

Structural Health Management/Monitoring

Arne Lewis
The Boeing Co.
Structures Service Engineer
New Airplane Product Development

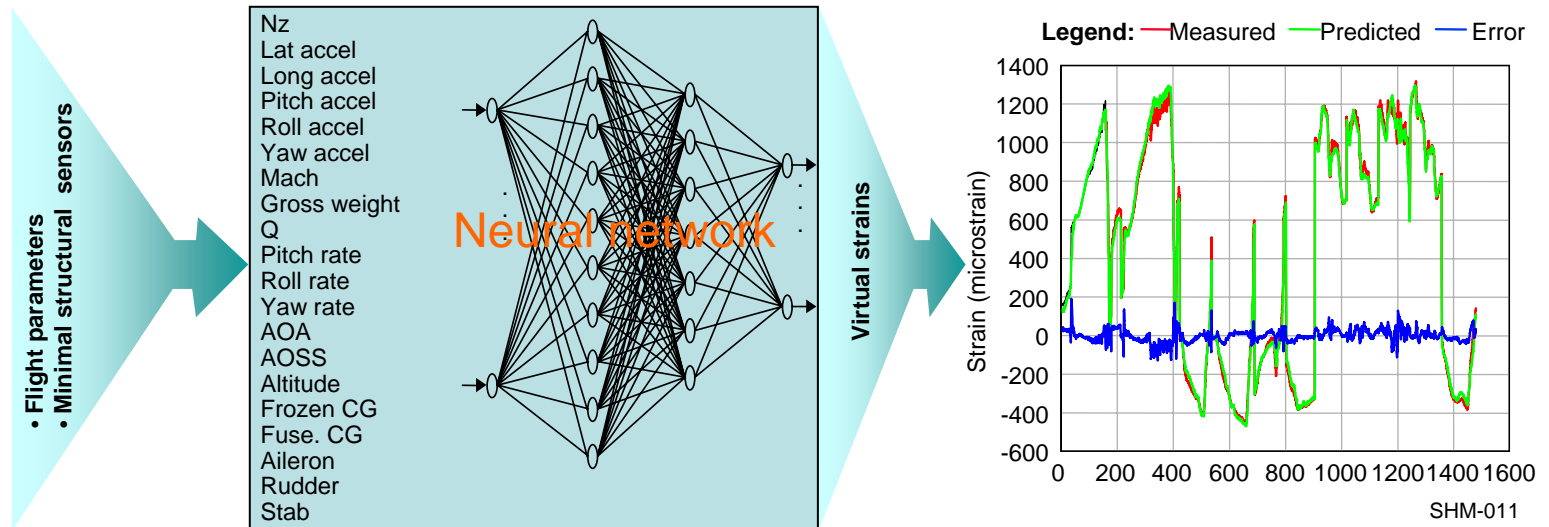
Structural Health Management

- ❖ **Definition and Development**
- ❖ **Testing**
- ❖ **Implementation**
- ❖ **Benefits**

What Is SHM?

