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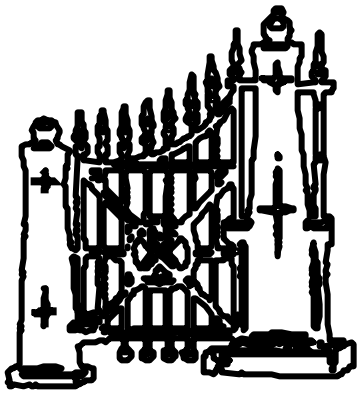
Mobility and Firepower for America's Army

Aversive Audible Acoustic Devices



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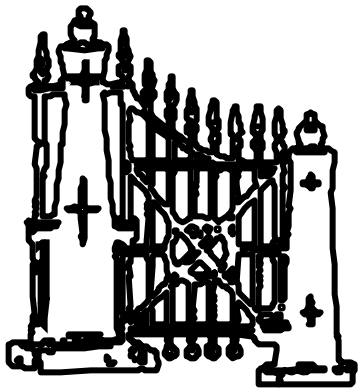

US Army ARDEC

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Close Combat Armaments Center

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Outline

- Background
- Acoustic Primer
- Types of Sound Generation Sources
- Useful Acoustic Regime
- Types of Aversity
- System Characteristics
- Pay-off to the Warfighter/User

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Acoustics – Background

- Definitions:
  - **Aversive:** A strong desire to avoid because of dislike, repugnance, etc.
  - **Audible:** Actually heard or capable of being heard, frequencies between 15 and 20,000 Hz
  - **Acoustic:** Sound or Sound Waves
  - **Device:** Consider as a Tool and not a Weapon

Acoustics Primer

- How does acoustics work
  - Acoustic energy/power is generated by compressing a medium (in this case air) to create a pressure wave
  - Acoustics are similar to mm/microwaves in many areas

Acoustics Primer

- Advantages of acoustic
  - Can be directional, depending upon frequency
  - Naturally provides area coverage, and hence area denial
  - Can provide tunable target effects
    - Anti-personnel
    - Anti-materiel

Acoustics Primer

- Advantages of acoustic (cont.)
  - Weather conditions
    - High relative humidity improves performance – not required
  - Countermeasures
    - Non-aural target effects have little if any countermeasures
  - Non-polluting

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Acoustics Primer

- Disadvantages of acoustic
  - Frequency
    - High frequency
      - Increases atmospheric attenuation
    - Low frequency
      - Reduced directionality to omni-directional
        - » Potential for increased fratricide
      - More energy/power from source which increases system weight/volume and logistics burden

