

**“Buy-Quiet” and “Quiet-by-Design”  
at NASA**

**Beth Cooper, PE INCE.Bd.Cert. Fellow INCE/USA**

*Internal Agency Consultant for Hearing Loss Prevention and Low Noise Design*

**National Aeronautics and Space Administration  
Office of the Chief Health and Medical Officer**





# NASA BQ/QBD Vision:

*Noise emissions intentionally considered*



- ||| Noise-related consequences of all purchase and design decisions are anticipated and evaluated
  - ||| Long-term cost of each option is quantified
  - ||| *Informed* decisions are made
  - ||| Noise-related impacts are properly accommodated
- ||| Best practices approach is promoted for “non-hazardous” scenarios



# NASA-wide BQ requirements

- Added to NASA Procedural Requirement NPR 1800.1 in 2006
- Each NASA site must:
  - Include noise emissions with technical and performance criteria when purchasing or designing new equipment that is “expected to produce noise which is approaching hearing conservation levels of 80 dBA and higher.”
- Noise emissions shall be considered equally with all other requirements.
- Initial policy language intentionally broad



# Buy/Design-Quiet Program goals

- Establish a low-noise workplace
  - Reduce noise-induced hearing loss
    - Reduce financial cost of hearing loss
  - Improve safety, productivity and comfort
- Influence workforce to be proactive
  - Identify and purchase low-noise products
  - Design low-noise equipment and systems
- Harmonize with infrastructure and culture
  - NASA procurement regulations and vehicles
  - Site-specific operations and culture



## Benefits of formalized BQ process

- === A corporate policy sends a message
  - === Manufacturers and vendors take note
  - === Demand increases supply (e.g. IT/consumer)
- === Publicly visible programs set a precedent
  - === The existence of one program fuels others
  - === Programs build on existing best practices
- === Strong federal agency leadership is critical to the success of all programs!
  - === NASA and NIOSH (DART) leading



# Implementation challenges

- ▄▄▄ Diversity in operations, culture across 15 sites
- ▄▄▄ Responsibility distributed throughout Center
- ▄▄▄ Advocacy and training are major tasks
  - ▄▄▄ Technical content outside EH&S scope of practice
  - ▄▄▄ Purchasers (requestors) unsure how to comply
  - ▄▄▄ Centers have multiple contractors and tenants
  - ▄▄▄ Stakeholders are unfamiliar or skeptical (or both)
- ▄▄▄ Contractor compliance must be monitored
  - ▄▄▄ Can only “suggest” without a contract requirement
- ▄▄▄ Senior management enforcement is critical



# Center BQ program development

- Implementation must be site-specific
  - Organization, communications, and procedures
- Each EH&S organization assigned a lead
- HQ provided technical support
  - Series of six-month goals
  - Periodic (~6 mo) status review telecons
  - Webinar and conference-based training sessions
  - Frequent meeting presentations and updates
- Enforcement via HQ audit team site visits**
  - Audit checklists mirror 6-month goals



## Intermediate goals in development of site-specific programs

1. Identify lead and EH&S internal team
2. Modify site-specific policy document
3. Conduct awareness briefings
4. Assemble cross-functional team
5. Develop detailed internal procedures\*
6. Include Contractor organizations  
(Modify onsite support service contracts)
7. Conduct “how-to” briefings on procedures

*\*Turning policy into specific procedures presented challenges for Field Center programs*



# Field Centers want to know



- What are other companies, government agencies, and the military doing about this?
- Do manufacturers make low-noise equipment, and how much more does it cost?
- How to navigate the process of locating, evaluating, purchasing, and verifying the performance of low-noise equipment?
- And, just how quiet *should* each product be??



# BQ corporate surveys

- Solicited information on corporate programs
  - 60 individual (corporate, military, federal) contacts
  - ANSI S Committees
  - AIHA Noise Committee
  - Institute of Noise Control Engineering members
  - ORC Occupational Health and Safety Network
  - NIOSH *Prevention through Design* project
- Compiled detailed data on 10 programs
  - Most programs use 80 dBA noise emission limit
  - Most programs involve partnerships with major suppliers to develop custom equipment/systems



# BQ Manufacturer surveys

- Solicited information on low-noise equipment
  - 60 individual manufacturer contacts
  - INCE Product Noise Technical Committee
  - ANSI S Committees
  - National Academy of Engineering “Technology for Quieter America” project
- Compiled detailed data from 11 manufacturers re: design/marketing
  - Most estimate 10% - 20% markup for “quiet” equipment



# NASA Buy-Quiet Process

1. Requestor researches and identifies achievable noise *emission* criterion that supports noise *exposure* criterion
2. Determine appropriate procurement vehicle\*
3. Noise emission criterion (limit) language included in specification
4. Submittal data required prior to purchase
5. Selection considers cost and noise emission
6. Shop verification test before shipment
7. Field verification test after installation