Definition and Development

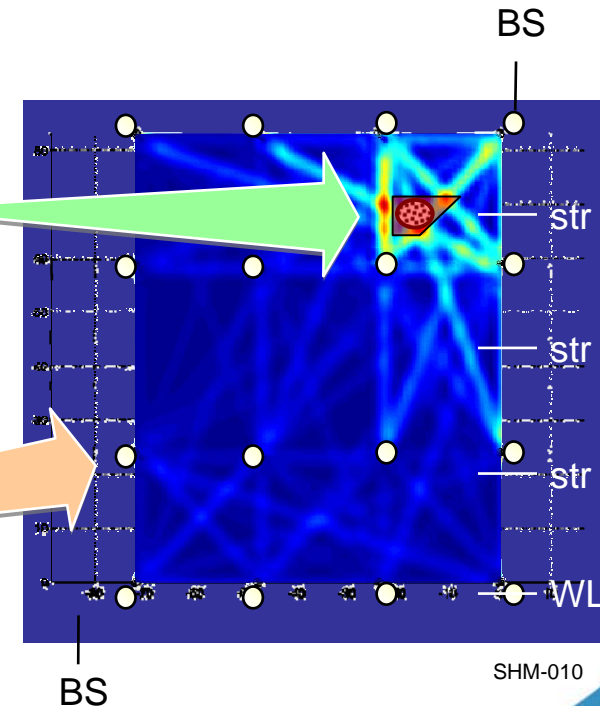
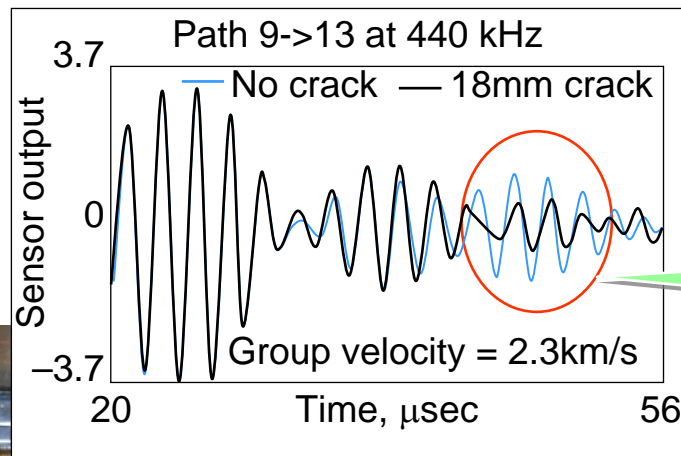
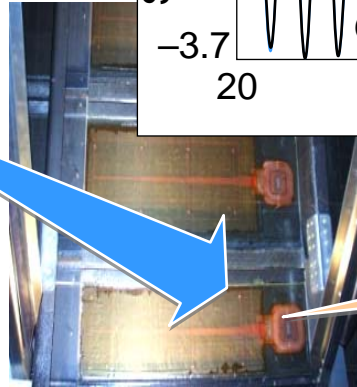
- **SHM is a structural condition assessment system using sensor technology and flight parameters that can potentially monitor airplane loads and structural damage**
 - ❖ **Accidental and fatigue**
 - ❖ **Load monitoring**
 - ❖ **Load exceedance (hard and heavy landing)**



Accidental Damage Sensors Installed

Definition and Development

- Two embedded layers
- Three part surface mounted layers bonded to inner mold line



Phased Implementation of SHM

- **What will it take to implement SHM?**
 - ❖ **Laboratory testing**
 - ❖ **In-service testing**
- **Industry working together**
 - ❖ **Understanding issues and working together to resolve issues**
- **Qualification of SHM as part of airplane maintenance**
 - ❖ **Algorithm development**

Implementation in Phases

- **Initial Discovery**
- **Testing/Algorithm Development**
- **Working Group Development (CAWG)**
- **Phase I – Passive Damage Detection and Flight Parameter monitoring**
- **Phase II – Active Damage Detection**

SHM Benefits

- **Reduced operating cost**
- **First step in progression to condition-based structural maintenance**
- **Longer economical airframe utilization**
- **Structural inspection tasks customized for each airplane**

SHM Benefits (Con't)

- **Could be adapted to current fleet**
- **Possible third option in Service Bulletins: Monitoring**
- **Determine the extent of damage in areas prone to accidental damage**
- **Open architecture allowance to expand upon existing system after airplane entry to service**
- **Lighter future commercial airplanes**

SHM Issue Paper

- **SHM definition developed by Working Group Members (*ATA, Airbus, Boeing, Bombardier, Embraer, FAA and others*)**
- **Requesting that SHM definition be placed in ATA MSG-3, Appendix A**
- **Requesting that section 2-4-2 “*Scheduled Structural Maintenance*” be revised to add SHM as a recognized technology.**

Summary

- **SHM has potential to reduce airplane structural maintenance cost**
- **Testing and development of SHM technology in progress**
- **Work with airplane operators and regulators to gain acceptance in the industry**

Thank You!