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Acoustic Sources

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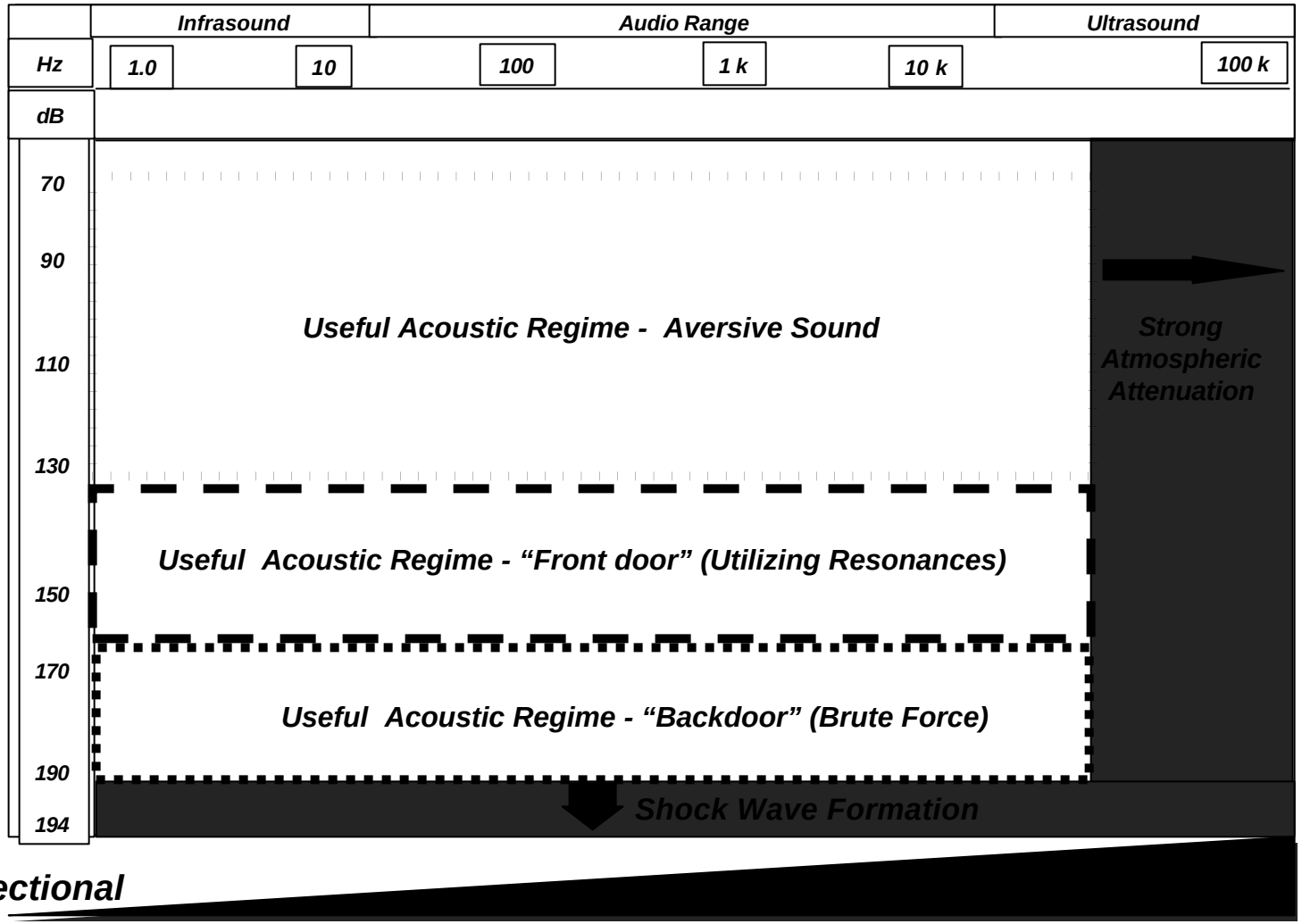
Useful Acoustic Regime



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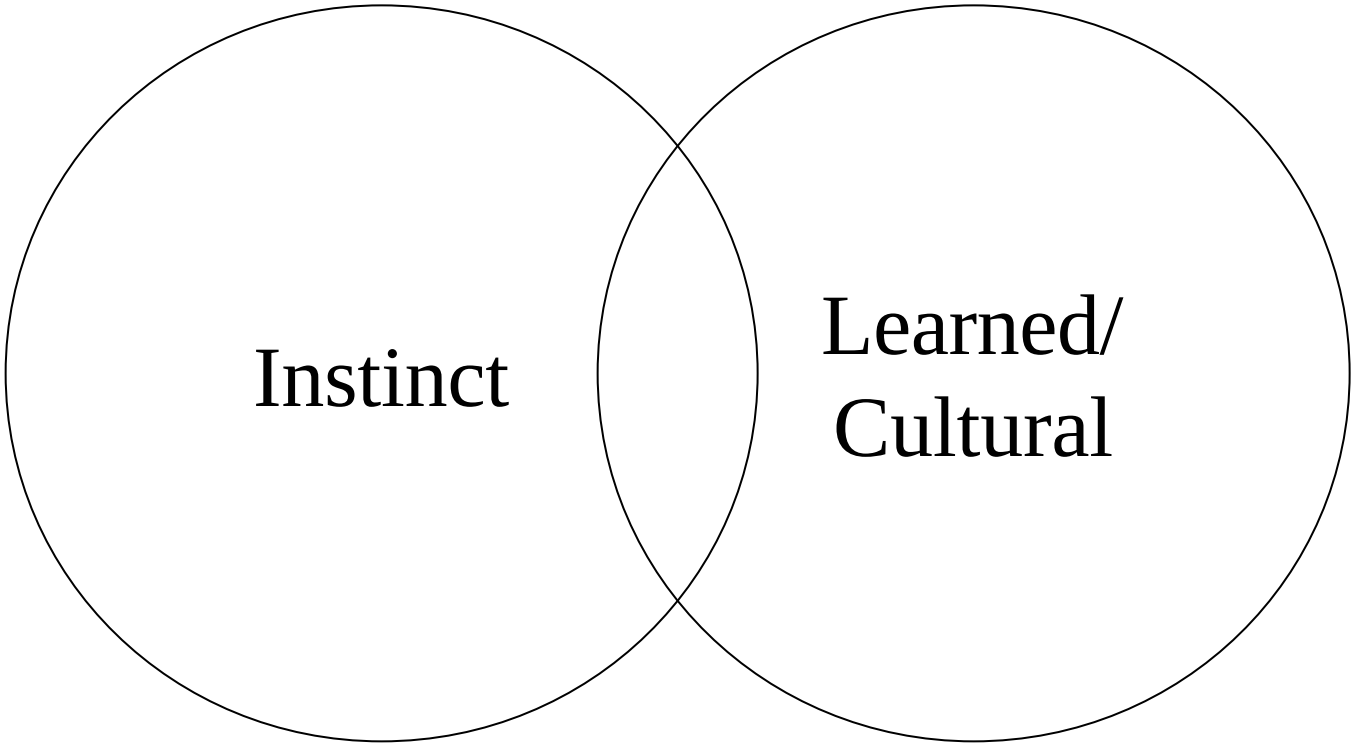
Types of Aversity



