Development and implementation of policy-compliant site-specific Buy-Quiet programs at NASA

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ABSTRACT

National Aeronautics and Space Administration field centers and facilities are required to maintain site-specific "Buy-Quiet" programs that guide the identification, evaluation, and procurement of low-noise products in a manner that is both consistent with NASA procurement policies and compliant with Agency-mandated hearing conservation directives. These programs operate under the auspices of the Agency's occupational health organization but also rely heavily on the informed efforts of local engineering and procurement staff while making use of existing protocols that govern design, communications, and safety management at each site. Program coordination assistance and technical resources are provided to field centers by the Office of the Chief Health and Medical Officer to foster successful implementation and encourage sharing of technical information and "lessons learned." A web-based *Buy-Quiet Roadmap* provides purchasers with a guided path through the procurement process and provides flexibility for field centers to customize the resources for site-specific application.

1. INTRODUCTION

Occupational noise exposure of ground-based employees at the 14 National Aeronautics and Space Administration (NASA) field centers and facilities is managed by means of a hearing conservation policy[1] that incorporates the requirements of §29CFR 1910.95, the Occupational Safety and Health Administration standard on occupational noise exposure[2]. This agency-wide hearing conservation policy provides increased protection against noise-induced hearing loss by adopting the 85 dBA TWA criterion level and 3 dB exchange rate recommended by the National Institute of Occupational Safety and Health (NIOSH) [3], which is now considered best practice among hearing conservation professionals.

NASA's policy requires each field center to maintain a hearing conservation program that includes an engineered noise controls component. Realization of the full value of the financial

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investment in large retrofit noise control projects depends on the ability to maintain momentum toward a quieter work environment, which, in turn, depends on preserving gains that have been made with each successive project. In addition, it is desirable to shift the focus of noise control design and expenditure from relatively expensive retrofit projects to the initial design and construction stage of all projects, where noise reduction is most appropriately achieved. New equipment purchases continually present opportunities to further both objectives. In many work areas, multiple, complex or distributed noise sources limit opportunities for cost-effective source noise control, requiring emphasis on hearing protection and personnel enclosures as the primary means of noise exposure management. In these areas, gradual, yet cost effective, reduction in area noise levels (and employee exposure) may only be achievable as noisy equipment is replaced with low-noise equipment purchased in accordance with a "Buy-Quiet" philosophy.

Historically, the implementation of retrofit engineered controls has been a key element of the NASA Glenn Research Center hearing conservation program[4]. During 1996, the hearing conservation program implemented a "Buy Quiet" program with the goal of achieving long-term reduction of employee noise exposures through purchase of equipment that conforms to hearing conservation goals. Project designers and engineers who purchase equipment expected to generate noise emission levels of concern for hearing conservation (80 dBA and above) are required to consider noise emissions along with other performance criteria. A *Guide to Specifying Equipment Noise Emission Levels*[5] was published as a technical resource to assist purchasers with the low-noise equipment procurement process. The *Guide* addressed noise emission from a broad variety of fixed and portable equipment and guided the purchaser through the development of noise emission requirements and the preparation of specification language, using spreadsheet-based tools. This resource, along with a companion Guide[6-7] for systems and equipment designed in house, has been publicly available (http://acousticaltest.grc.nasa.gov) since 1997.

2. AGENCY-WIDE BUY-QUIET PROGRAM REQUIREMENTS

In 2006, NASA incorporated requirements for Buy Quiet and Quiet-by-Design programs into its agency-wide hearing conservation policy, based largely on the precedent set at Glenn Research Center in the late 1990s. The policy requires field centers to establish and maintain programs that "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)," but the interpretation of "include noise emissions" is left to the individual field centers so that programs can be as site-specific as possible and take advantage of existing processes, communication mechanisms, and controls that are already in place and that function smoothly in the context of the center's organization and culture. Contractor organizations are required to maintain parallel programs if they are responsible for procurement or design of equipment and systems that may fall under the auspices of the policy. Each center's effort is championed by an identified representative within the center's occupational health organization, but the responsibility for development and implementation of the program is shared by the entire center, often managed by a cross-functional team comprised of representatives from multiple stakeholder organizations. This multi-disciplinary and multi-organizational approach is particularly important because so much of the critical decision-making and effort associated with low-noise procurement and design takes place outside of the occupational health organization, typically within engineering or research. Senior management support and enforcement also are critical to the success of such a program.

3. BUY QUIET PROCESS GUIDANCE ROADMAP

As a result of field center requests for specific guidance on how to approach and accomplish the procurement of low-noise equipment, NASA contracted with Nelson Acoustics to develop a Buy-Quiet "Roadmap." This web-based tool incorporates elements of several successful best-practices programs, based on a survey of industrial, government, and military organizations in the United States. A common factor in these programs, which has been adopted in the NASA *Roadmap*, is a maximum equipment noise emission specification of 80 dBA. In addition to a stringent noise specification, the *Buy-Quiet Roadmap* incorporates field verification requirements as well as a means for estimating the cost of relevant noise exposure over a career, and it provides links to extensive online databases documenting typical noise emission for a wide variety of equipment types. A high degree of flexibility is achieved by adjusting candidate equipment prices for the net present value of the equipment's noise emission prior to making a purchase decision[8]. Addition of this "cost of noise" approach to NASA's equipment purchasing process is expected to increase flexibility on the part of the purchaser while rewarding noise control advances on the part of the supplier.

