Agency Hearing Conservation Focus on Buy-Quiet and Quiet-by-Design

Beth Cooper, PE INCE.Bd.Cert

NASA Glenn Research Center

July 24, 2007

Today's agenda

- Introduce "Buy-Quiet" and "Quiet-by-Design" concepts (but not technical specifics)
- Review requirements of agency hearing conservation policy (NPR 1800.1B Chap 4.9)
- Discuss my role as agency hearing conservation consultant
- Outline plan for providing support for field center BQ/QBD programs

Why buy (or design) quiet?

- Effective hearing conservation programs emphasize engineered noise control
- Financial investment in retrofit noise controls is negated if new equipment is too loud
- Not all noise problems can be fixed retroactively

GRC Central Air Equipment Bldg.

BQ/QBD is especially important where retrofit controls are prohibitively difficult or expensive

OEM vs. aftermarket enclosure

OEM controls function better and are cheaper than aftermarket fixes (HC isn't cheap either!)

“Quiet” waterknife (Δ > 30 dBA)

Buy-Quiet covers *purchase* of *new* equipment

Buy-Quiet Strategy

- Noise emission specification language included in procurement documents
  - Vendor assumes burden of meeting spec
  - Vendor must provide verification data
- User is responsible for development of a reasonable and achievable equipment noise *emission* limit that contributes to meeting noise *exposure* limits

Gas-flow system (in-house design)

Quiet-by-Design covers *in-house* design and construction of equipment and systems

Quiet-by-Design Strategy

- NASA assumes technical burden
- Buy-Quiet program output (noise emission limits) can provide design goal
- User involvement is similar to graduate-level engineering course content (e.g., gas dynamics, aero-acoustics), tailored for NASA

Benefits of BQ & QBD programs

- Formal policies and procedures provide guidance for users outside EH&S community
- Noise emission specifications create level playing field for vendors
- Most vendors that offer “quiet” equipment versions on request do not promote them
- Demand increases supply – the market will respond over time (think IT and commercial products industries)

What does the policy say?

Buy Quiet/Quiet-by-Design Programs SHALL:

- *Meet realistic and achievable baseline noise criteria and optimize noise emission criteria based on individual and specific operational and site conditions.*
- *Encompass design and development, or selection and purchase, of a broad variety of fixed and portable equipment purchased for use by Centers, including equipment purchased by contractors, to minimize noise-exposure hazards to personnel.*
- *Encompass equipment expected to produce noise which is approaching hearing conservation levels of 80 dBA and higher under a variety of site and operational considerations.*
- *Identify noise emission and control requirements for equipment procurement specifications and design.*
- *Contain provisions for "Buy Quiet and Quiet by Design" program support, promotion, training, and management sponsorship.*
- *Be individualized to meet the Center's specific needs, configuration, and other relevant factors.*
- *Not apply to specialized research project items or flight hardware, which may be expected to produce large amounts of noise.*

What does this mean?

- ***"Include noise emissions with technical and performance criteria*** when purchasing or designing new equipment that is expected to generate noise emission levels of concern for hearing conservation (80 dBA and above)."
- Consider noise emissions <u>equally</u> with all other functional and EH&S requirements

What's the *real* goal?

- Raise awareness of the need to *intentionally* consider noise emissions of new equipment
- Encourage behaviors in the spirit of the requirement
- Create a culture where noise-exposure-related consequences of every design and purchase decision are anticipated
- Motivate best practices "voluntary" use with non-hazardous noise conditions (example: ISS interior noise environment)

Is there a template program?

- Interpretation of “include noise emissions” is left up to each field center
- Some common program challenges, needs
- Differences exist in nature of work and organizational structure/culture
- Resulting plans and implementations should be center-specific for best results
  - Approaches
  - Technical tools

My Role

- Now supporting OCHMO as 25% FTE agency hearing conservation consultant
  - Priority #1: Buy-Quiet and Quiet-by-Design support
- Previous EH ViTS presentations:
  - October 2006 – Intro to BQ & QBD
  - May 2007 – Planned field center support
- Today – kickoff center needs assessment

Here's what I can offer

- Coaching
- Teaching, training, and promotional information
- Connecting you with external resources
- Sharing information with and among centers
- Reviewing ideas/progress and offering feedback
- My role won't include
  - Policy-setting, approving, or enforcing
  - Issuing directives or mandating approaches
  - Providing funding for center-specific needs
- Your participation is completely voluntary!