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System Characteristics

- Effects
  - Audible Range
  - Non-Injurious Effects
  - Behavior Modification
  - Effects not Intensity Based
- Countermeasures
  - Hearing Protection not effective

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Operational Capabilities

- Increased Comfort Zone
  - Between Friendly Forces/Equipment and Belligerents
    - Potential to Contain/Reduce Escalation Factor
- Enhances Maneuverability
- Provides Force Protection

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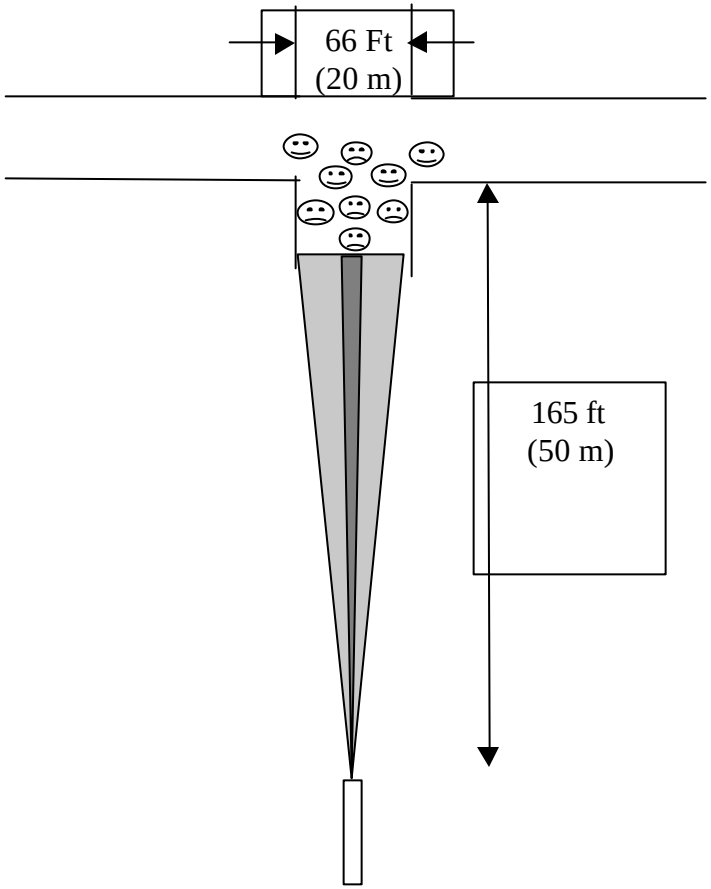
Application for Initial Device



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- Mode 1: Commander/Individual Soldier Communicates to Combatants, then bathe the entire area with low/mid intensity aversive sound
- Mode 2: Commander/Individual Soldier Communicates to Individual Combatant(s). If non-responsive bathe individual combatants with high intensity aversive sound

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Bottom Line
Payoff To Warfighter/User

- Provides the User with capabilities which more closely match warfighting requirements
  - Area denial
  - Military operation other than war (MOOT)
  - Military operation in built-up areas (MOBA)
  - Military Operations in Urban Terrain (MOUT)
  - Facility protection
  - Law enforcement (prisons, crowd control)

