Buy Quiet:
On the ground experience at NASA

Beth Cooper, PE INCE.Bd.Cert.
NASA Glenn Research Center

NASA Buy-Quiet Program

- Buy-Quiet and Quiet-by-Design requirements added to Agency-wide policy in 2006
- Precursor work at Glenn Research Center
  - Mid 1990s effort motivated by surge in installation of new high-noise equipment and systems
- My role is to assist 14 field centers:
  - Agency-level program planning and direction
  - Technical expertise
  - Development of technical resources and tools
  - Oversight and evaluation assistance for HQ

NASA Agency-wide requirements

- Each field center must develop and implement a center-specific program to:
  - ***"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)."
- Noise emissions shall be considered <u>equally</u> with all other requirements.

NASA Buy-Quiet Vision:

Everyone thinks like a hearing conservationist

- Noise emissions *Intentionally* considered
- Noise-related consequences of purchase decisions routinely anticipated and evaluated
- Long-term cost of each option quantified
- *Informed* purchase decisions are made
- Noise-related impact properly accommodated
- Best practices approach promoted for “non-hazardous” equipment noise emissions

Implementation challenges

- Agency-wide diversity in operations, culture
- Responsibility distributed throughout Center
- Advocacy and training are major tasks
  - Technical content outside EH&S scope of practice
  - Program “users” (requestors) are outside EH&S
  - Centers have multiple contractors and tenants
  - Stakeholders are unfamiliar or skeptical (or both)
- Contractor compliance must be monitored
- Senior management enforcement is critical

Meeting the BQ requirement

- Interpretation of “include noise emissions” intentionally left to each site
- Implementation must be site-specific
  - Organization, communications, and procedures
- Responsible POC in each EH&S organization
- Series of six-month goals established by HQ
- Periodic (~6 mo) status review telecons
- Video and conference training sessions
- Enforcement via HQ audit team site visits
  - Checklists mirror goals discussed in status reviews

Implementation steps toward development of site-specific programs

1. Identify POC and EH&S internal team
2. Modify policy document
3. Conduct awareness briefings
4. Develop cross-functional team
5. Develop internal procedures
6. Include Contractor organizations
7. Conduct “how-to” briefings on procedures
8. Incorporate *Buy-Quiet Process Roadmap*
9. (Modify onsite support service contracts)

