



Innovation Award

Apache Hush Kits

February 21, 2021
Jason Destories



COMPANY/ORG PROFILE

- The Boeing Mesa site's core competency is the assembly, integration, and testing of rotorcraft.
- The AH-64E Apache Helicopter is combat-proven with combination of performance and technology
 - US Army and customers around the globe



Boeing Mesa History

- **1948** – Howard Hughes launches first helicopter program, the XY-17 flying crane
- **1963** – Hughes OH-6A, forerunner of MD 500 Series, makes first flight
- **1975** – First AH-64 Apache prototype makes first flight
- **1982** – Hughes Helicopters, Inc. opens Mesa, Arizona facility
- **1984** – McDonnell Douglas Corporation purchases Hughes Helicopters, Inc.
- **1986** – McDonnell Douglas moves helicopter headquarters from Culver City, CA to Mesa, AZ
- **1993** – McDonnell Douglas Helicopter Company becomes McDonnell Douglas Helicopter Systems
- **1997** – McDonnell Douglas merges with The Boeing Company



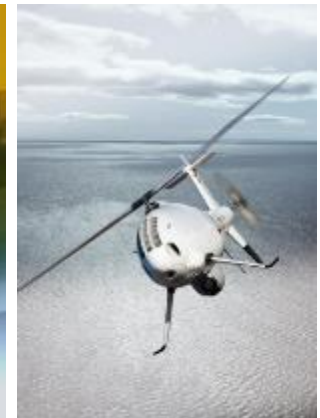
Boeing Mesa Facility

- Opened in 1982
- 4,000+ employees & 300 contractors
- 2 million square feet
- 41 Buildings
- 348 Site Acres



Boeing Mesa Products & Services

- AH-64E Apache
- S-100 unmanned aerial vehicle
- Global Security Operations Center
- Phantom Works
- Global Services
- Centers of Excellence
 - Electrical
 - Composites
 - Metals
- Boeing Test & Evaluation



TEAM MEMBERS / INDIVIDUALS

- Jason Destories

- Manufacturing Research & Development (MR&D) Engineer



- Talmadge Ryan-III

- Repair/Mod Technician (Safety Champion)



- Israel Limon

- Manufacturing Research & Development (MR&D) Technician



- Stu Lange

- Production Manager Flight Test



- Jeff Mieth

- Environment, Health and Safety Sr. Manager



- Parvin Wallum

- Mesa EHS Hearing Conservation Program Coordinator



Other team members- Erik Knutesen, Chris Allen and Dylan Barber

Background – Overview

- Apache Environmental Control System (ECS)
 - Air conditioning system used to keep electronics and cabin cooled.
 - 4 ducted fans run at high RPM to move air across the condenser. The noise levels range from 84 to 104 dBA*



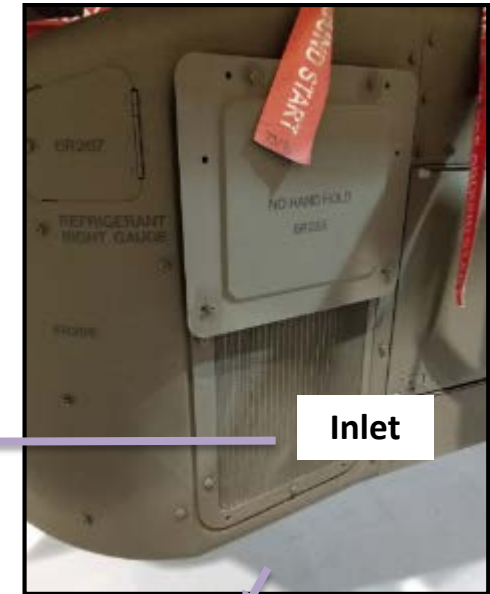
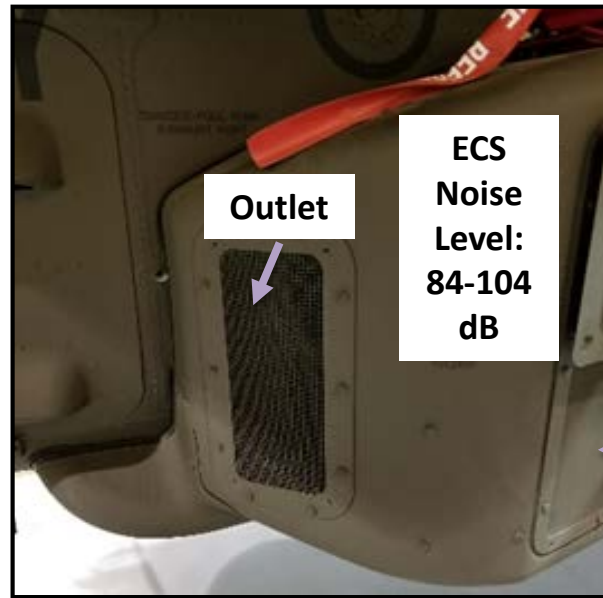
4 (2 each side) Military Grade Electric Ducted Fans, High RPM