Back-up Slides

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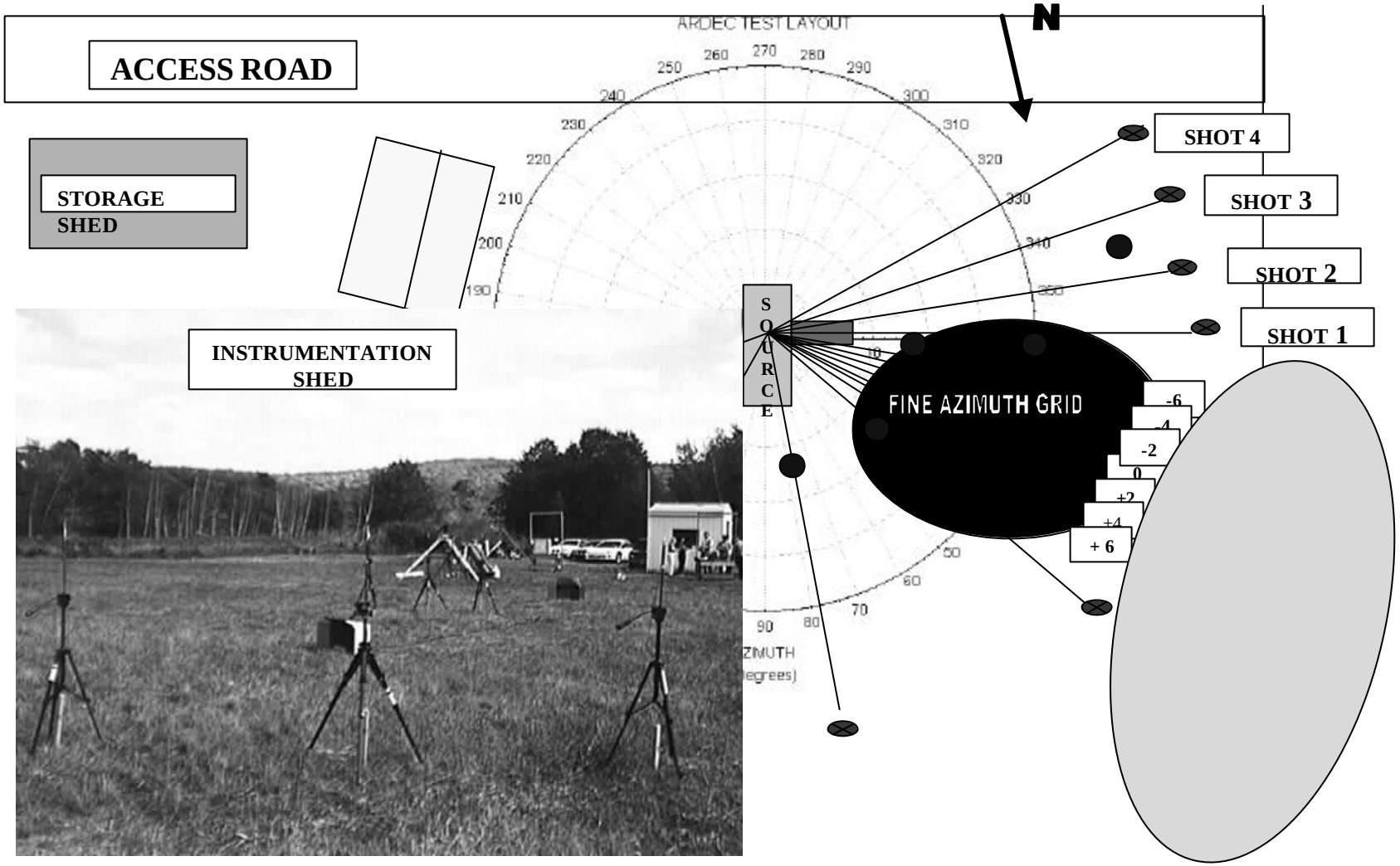
Typical Test Layout
Pyro Range