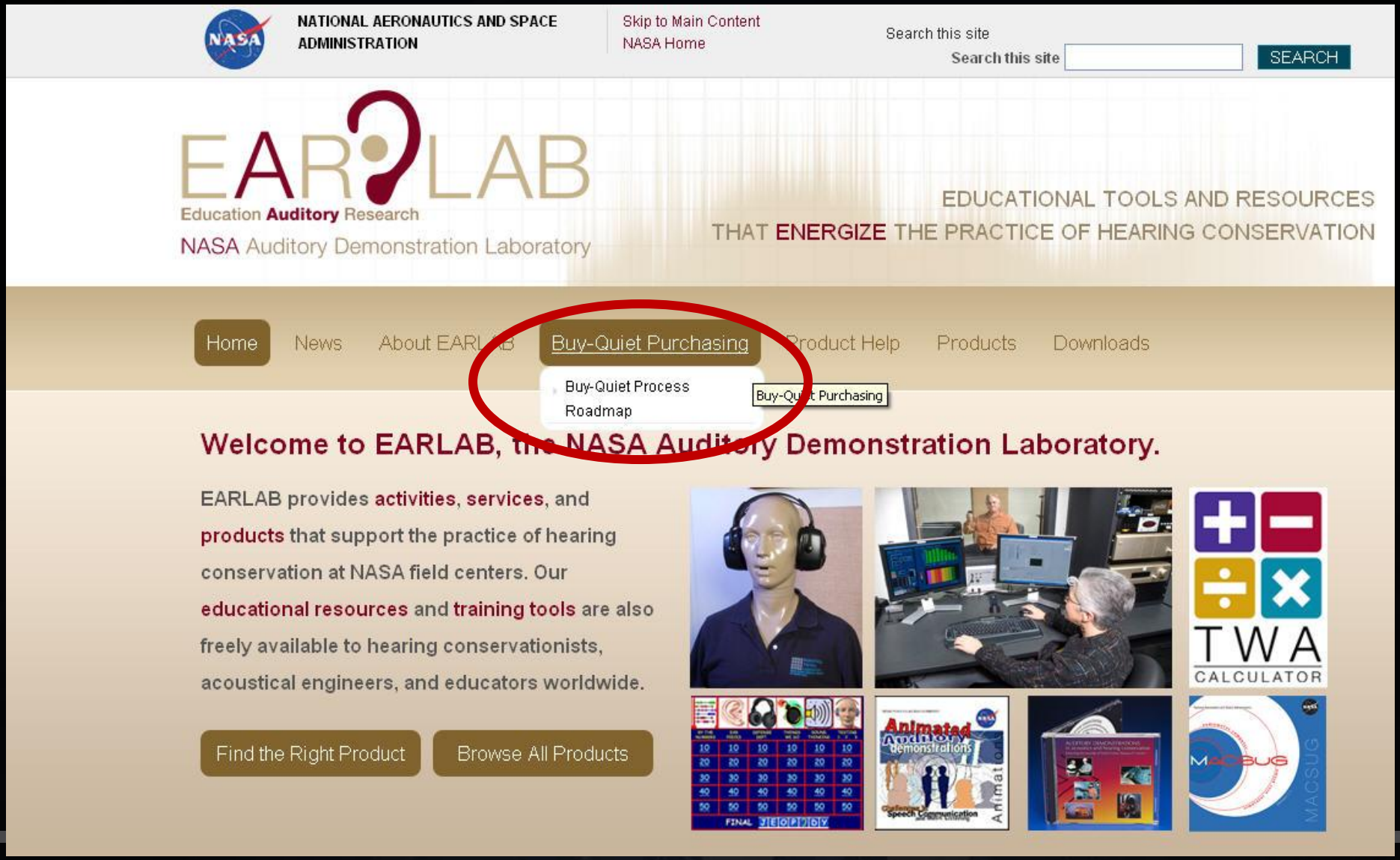
Roadmap: meeting field centers' needs

- Won't it cost more to buy quiet?
  - Quantify the long-term cost of noise
- What are other companies, government agencies, and the military doing about this?
  - Collect some case studies
- Do manufacturers make low-noise equipment, and how much more does it cost?
  - Poll some manufacturers for their input
- How do I navigate the process of locating, evaluating, purchasing, and verifying the performance of low-noise equipment??
  - Create a Buy-Quiet Process Roadmap for NASA
  - Make it customizable and generic so it can be used by all NASA centers and contractors and by non-NASA entities

NASA Buy-Quiet Process Roadmap

- Web-based tool 
- Provides stepwise process guidance
- Developed for NASA but applicable externally
- Technical content by Nelson Acoustics; web design and content editing by Gelfand Design
- Incorporates best practices from corporate, military, government programs
- Incorporates manufacturer–provided data on availability and cost of low-noise equipment
- Contributions from 20+ external organizations

NASA Buy-Quiet Process Roadmap



Best-practices case studies

- Solicited 60 individual (corporate, military, federal) contacts plus
  - 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 non-NASA Buy-Quiet programs
  - **Most successful programs use 80 dBA noise emission limit**

Manufacturer interviews

- Solicited 60 individual manufacturer contacts plus these lists:
  - 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**