* Study results provided by Mesa EHS

Describe the Problem

- The Apache ECS creates high pitch sound when running >100 dBA at the source.*
 - Operated for avionics cooling
- Hearing protection is required but makes communication between crew members difficult.



Describe the Problem (Continued)

- Engineering controls were evaluated in late 1998. At that time, the controls were not economically feasible.
- Cost effective engineering controls were needed to reduce noise
- In 2012, improving workplace safety became a top priority
- The Safety Champion program was launched

External customers have built sound suppression equipment - \$58k/set



Noise is the most prevalent occupational hazard at Boeing.

Noise-induced hearing loss is 100% PREVENTABLE if appropriate hearing protection is fit properly and worn consistently during all high noise level exposures.



Explore Solutions

- Rapid proof of concept (same day)
- Leverage existing ideas
 - External customer solutions
 - Off the shelf noise reducing solutions



External Customer Solutions



Zombie Box



Proof of Concept



Zombie Box

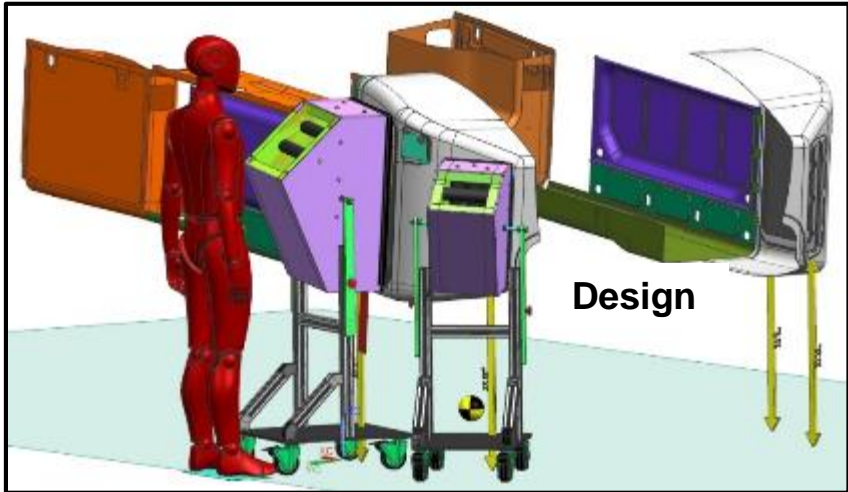
Proof of Concept



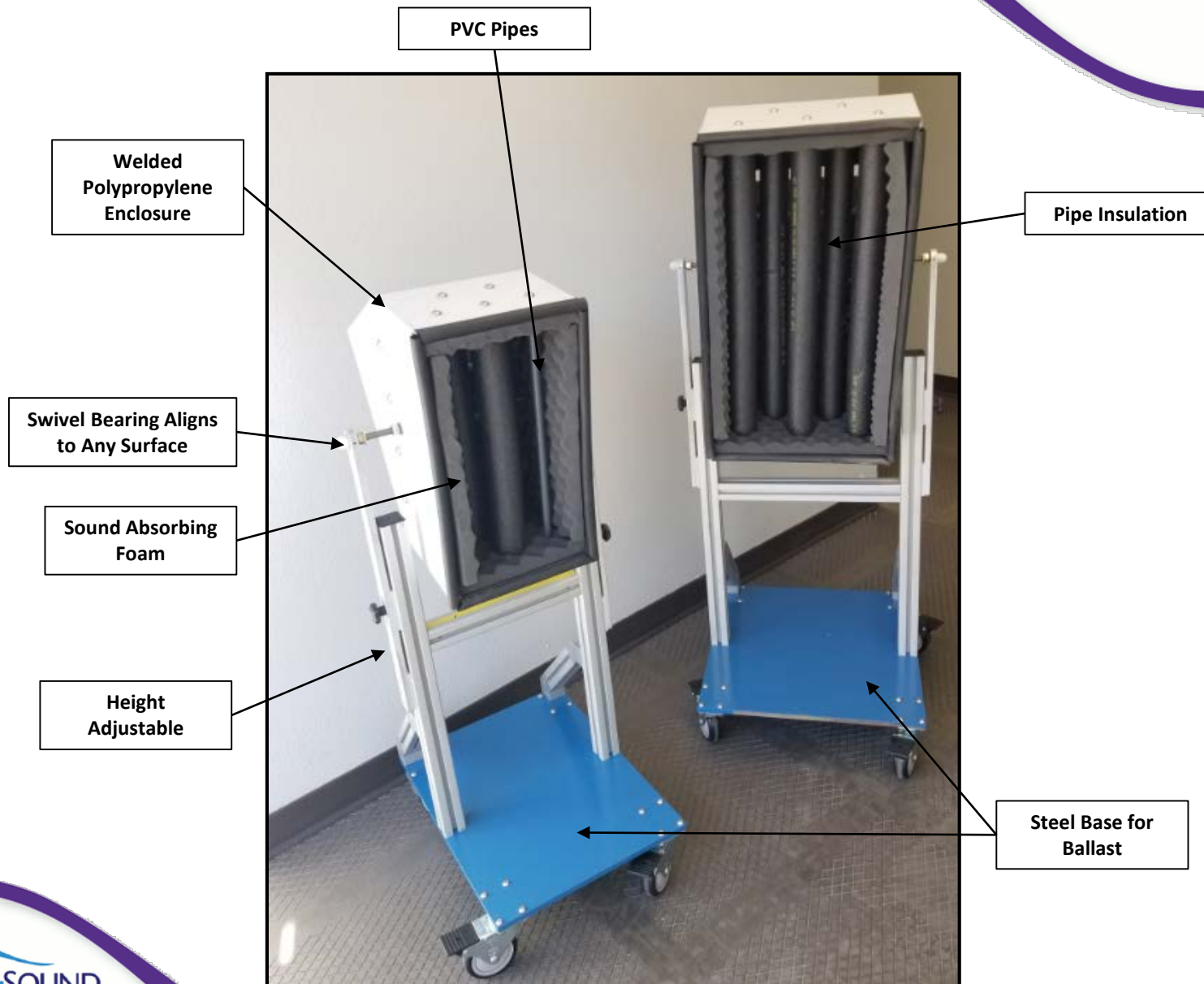
Test Proposed Solutions – Hush Kits



*Entrepreneurial mindset,
take smart risks.*



Apache Hush Kits



EHS Noise Reduction Study

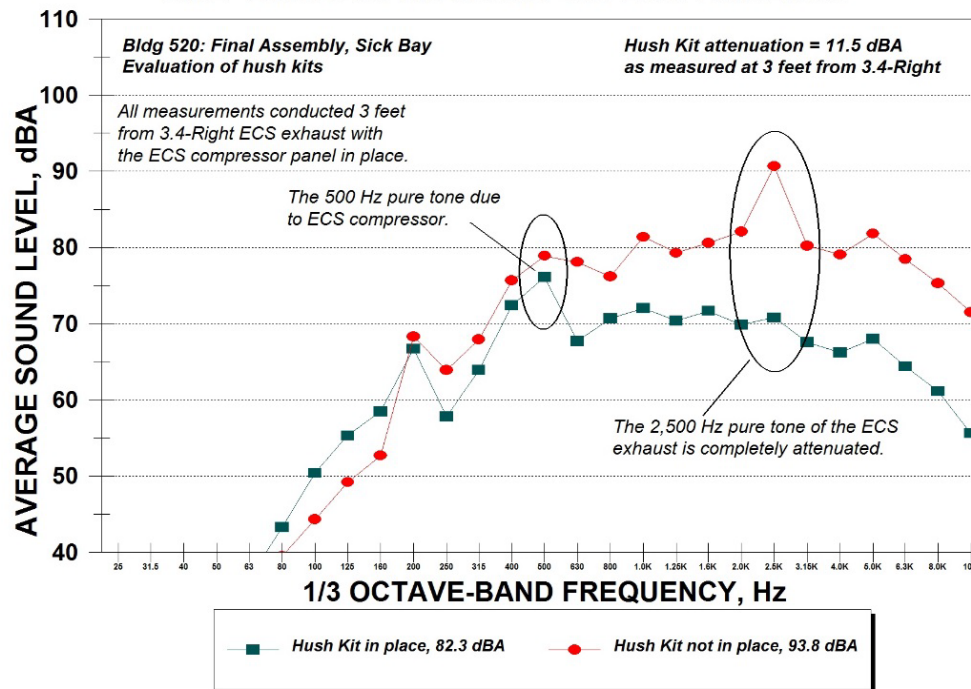
- Noise measurements made with and without the Hush Kits
- The overall noise reduction ranged from 5 dBA to 12 dBA.
 - Percent Reduction of Amplitude ranged from 37% to 72%
 - The noise measurements were validated by a third party (APEX/Associates in Acoustics)