\*allows for “simplified” acquisition strategies



## **Needed: a self-contained Buy-Quiet process resource**

- ▄▄▄ Help NASA sites effectively implement policy
- ▄▄▄ Provide education, guidance and tools
  - ▄▄▄ Applicable beyond NASA and contractor programs
- ▄▄▄ Assume visible leadership role in BQ/QBD
  - ▄▄▄ Join NIOSH, Federal agencies, Armed Services
  - ▄▄▄ Set example for corporate programs
  - ▄▄▄ Encourage publication of noise emission data
  - ▄▄▄ Support voluntary product noise labeling (INCE)
- ▄▄▄ Contribute to the state of the art
  - ▄▄▄ Program models and resources



# NASA Buy-Quiet Process Roadmap



- Web-based tool
- Developed for NASA; applicable externally
- Publicly available (Google: NASA Buy-Quiet Process Roadmap)
- Technical content by Nelson Acoustics; web application by Gelfand Design
  - Best practices from corporate, military, government programs
  - Manufacturer—provided data on availability and cost of low-noise equipment
  - Contributions from 20+ organizations



# Buy-Quiet Process Roadmap

## Key external contributors

- ■ ■ Baltimore Aircoil
- ■ ■ United Technologies
- ■ ■ Caterpillar
- ■ ■ Cisco
- ■ ■ Honeywell
- ■ ■ Hewlett Packard
- ■ ■ Ingersoll Rand
- ■ ■ Toro
- ■ ■ Carrier
- ■ ■ ExxonMobil
- ■ ■ Colgate Palmolive
- ■ ■ Trane
- ■ ■ 3M
- ■ ■ Becton Dickinson
- ■ ■ General Motors
- ■ ■ Air Force
- ■ ■ Navy
- ■ ■ National Park Service
- ■ ■ NIOSH



Home News About EARLAB

You are here: Home » Buy-Quiet Purchasing » BU

- ▶ Roadmap Home
- ▶ Applicability of Roadmap
- ▶ Using the Roadmap
- ▶ 1. Plan Your Procurement
  - ▶ When to Hire an Acoustical Consultant
- ▶ 2. Research Available Products
  - ▶ Online Noise Databases
  - ▶ External Specifications and Regulations
- ▶ 3. Select Noise Emission Criterion
  - ▶ Select Baseline Criterion
  - ▶ Simplified EU Machinery Directive Table
  - ▶ Adjust the Criterion
  - ▶ Raising the Criterion
  - ▶ Lowering the Criterion in Special Cases
  - ▶ Community Noise Check for Outdoor Equipment
- ▶ 4. Determine Procurement Strategy
  - ▶ Micropurchase (Purchase Card)
  - ▶ GSA Schedule Purchase
  - ▶ Lowest Price Technically Acceptable
  - ▶ Tradeoff Process
  - ▶ Tradeoff Analysis
- ▶ 5. Build Specification
- ▶ 6. Verify Noise Emission
  - ▶ Equipment Test Standards
  - ▶ Shop Verification
  - ▶ Field Verification

- ▄▄▄ Focused on hearing loss prevention
- ▄▄▄ Also considers community noise impact
- ▄▄▄ Leads user through step-wise process
  1. Procurement planning
  2. Research available equipment
  5. Specification development
  6. Verification by test
- ▄▄▄ Includes key decision points for the user
  3. Noise emission criterion
  4. Simplest allowable procurement vehicle
  - ▄▄▄ (“Selection” is a procurement [CO] function)
- ▄▄▄ Includes customizable templates/forms
- ▄▄▄ Authorization forms promote *responsible* exceptions



# Next up: Quiet-by-Design!





# Quiet-by-Design



- Assume technical burden “in-house”
- Primary application: gas flow systems
  - Advanced engineering (gas dynamics, aeroacoustics)
  - Buy-Quiet *Roadmap* output provides criterion
- Applies to engines of inhabited spaces
  - “Best-practices” architectural and engineering design
  - Requires understanding hearing loss prevention goals
- “Ground” equivalent of ISS Acoustics Program
  - Program and technical materials provide starting point
- Extension of Buy-Quiet Program implementation



# Getting there . . .

- ▄▄▄ Low-noise product design is possible
- ▄▄▄ Successful corporate programs do exist
- ▄▄▄ However . . .
  - ▄▄▄ Manufacturers must advertise quiet products
  - ▄▄▄ Corporate consumers (we) must be proactive
  - ▄▄▄ Voluntary product noise labeling needs support!
- ▄▄▄ The good news:
  - ▄▄▄ “Level playing field” promotes competition
  - ▄▄▄ Demand will increase supply and control costs
  - ▄▄▄ Resources, models and help are available!