The *Roadmap* provides a potential purchaser with a guided path through the procurement process, which includes:

- Identifying relevant purchases
- Researching a low-noise purchase
- Requesting noise emission data from vendors
- Evaluating options, using a "cost of noise" tradeoff calculator
- "Outboard" noise control as an alternative
- Assessing cost and exposure impact of purchase options
- Documenting process, decisions, and impact

Customizable forms, templates, checklists, and specifications are provided for download and printing. The *Buy-Quiet Roadmap* will be publicly accessible via a link from the NASA Auditory Demonstration Laboratory website at http://acousticaltest.grc.nasa.gov.

4. SUMMARY

Consistent specification of low-noise equipment is an important component of bringing about reduction in workplace and environmental noise levels, reduction of administrative and operational noise controls, and improvement in the safety, productivity, comfort, and regulatory compliance of the work environment. NASA's Buy-Quiet and Quiet-by-Design requirements allow field centers the flexibility to implement site-specific programs that are responsive to organizational and cultural context and that address the technical and procedural needs of the stakeholder community. The *Buy-Quiet Roadmap* is a web-based tool that has been developed to provide comprehensive assistance to purchasers across the agency. Gradual decreases in area sound level and employee noise exposure at all field centers are expected as equipment purchases are made in accordance with NASA's Buy Quiet program requirements.

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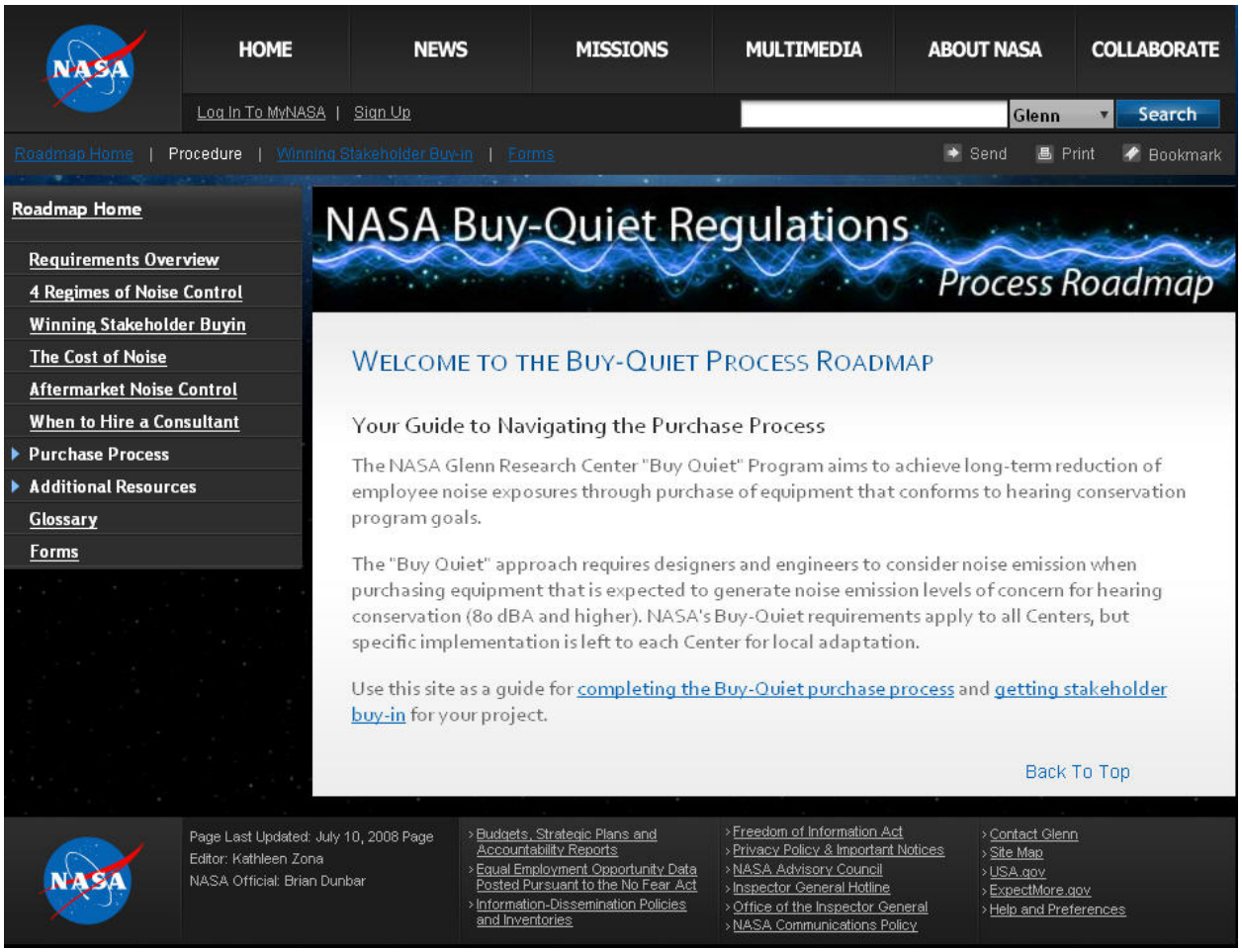

Figure 1: The *Buy-Quiet Roadmap* will be publicly accessible via a link from the NASA Auditory Demonstration Laboratory website at http://acousticaltest.grc.nasa.gov.