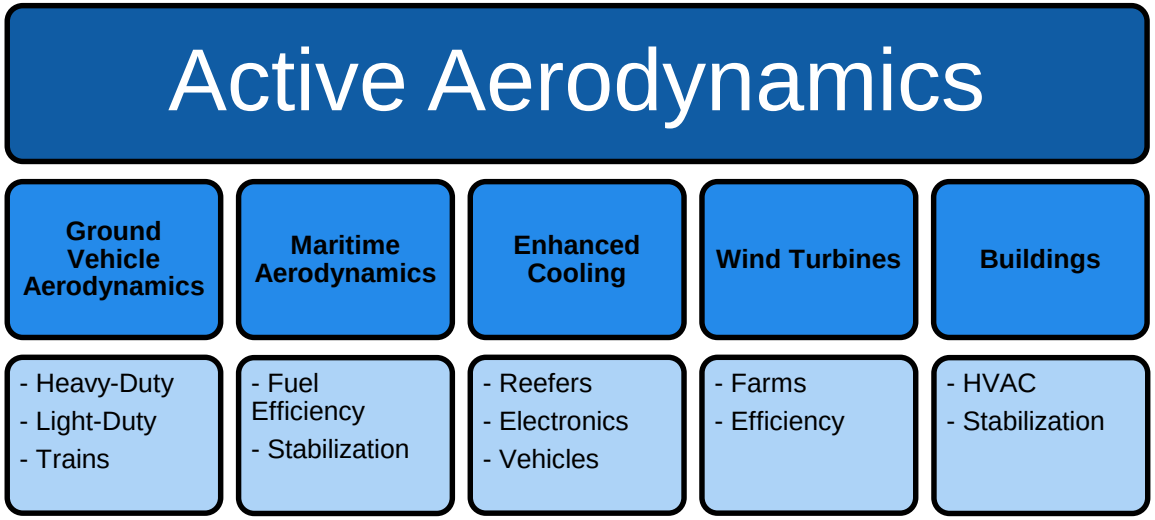
A Revolution in Aerodynamics

HPC4Mfg Industry Engagement Day: Project Impact

About Actasys

- Actasys is developing a patented platform technology based on ‘Active Aerodynamics’
- Located in Watervliet, NY (near Albany)
- Small high-tech company with a core team of 6 employees

Platform Technology - Approach



The majority of current aerodynamic solutions rely on static designs that poorly adapt to dynamic conditions, resulting in low performance

Actasys is developing a novel technology that can adapt in real time to dynamic conditions by acting on the way objects interact with airflow and it does so without changing their physical shape

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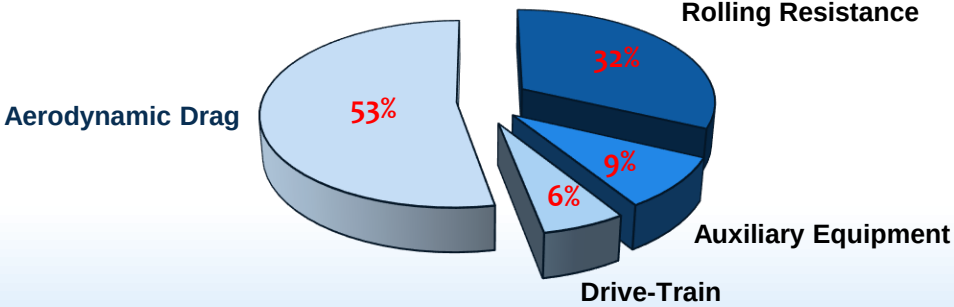
The Problem

- The shape of heavy trucks (Class 8) is optimized for load and logistics.
- The resulting shape has high aerodynamic drag, high fuel consumption, poor handling and stability.
- Changing the shape of the truck is not practical or cost-effective.