Acoustical Engineering / Noise Control Survey

Conducted by Apex Companies, LLC

June 2019

FIGURE 1
COMPARISON OF AVERAGE SOUND LEVEL WITH AND WITHOUT HUSH KIT ON ECS EXHAUST

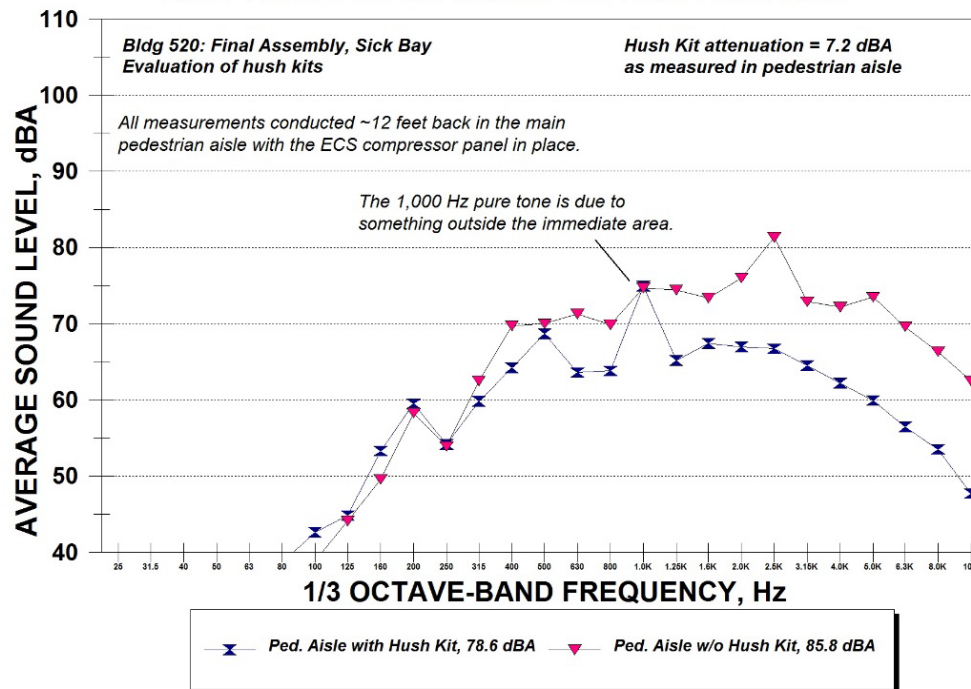


Acoustical Engineering / Noise Control Survey

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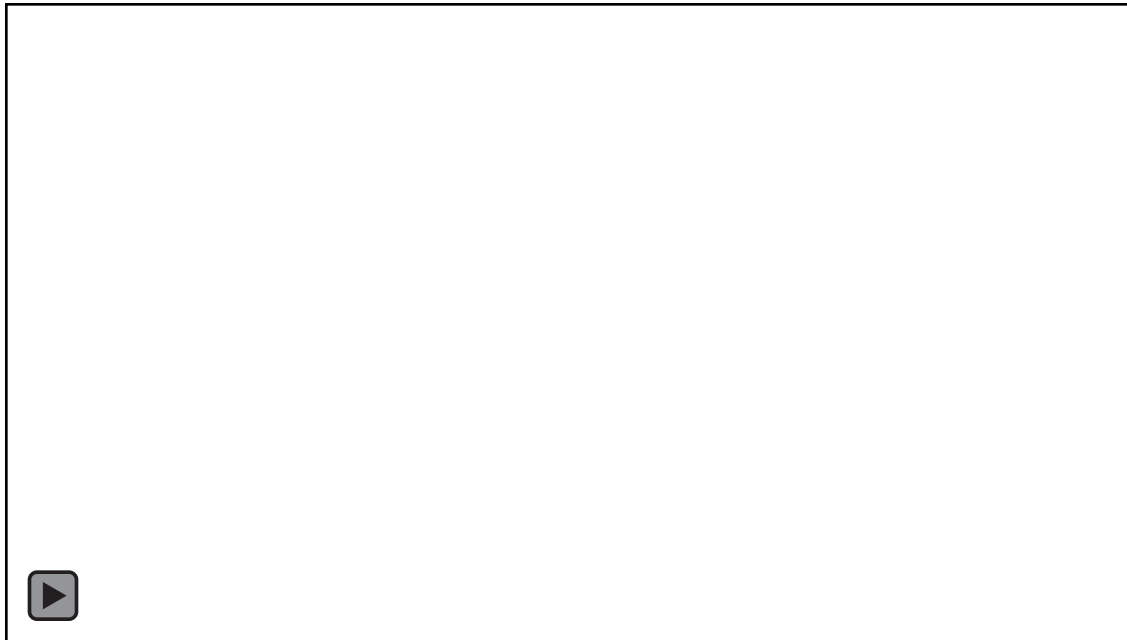
June 2019

FIGURE 2
BACKGROUND AVERAGE SOUND LEVEL WITH
AND WITHOUT HUSH KIT ON ECS EXHAUST



Apache Hush Kits Video

Hush Kits before and after sound effect



Scale and Implement the Solution

- **Positive feedback** from all teams including adjacent employees
- The Hush Kits were distributed to production areas
- Cost savings
 - \$2,300 per aircraft based on 4 hush kits
 - Significantly less than original estimate of \$58,000
 - Currently, 10 hush kits have been delivered



Next Steps

- Build additional Hush Kits for production
- Customer awareness of the innovation
- Leverage the Award to communicate to other teams within Boeing for future innovations
- Inspire other employees to become engaged and take action

LESSONS LEARNED

- Working together and collaborating can lead to cost effective innovations
- One employee's idea can lead to a significant improvement
- Innovation is needed when the solution is not obvious or is costly
- Team Based Business Initiatives (TBBI) are encouraged for Employee Involvement Teams

SIGNIFICANCE OF THE AWARD

- Award will raise awareness of the importance of engineering solutions to control noise
- The award will create recognition within Boeing and with other stakeholders
- Boeing will continue to innovate to improve workplace safety

Future - Hearing Protection Standard

- One of Boeing's safety standards includes the Hearing Protection Standard (HPS)
- The ultimate goal of HPS is to reduce risk of hearing loss
 - Mandatory hearing protection for specific tasks regardless of frequency, duration, and sound level measurements (dBA)
 - Develop and implement a High Noise Control Plan

