

## Anastasios (Tasos) Lyrintzis

- Ph.D. Aerospace Engineering, Cornell University (1988)
  - Helicopter blade-vortex interactions
- Professor, School of Aeronautics and Astronautics
  - Graduate Chair
  - Faculty Scholar
- Areas of Research:
  - Computational Aeroacoustics (CAA)
  - Computational Fluid Dynamics (CFD)
- Applications:
  - Jet noise, jet engine mixer and nozzle flows, rotorcraft flows, high-speed boundary layers and shock-boundary layer interactions
- Funding: NASA, AARC (Aeroacoustics Research Consortium), 21<sup>st</sup> Century Research & Technology Fund (with Rolls-Royce)
- <http://roger.ecn.purdue.edu/~lyrintzi/>



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## Gregory Blaisdell

- Ph.D. Mechanical Engineering, Stanford University (1991)
  - Compressible turbulence simulations
- Associate Professor, School of Aeronautics and Astronautics
- Areas of Research:
  - Turbulence simulation and modeling
  - Computational fluid dynamics (CFD)
- Applications:
  - Jet noise, jet engine mixer and nozzle flows, aircraft wake vortices, high-speed boundary layers and shock-boundary layer interactions
- Funding: NASA, AARC (Aeroacoustics Research Consortium), 21<sup>st</sup> Century Research & Technology Fund (with Rolls-Royce)
- [https://engineering.purdue.edu/AE/FacultyStaff/Faculty/showFaculty?resource\\_id=1446](https://engineering.purdue.edu/AE/FacultyStaff/Faculty/showFaculty?resource_id=1446)

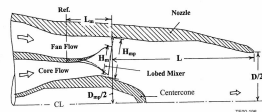


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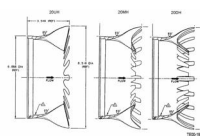
## Current Research Areas

**Goal**  
Improve engine design methodology for noise reduction

**Objectives**  
Develop accurate first-principles simulations to understand mechanisms of jet noise generation  
Develop a noise prediction method for complex jet configurations (e.g. lobed mixers) that does not depend on experiments



Engine flow mixing



Lobe scalloping

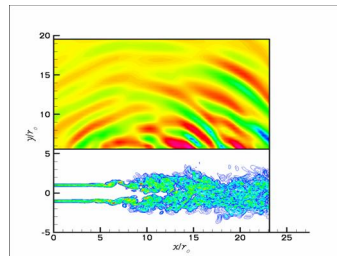


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## Jet Noise Simulations

Large eddy simulations (LES) + surface integral method for the acoustic far-field

Typical Grid Size:  
12 million points



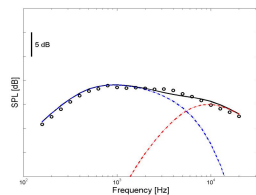
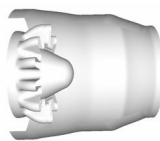
Typical Run Time:  
5 days to run 50,000 time steps using 200 POWER3 processors on an IBM-SP



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## Jet Noise Modeling

Reynolds Averaged Navier-Stokes (RANS) with a two-equation model + noise model based on single jet components



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## Future Directions

- Supersonic jet noise (777, 787, Joint Strike Fighter)
- Flows with chevrons
- Hybrid methods (detached eddy simulations) for flows with complicated geometries (e.g. mixers, ejectors)
- Noise control devices

GOAL:

- Increase the level of understanding of jet noise in order to develop a quieter design



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