Break down of consumed energy at highway speed

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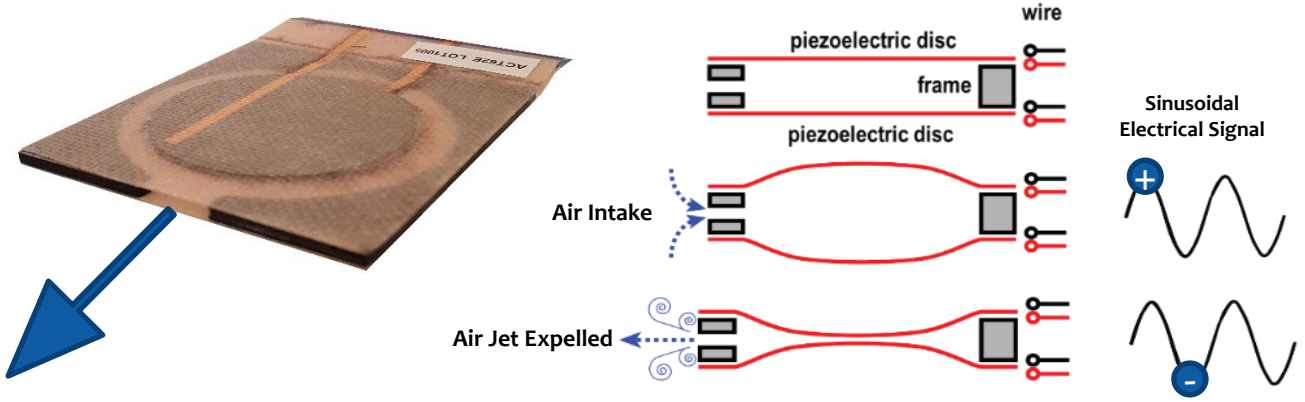
The Technology: Synthetic Jet Actuators

Generate high velocity jets of air using very low power



The actuators are assembled using a proprietary patent pending cartridge

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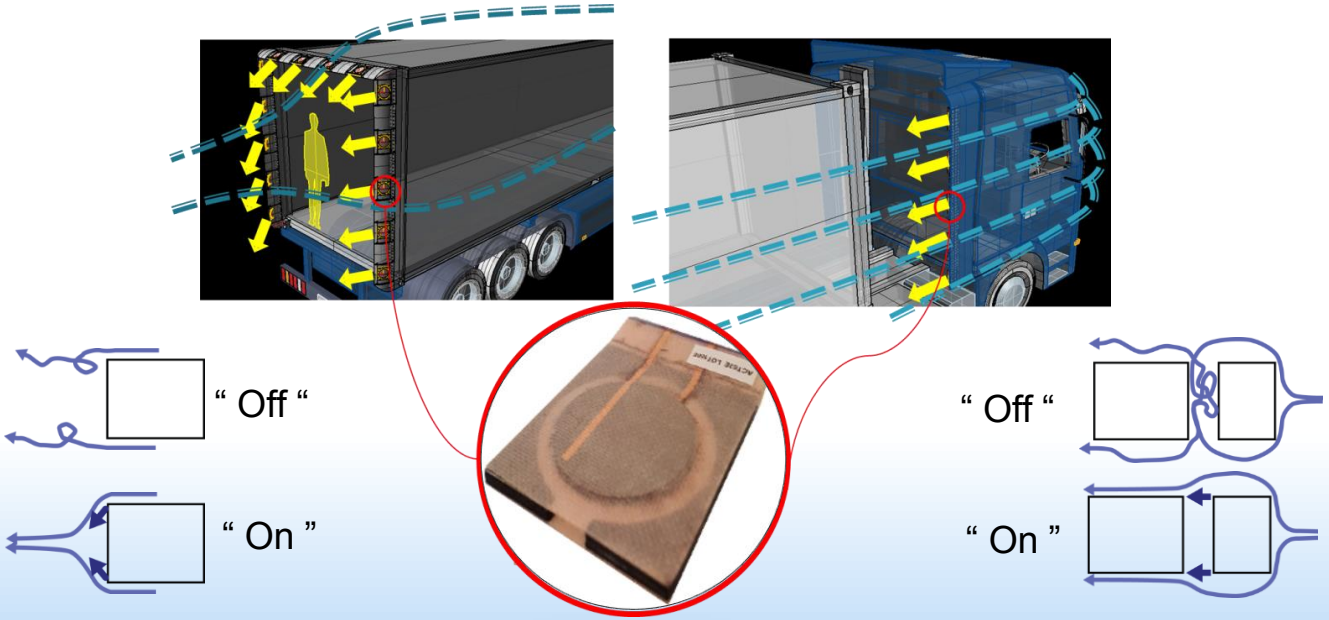
The Solution: Active Aerodynamics

- Synthetic Jets redirect the airflow, virtually reshaping the vehicle.
- Already validated and used in the aircraft industry.
- Reduces aerodynamic drag of trucks by 10-36%.
- Potential to reduce CO2 emissions by 55M metric tons in the U.S. alone.