What end users need from EH

- Buy-Quiet Program
  - Straightforward and structured method of developing noise emissions limits and specification language
  - Buy-Quiet users may have very little technical background – simplicity and ease of use are key
- Quiet-by-Design Program
  - Design tools for estimating noise emissions of specialized equipment and systems, including noise control devices and materials (e.g., silencers and pipe lagging)
  - Quiet-by-Design users are engineers (but not acousticians) – technical rigor is important

Challenges you'll face

- Program requirement is mandated by Occupational Health (HQ and field center) but implementation details are not
- Program specifics that need to be developed will be outside OH scope of practice
  - Input from Engineering and Facilities is critical
  - Will likely reveal need for engineering design tools
- Most program content and activity (users, developers, implementers) will be in Engineering, Facilities, other organizations

What's essential for success?

- Broad user and organizational buy in
- Center- and scenario-relevant tools
- Useful and practical methods and processes
- Program champion with credibility, technical background, and cross-organizational skills
- Ongoing access to expert technical support
- Cross-functional team approach
- Management support and enforcement

GRC experience – Buy-Quiet

- Program developed 1996
- Program not influenced by formal requirement
- Effort motivated by surge in installation of new high-noise equipment and systems
- “Common-sense” program was tailored to GRC’s organization, culture, noise environment, and users
- GRC EH subsidized initial purchases

GRC experience – Quiet-by-Design

- Program developed 1998
- Applies primarily to large gas flow systems
- Effort motivated by noise sources developed in-house (outside scope of BQ program)
- Natural extension of Buy-Quiet program
- Incorporates Buy-Quiet Program noise emission limits
- Specialized research hardware exempted

GRC Experience

- Development was collaborative, but serially
  - Incorporated in-house design guides and policies
  - Captured equipment most likely to be encountered
- Technical development and training contracted to David Nelson (consultant)
- Emphasis placed on education and advocacy, since participation was voluntary
- Developed *tools* rather than programs
  - Never fully institutionalized
  - No ongoing technical support was funded
  - No *formal* management support sought
  - No means of enforcement

Planned approach to providing field center support

- Identify most common (and unique) needs
- Develop and offer generic services/resources
  - Recommended approaches
  - Awareness training for EH and other stakeholders
  - Program promotional information
  - Technical resources with common applicability
- Offer center-specific consulting
- Offer additional specialized services at cost

Needs Assessment Phase
Summer '07

- Develop list of field center POCs
- Assess field center operations, needs, status
  - Not a compliance check!
  - Individual conversations with center POCs
  - Please contact me if you haven't already
- Identify commonalities among centers
  - Operations
  - Noise sources
  - Organizational responsibilities and structure

Implementation Phase Beginning Fall '07

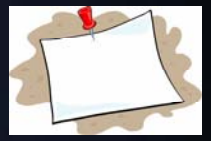
- Plan based on collective prioritized needs
  - Information
  - Training – awareness and technical
  - Template documents
  - Technical tools (including GRC's software)
  - Center-specific services
- Communication via email and website
- ViTS and webinar conferences and training
- Center visits by request (and funding)
- *External consultant now on board!!*

Center POCs (Self-Identified)

- JSC (White Sands?)
  - John Cross
  - Thomas Samson
- KSC
  - James Taffer
  - Don Paniale (for USA)
- Goddard (Wallops?)
  - Jeff Dalhoff
  - Mike Cooper
  - Roy Deza
- Ames (Moffett Field?)
  - Ramsey Razik
- Dryden
  - Bette Davis
- GRC (Plumbrook Station)
  - Marne Bold
- Stennis
  - Dan Dobrinen
  - Mike Blotzer
- LaRC
  - ??
- JPL
  - ?
- MSFC (Michoud?)
  - ?
- HQ
  - ?

Please communicate your input!

Center Needs Assessment
1. Operations and Noise Sources



- Nature of existing and planned operations and noise sources
- Organizational responsibilities
  - Development of purchase specs
  - Engineering
  - Procurement
- EH-resident capabilities relevant to BQ/QBD
- Any activity on BQ or QBD programs yet?
- Expected or known challenges
  - Attitudes
  - Technical capabilities

Center Needs Assessment
2. Center Organization and Culture

- Procurement mechanisms and responsibilities (who? and how?)
- Noise-relevant construction vehicles
  - 8A contractors
  - On-site support service
  - C of F
- Existing organizational systems (e.g., cross-functional teams) that can be used to implement BQ & QBD
- Management awareness and level of support

Center Needs Assessment
3. Identified Opportunities for Support

- Technical support
  - Training
    - Awareness
    - Technical
  - Design and other software
    - **Evaluation of GRC software, with technical support**
  - Project-specific consulting as needed
- Written procedures
- Program promotional information
- Other?

