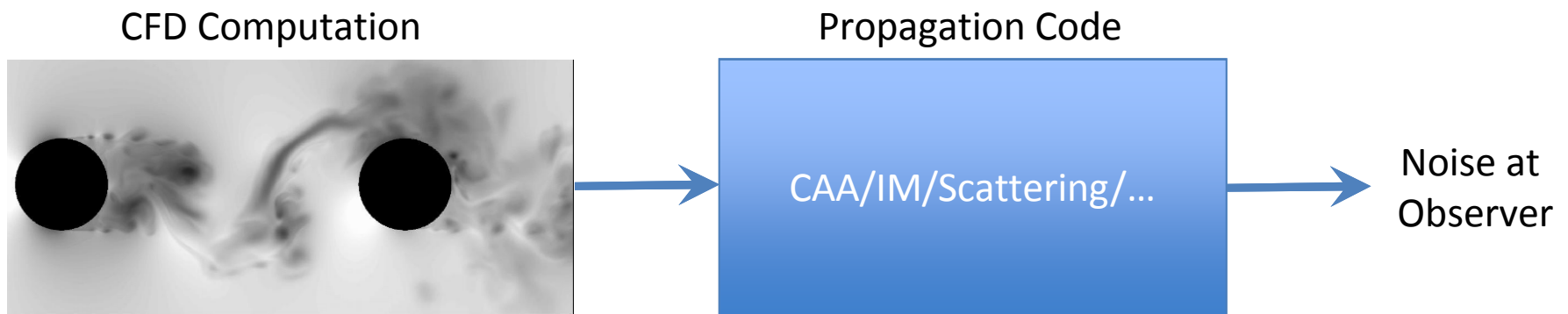
Stéphane Redonnet (ONERA)

Taro Imamura/Ikeda Tomoaki (JAXA)



Introduction

- Coupled CFD/Propagation computations provide physics-based calculation of noise at observer
 - Comparison to experiment measurements
 - Provide insight into noise generating mechanisms and how the noise reaches the observer
 - Effective method reduces requirements for extensive testing
- For given CFD solution, which methods to use? When? Tradeoff?
- Quantify variability associated with propagation phase
- Variability of CFD input on propagated noise



Problem Statement

1) **Categorize** the most popular “propagation” approaches

- Physics : underlying hypothesis & constraints
- Implementation : stability, efficiency, usability

2) **Validate** through coupling with CFD calculations

- Physics : Accuracy, applicability, range of validity
- Implementation : consistency, accuracy, stability, interpolation/extrapolation

3) **Classify** the various scenarios of typical airframe noise configurations

- Physics : Best method for application, tradeoffs

4) **Identify** common issues and potential solutions for all methods

- Physics : *Limitations and issues with methods*
- Implementation : Storage of CFD/Acoustic data, common format?

5) **Investigate** the noise source mechanisms and their intrinsic modeling

- Physics : dipolar vs. quadrupole noise
- Implementation : Equivalent vs. real sources

6) **Assess** the sensitivity to input data

- Implementation : CFD data entry of CFD-acoustic hybrid scenario

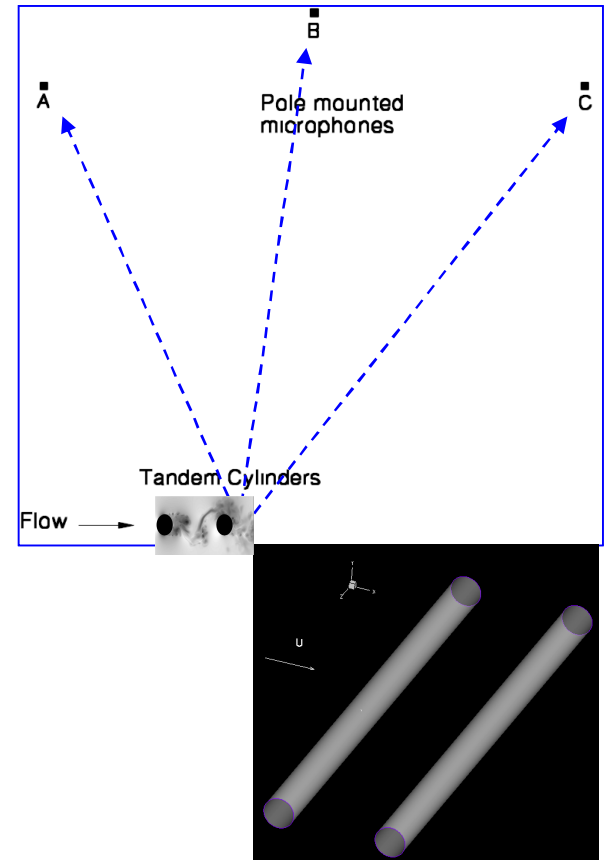


Short Term Goal

- Predict noise at observer from common CFD input
 - Limited number of CFD data sets provided to participants
 - Already existing data set calculated in other BANC categories
 - Participants predict noise with chosen method
 - Provide given set of metrics for comparison with other participants
 - Metrics include noise, computation time, memory, others to be determined
- Participants may include
 - Integral Methods
 - Free field Green's function, require on/off body surface grids
 - CAA Methods
 - Euler equation, require volume field
 - Scattering Methods
 - Exact Green's function, require surface/volume grids
 - Others

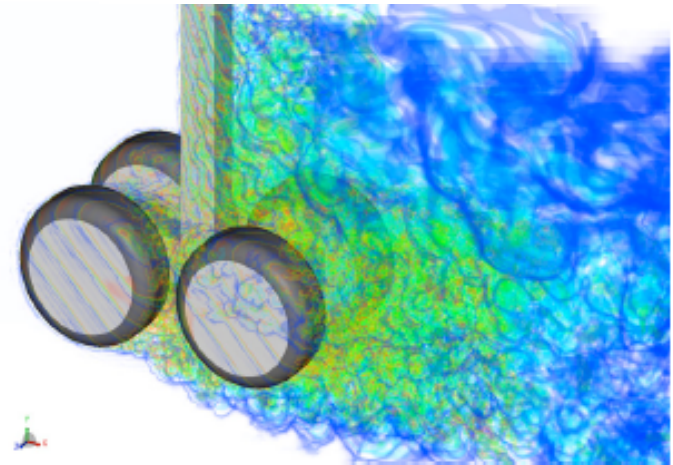
Potential Case A

- Supercritical Isolated Tandem Cylinder
 - Results well documented & validated
 - Several AIAA papers
 - Extensive measurements
 - Includes side plates
 - Ready CFD data
 - On/Off body surfaces
 - Pressure and velocity
 - Integral methods
 - Volumes
 - Pressure, velocity, density
 - Volume methods
 - Large set of nodes/iterations
 - Limited interpolation in space and time
 - Relatively simple case
 - Useful test bed for certain methods



Potential Case B

- Levitating Landing Gear
 - Complex geometry/sound
 - Unique challenge, realistic problem
 - CFD required
 - On/Off body surface grids
 - Volume around body
 - Large wake region
 - Difficult computation region
 - Spurious signal implications
 - Potentially large data set
 - Difficult to disseminate



Requirements From Participants

- Predicted Far-Field Noise
 - Observer positions same as experiments
 - Spectra (narrow band or 1/3rd octave)
 - Directivity patterns
- Algorithm Details
 - Interpolations/differentiations required, etc.
 - Assumptions: Green's function, mean flow, etc.
- Efficiency Metrics
 - Computational time, memory requirements
 - Resources used (benchmarking code)
- Method specific requirements tbd