“Synthetic Jet Actuator”

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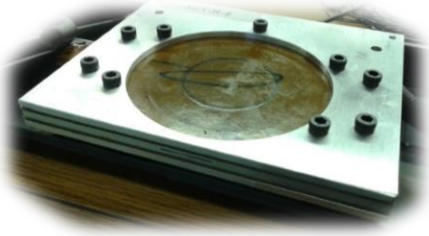
Current Development is Prototype-Driven



Generation 1:
Cost: $550
Weight: 1lb

More than 100 different configurations and designs tested

Target
Volume Cost: $20
Weight: <0.1lb

Current Generation:
Cost: $90
Weight: 0.1lb

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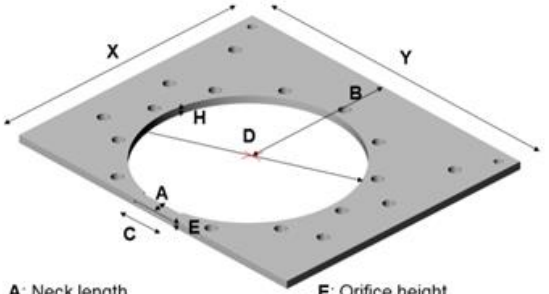
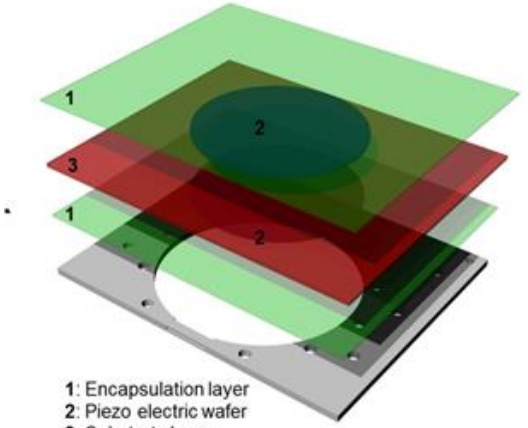
Prototype-Driven Development vs Model-Driven Development for Synthetic Jets

- Synthetic Jet actuators performance is strongly impacted by their geometry.
- More than 8 parameters involved in the internal geometry of actuators, and 4 layers of different materials.
- Requirements change significantly depending on the application.
- Prototype-driven approach is sufficient in initial stages of development for proof of concept, but for go-to-market, model-based optimization is required.



A: Neck length
B: Cavity location
C: Orifice length
D: Cavity diameter
E: Orifice height
H: Cavity height
X: Cavity plate depth
Y: Cavity plate breadth



1: Encapsulation layer
2: Piezo electric wafer
3: Substrate layer

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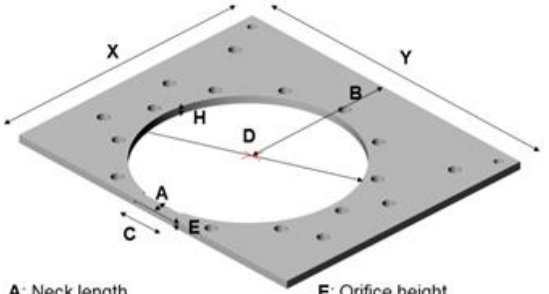
Actasys-ORNL HPC4Mfg Project

- Mathematical models of actuators require very complex CFD simulations, needing more than 50M core hrs.
- Simulations will span a wide range of parameters, leading to a range of performances that will be utilized accross the targets markets that Actasys is planning to tackle.
- The project will create the basis for a reduced-order model that Actasys will utilize to customize actuator designs depending on application requirements.



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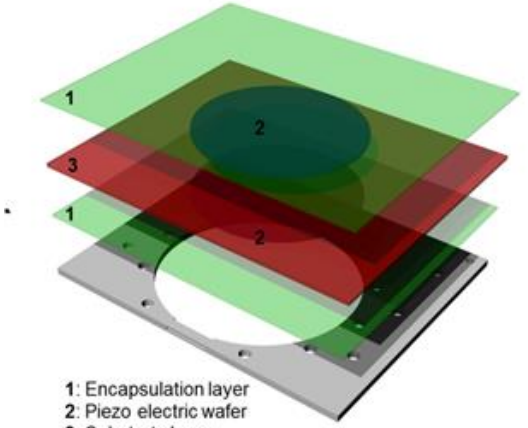

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Impact of HPC4Mfg Project on Actasys

- Model-based optimization is the next logical step to get to performance and cost level that are required to get to market.
- The complex CFD simulations (more than 50M core hrs) and the expertise required to conduct such simulations makes HPC4Mfg a fundamental and necessary asset.
- The reduced-order-model produced at the end of the program will allow Actasys to perform simulations with resources and exepertise that are sustainable.

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