Buy-Quiet Process Roadmap

Key external contributors

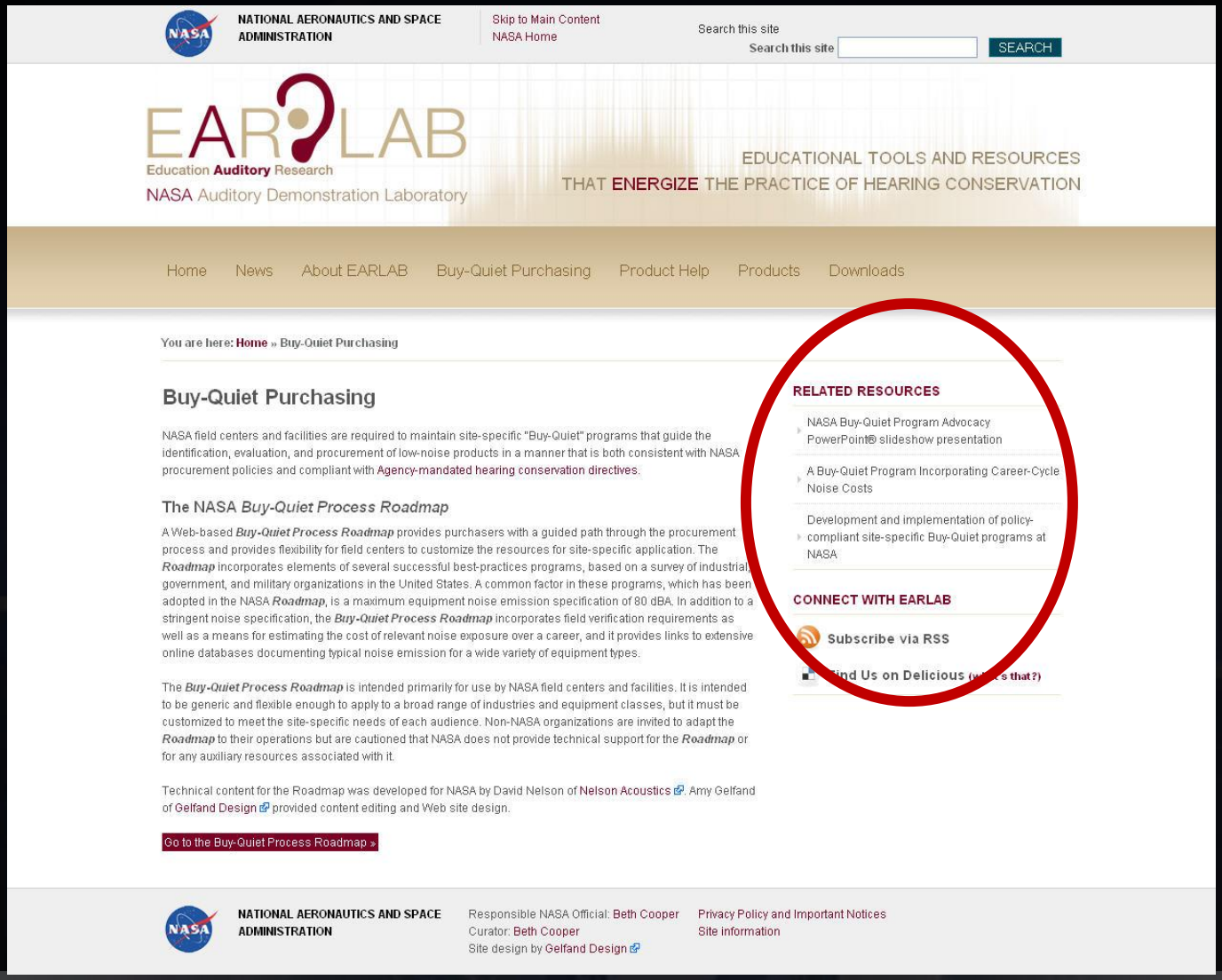
- Baltimore Aircoil
- United Technologies
- Caterpillar
- Cisco
- Honeywell
- Hewlett Packard
- Ingersoll Rand
- Toro
- Carrier
- ExxonMobil
- Colgate Palmolive
- Trane
- 3M
- Becton Dickinson
- General Motors
- Air Force
- Navy
- National Park Service
- NIOSH

NASA Buy-Quiet Process Roadmap
Key features

- Relevant to hearing-conservation scenarios
  - Considers community noise impact
- Leads user through step-wise process
- Includes customizable specification template
- Authorization forms promote *responsible* departures from process
- "Cost of noise" calculation calculates net present value of long-term exposure

  - Can compare equipment differing in noise and cost
  - Total cost = purchase + long-term noise exposure

NASA Buy-Quiet Process Roadmap
Key features



Roadmap process

1. Research appropriate noise emission criterion
   a) Links to online databases and other sources
2. Research available equipment that meets criterion
3. Select noise emission criterion
   a) 80 dBA SPL or EU Machinery Directive listing is baseline
   b) Adjust baseline if appropriate, and obtain authorization
4. Develop and issue specification
5. Compare long-term cost of noise exposure for candidate proposals; make selection
6. Verify noise emission after delivery/installation

Incorporating the Roadmap

- ***Roadmap*** is intended to form the core of Center-specific Buy-Quiet procedures
- Should be customized to each organization
- Adapt to culture, organization and operations
- Piggyback on existing processes and controls
- Employ existing cross-functional teams

http://adl.grc.nasa.gov

or Google “Buy-Quiet Process Roadmap”

Additional *Roadmap* features

- Streamlined process includes links to resources
- Advocacy resources provided for use in briefings
  - “Buy-Quiet” advocacy PowerPoint® Presentation
  - “Cost of noise” spreadsheet and analysis
- Customizable training slides provided
- External resources for additional depth
- Example cases provided for study and briefings

Note: ***Roadmap*** is currently being harmonized with NASA’s procurement structures

Next up: Quiet-by-Design!

- NASA assumes technical burden “in-house”
- Applies to engineering of gas flow systems
  - End-user involvement requires graduate-level engineering (gas dynamics, aero-acoustics)
  - Buy-Quiet program output provides criterion
- Applies to engineering of inhabited spaces
  - End-user involvement is “best-practices” architectural and engineering design
  - Requires understanding hearing conservation goals

Next up: Quiet-by-Design!

Getting there . . .

- Low-noise product design is possible
- Manufacturers must advertise quiet products
- “Level playing field” promotes competition
- Corporate consumers (we) must be proactive
- Demand will increase supply
- Product noise labeling initiative in progress
- Successful corporate programs do exist
- Resources, models and help are available!