

# 1523 - Analytical Structural Dynamics

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## Mission:

Providing structural dynamics expertise to assure the structural dynamics performance of Sandia products in the national interest.



**Tom Baca**  
**Manager**

## Focus Areas:

1. Environments Engineering
2. System Modeling and Model Validation
3. Coupled Structural and Acoustic Modeling
4. Advanced Computational Structural Dynamics

**Vision: Structural Dynamics Modeling and Simulation**

# 1523 - Analytical Structural Dynamics Environments Engineering

## Capabilities

- The definition of environmental requirements / specifications and the proper means by which to implement them for both component and system level testing and analysis.
  - Prototype Development
  - Product Design Qualification
  - Logistics Operations
  - Flight Operations
  - Product Quality and Aging Surveillance
- Planning, technical oversight, and post-test analysis for operational and laboratory testing.
- Generate and interpret performance assessments using computational simulation data as well as measured test data
- STS Derivation/Interpretation
  - Transportation
  - Flight
  - Hostile
  - Abnormal



## Customers

- W76-0, W76-1, W88
- W62, W78, W87
- W80
- B61, B83
- RRW
- UK Trident
- MTI
- STARS
- NMD Payloads
- NNSA/OST
- SGT

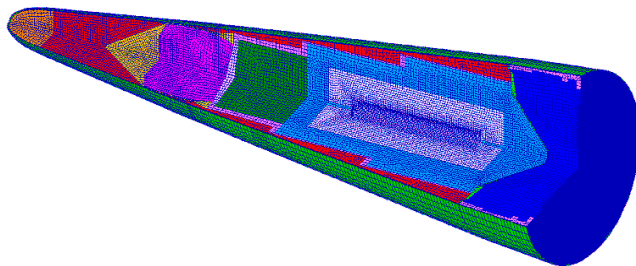
## Contact:

- Jerry Cap ([jscap@sandia.gov](mailto:jscap@sandia.gov))

# 1523 - Analytical Structural Dynamics System Modeling and Model Validation

## Capabilities

- System level, normal and hostile environments modeling
- Prediction of component response and environments
- Quantifying system level model uncertainty
- System level model validation
- Simulation of system level testing environments
- Combined environment modeling
- Test fixture analysis



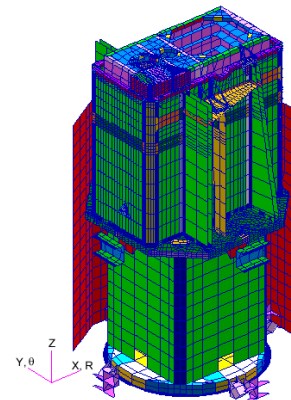
## Customers

- W76-0, W76-1
- W88
- W78
- UK Trident
- W80
- B61
- B83
- STARS
- MTI, HIFES



## Contact:

- Greg Tipton (gdtpito@sandia.gov)



# 1523 - Analytical Structural Dynamics

## Coupled Structural and Acoustic Modeling

### Capabilities

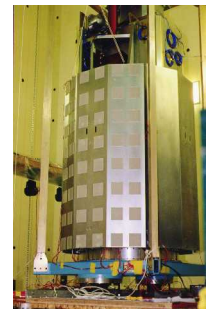
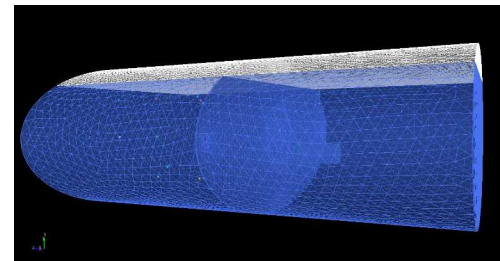
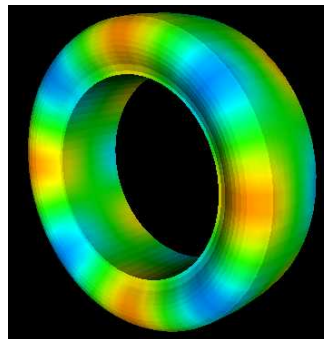
- Determine natural frequencies of vibration of air within tire and contact grooves
- Estimate transient and frequency-domain noise radiation using linear and nonlinear acoustic theories
- Modeling, model validation and product performance evaluation using Salinas finite element models
- Technical leadership for projects and research involving structural acoustics and structural dynamics modeling

### Customers

- Goodyear
- W80
- MTI Satellite
- STARS
- NMD Payloads
- MEMS Development
- Navy

### Contacts

- Jerry Rouse ([jwrouse@sandia.gov](mailto:jwrouse@sandia.gov))



# 1523 - Analytical Structural Dynamics

## Advanced Computational Structural Dynamics

### Capabilities

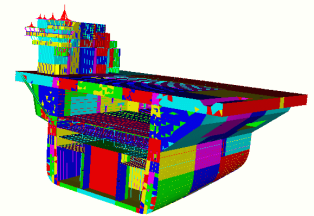
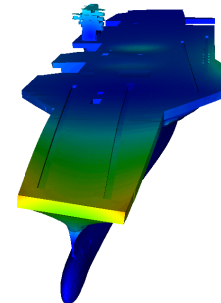
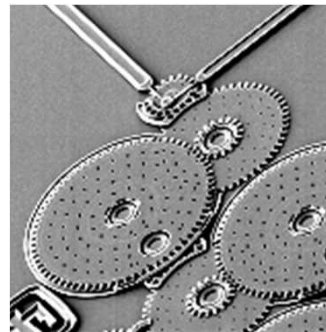
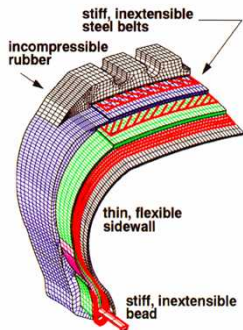
- Solver technologies for very large numbers of tied contact constraint equations in Salinas
- Solver technologies and solution methods for structural-acoustic analysis in Salinas
- Active R&D effort on efficient component mode synthesis methods
- Active R&D effort on efficient solvers for the Sierra code Aria
- Advanced dynamics using Kane's equations
- Admittance modeling
- Component modes synthesis

### Customers

- Goodyear
- ASC SIERRA Codes
- Salinas
- W76-0, W76-1, W88
- W88
- W78
- Navy
- MEMS Development

### Contact:

- Clark Dohrmann ([crdohrm@sandia.gov](mailto:crdohrm@sandia.gov))



# 1523 Vision for Structural Dynamics Modeling and Simulation

- We are closely linking experiment and appropriate scale computational modeling to develop a greater *understanding of structural dynamics* for Sandia and DOE products
  - parts (components)
  - subassemblies
  - systems
- We are rigorously *quantifying uncertainty*
  - unit-to-unit variability
    - as-built component differences
    - as-assembled system differences
  - pre-defined model validation metrics
  - life cycle performance estimates
- We are *validating our models* to a higher degree than ever
  - unprecedented confidence in our highly detailed, 3D SALINAS and NASTRAN models
  - new types of design certification evidence for Sandia's system designers and component developers
- We are *quantifying margins and the associated uncertainty* using test and simulations