GRC resources for evaluation

GRC's Buy-Quiet and Quiet-by-Design materials

- Excel workbooks with relevant calculations
- User manuals
- Conference papers describing each program in detail

- Technical support available during evaluation period
- (Fully functional tools need to be customized!)
- Your comments will drive revisions, releases, and funding of ongoing software support
- Early fall ViTS will provide initial orientation

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Glenn Research Center

+ Contact Us

FIND IT @ NASA + GO

ACOUSTICAL TESTING LABORATORY

+ Home | + Acoustical Testing | + On-Orbit Acoustics | + Hearing Conservati n | + Noise Control | + ite Map

+ NASA Home
+ NASA GRC Home
+ Structural Systems Dynamics Branch
+ Acoustics Branch

+ HOME
+ SUBSCRIBE
+ CONTACT US
+ "BUY QUIET"
+ QUIET BY DESIGN
CABLE TRAY WRAPPING
ACOUSTICAL PIPE LAGGING
VIBRATION CONTROL
LINKS

SEARCH GLENN + GO

Noise Control

NASA Glenn Research Center has developed a number of unique solutions to our industrial noise control challenges. We offer these as resources that may provide ideas to inspire solutions to noise control problems faced in other industries and work environments. These solutions are not intended to replace the services of a qualified noise control engineer, nor are they intended to be adopted without modification.

More information on assessing, developing, and implementing an industrial noise control project may be found in the publications below:

Cooper, Beth A., Hange, Donald W. and Mikulic, John J. "Engineering Solutions to Reduce Occupational Noise Exposure at the NASA Glenn Research Center: A Five-Year Progress Summary (1994-1999)." Proceedings of Inter-noise 1999. *(.pdf file)*

Cooper, Beth A. "In-Plant Noise Exposure Management for an Industrial Process Air System." Proceedings of Noise-Con 1996. *(.pdf file)*

Danielson, COL R.W. and Cooper, B.A. "Promoting a noise control program: Resources for successfully advocating a low-noise environment." Proceedings of Inter-noise 2002. Dearborn, MI. 19-21 Aug. 2002. *(.pdf file)*

Related Media

+ View Larger Image

+ View Larger Image

+ View Larger Image

http://acousticaltest.grc.nasa.gov

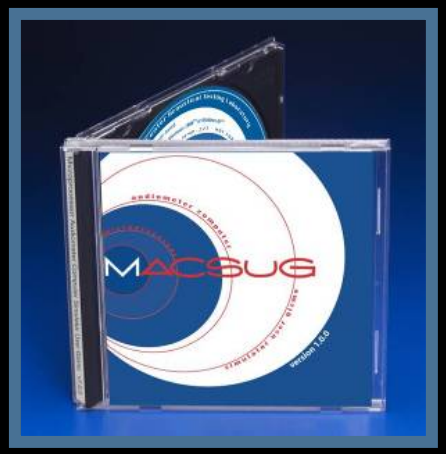
What's Next?

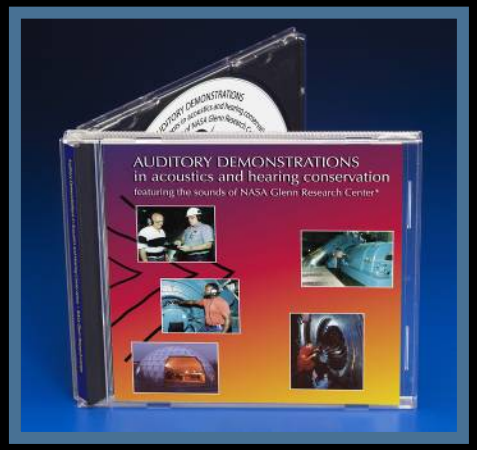
- Please see me to discuss needs assessment
  - This week between sessions . . . or
  - email me to set up a telecon after conference
    - Beth.A.Cooper@nasa.gov
- Your input is valuable to agency-wide assessment!
- Services with common applicability will get priority
- Expert technical support is available on limited basis for next few months
  - Use of GRC tools for specific applications
  - Development of agency training materials and requirements
  - Development of plan for implementation

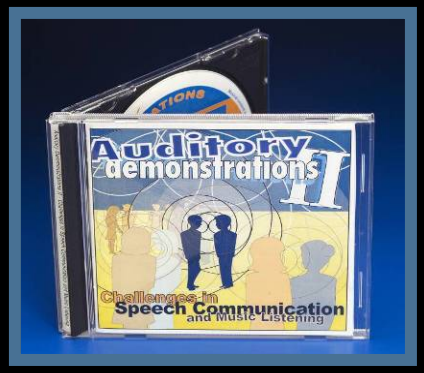
NASA Glenn Research Center Training Resources

- Free educational resources that promote:
  - hearing loss prevention
  - low-noise advocacy
- Request them on-line:

http://acousticaltest.grc.nasa.gov







JEOPODY

Hearing Conservation Game for Employee Training