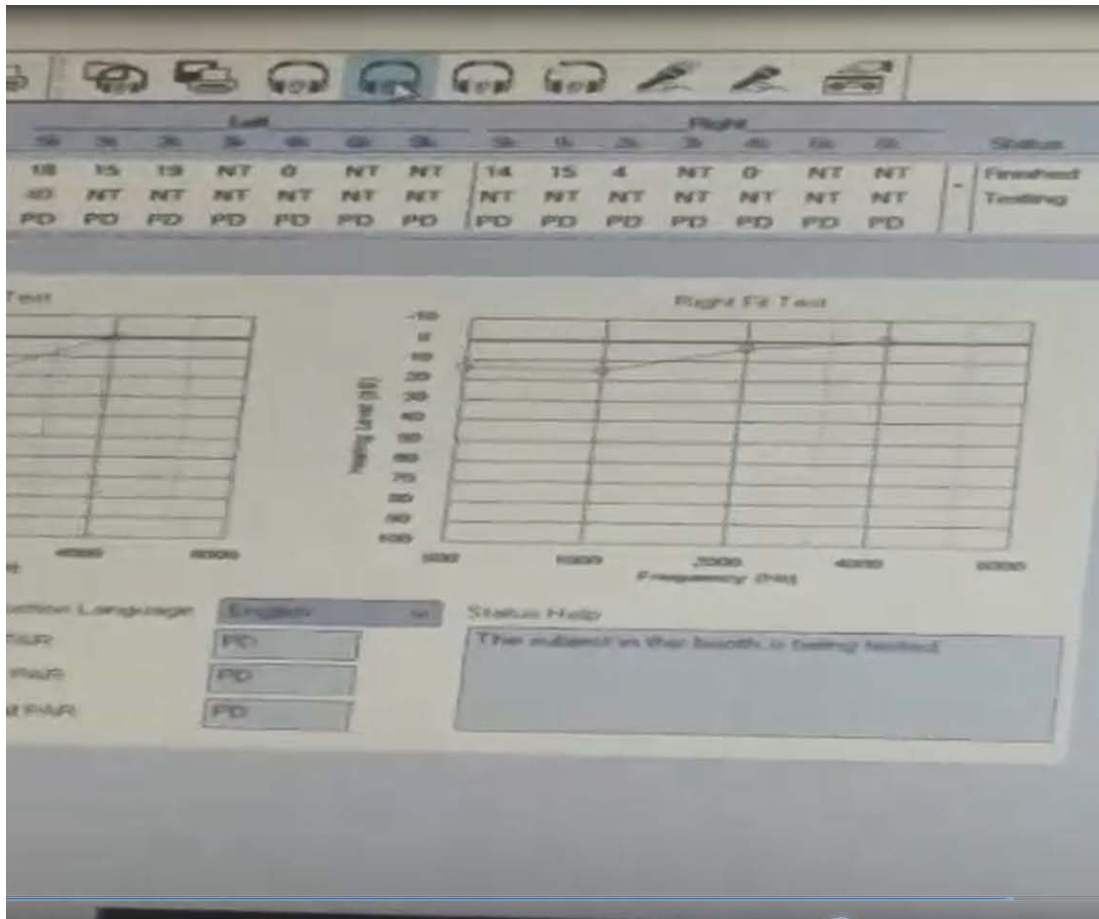
Future - Hearing Protection Standard (Continued)

- Maximum noise levels for new and refurbished equipment installations must be:
 - At operator station(s) 80 dBA
 - At any point three-feet from any exterior surface of the equipment 80 dBA
- Employees new to Mesa HCP must receive individualized fit evaluation
- All Standard Threshold Shifts (STS), both age and non-age corrected, must be followed up.



Future - Hearing Protection Standard (Continued)

Individualized Fit Evaluation Quantitative



Site: Mesa, AZ
Task: Hearing Fit Test



CONTACT INFORMATION

Jason Destories

Manufacturing Research & Development (MR&D) Engineer

The Boeing Company, Mesa, Arizona

jason.g.destories@boeing.com

Jeffrey A. Mieth, P.E.

Environment, Health and Safety, Senior Manager

The Boeing Company, Mesa, Arizona

jeffrey.a.mieth@boeing.com