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ANSYS Modeling

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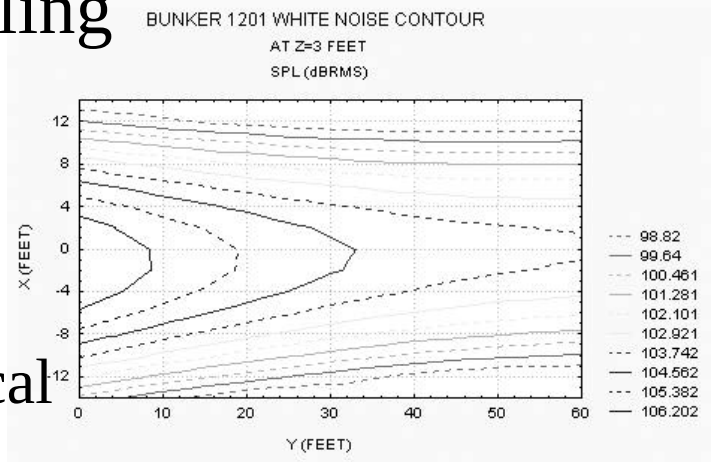
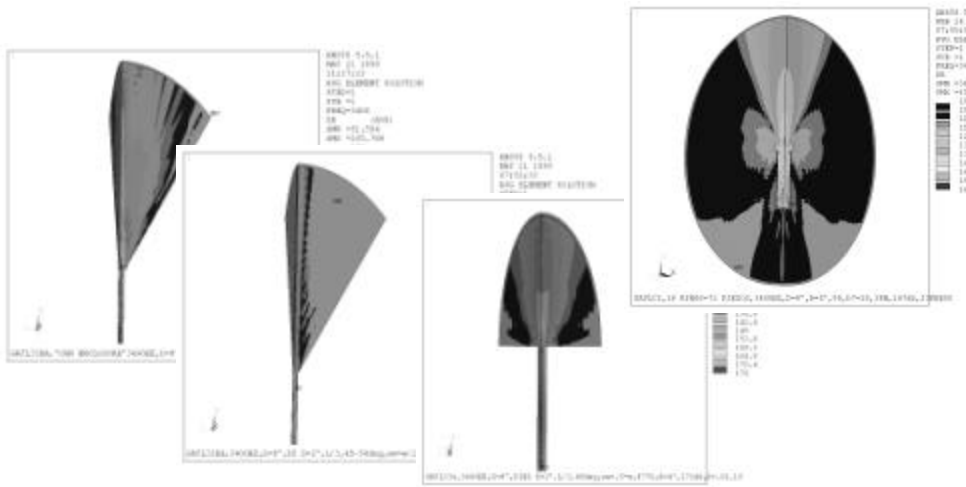
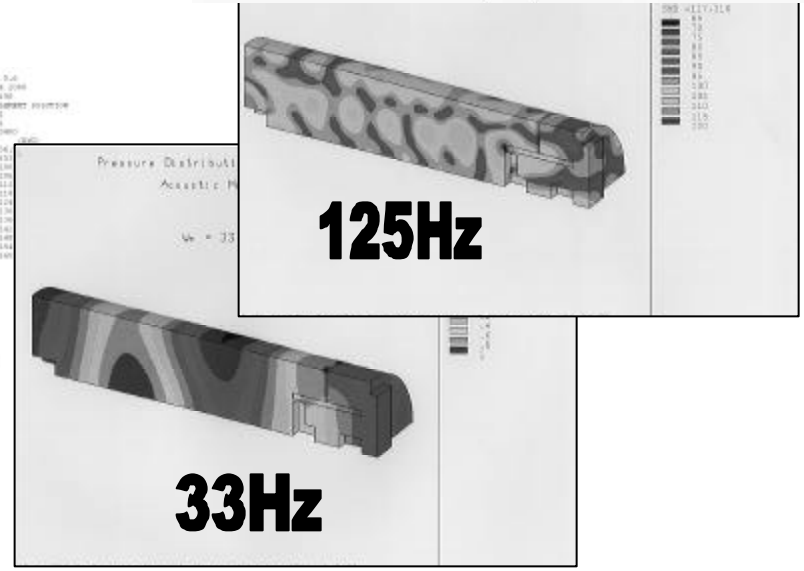
Extensive use of simulation and modeling

- Predict emissions of acoustic sources
- Response of enclosures
- Validated through experimentation
- Future modeling of impact on biological systems







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Acoustic Impedance of Biological Tissues and Structures

Developed an instrument capable of measuring the acoustic impedance of materials in the 25-250 Hz range

- Data is necessary to support modeling
  - No existing data for materials below 250 Hz
  - No existing data for biological materials