Agenda

NHTSA R&D - Truck and Bus Event Data Recorder WG
Meeting # 3
Florida Atlantic University, Boca Raton, FL

February 16, 2001, 8:30 am – 4 pm
(Tom Oxley Athletic Complex Building)

Morning

8:30 Coffee & Bagels

9:00 Welcome
- Host (FAU and Forensic Accident Investigations)
- Self introductions - please sign in

Docket Information - Public process - handouts will go in docket
- dms.dot.gov Docket# 7699
  - -Item 1–August 9, 2000 (Meeting 1 agenda, copy of TMC RP1212, Crash Survivable Module for Trucks and Buses - Smiths Industries, MAC Box description)
  - -Item 2–October 25, 2000 (Minutes from Meeting #1, VDO Presentation, NTSB Presentation, Enhanced Highway Safety via Event Data Recorders, Transportation Event Data Recorders)

9:30 TMC activities - Draft RP discussion
- William Schaefer (NHTSA)

9:45 Smiths Industries
- Barry Casey and Jim Elliott

10:15 Break

10:30 Update on Current EDR Technologies
- Robert McElroy, President, Forensic Accident Investigations
- Tony Reynolds, VDO North America

11:15 Emerging Technologies & Applications
- Ricardo Martinez, CEO, Loss Management Services
- Frank Coyne, President, Insurance Services Office

12 Lunch (*Provided*)

Afternoon

1:00 Objectives of working group - objective handout

1:30 Data and Definitions

Discussion Data Variables
- Review of survey - survey handout
- Additional data needs - full list handout

Data Definitions
- What data and related names need to be defined
- Discuss definitions

Break out sessions
- 6-10 interested participants
- 2-3 mini meetings (Mar-Aug)

3:30 General Discussion - New Business
- Next meeting - Location - Date - (possible Washington DC area in the Fall)
- Topics for next meeting - results of breakout sessions
- EDR Draft Report - copies on disk
- Round Robin test series of EDRs at VRTC, East Liberty, OH

Event Data Recorder (EDR) Issues and Recommendations
Smiths Group

Smiths Group

Event Data Recorder (EDR) Issues & Recommendations

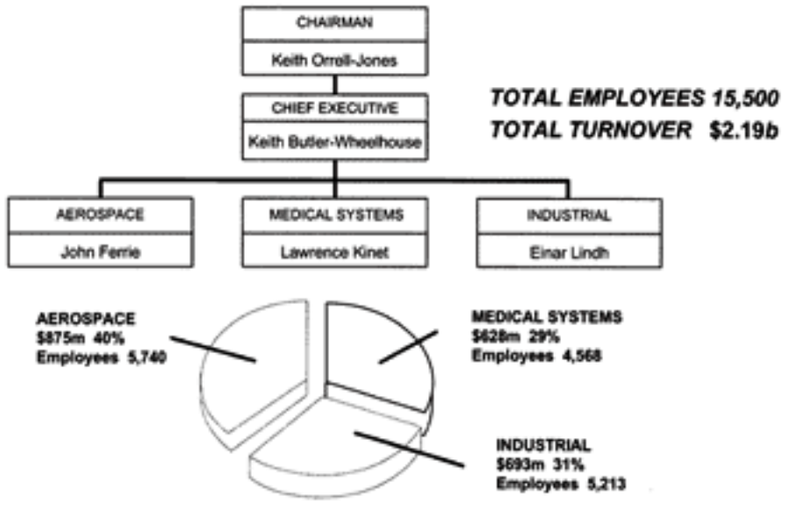
IMS Division Of Smiths Group

February - 2001

Outline

- **Smiths Aerospace - IMS Overview**
- **Recorder History & Evolution**
- **Most Wanted Transportation Safety Improvements**
- **EDR Design Issues**
  - Crash survivability
    - impact shock
    - penetration
    - crush
    - fire
    - fluid immersion
    - some statistics
- **Negligible cost differential to crash protect the memory**
- **Overall Summary & Recommendations for EDR**

Smiths Group plc



World Class Management

"Best Managed Mid-sized Aerospace Company"
Aviation Week & Space Technology - 1998 & 1999

"The World's 100 Best-Managed Companies"
Industry Week - 1997, 1998, 1999 & 2000

IMS Data Management Systems

Data Transfer Systems

Data/Voice/Video Acquisition & Recording

Engine Balancing Systems

Health & Usage Monitoring Systems

Gear Box Diagnostics Systems & Structural Fatigue Monitoring Systems

Rotor Track and Balance Systems

Recorder History & Evolution

- **The "Black Box"**
- **Aviation Recorders in existence over 40 years**
- **FDR 25 hour record requirement**
  - ⇨ Based on the round trip distance from NY to Japan
  - ⇨ Based on the round trip distance from LA to Europe
- **Evolution of crash survivability requirements**
  - ⇨ Impact Shock Levels
    - 100g
    - 1000g
    - 1700g
    - 3400g
  - ⇨ Fire Levels
    - 30 minutes 1100 deg C flame
    - 60 minutes 1100 deg C flame
    - 10 hr 260 deg C

Recorder History & Evolution (Cont'd)

- **Number of recorded parameters expands**
  - ⇨ 5 parameters on 1st generation FDRs
  - ⇨ 11 Parameters
  - ⇨ 17 - 34 parameters (depends on A/C passenger size)
  - ⇨ 57 - Transports manufactured after 2000
  - ⇨ 88 - Transports manufactured after 2002
  - ⇨ (Current capability exceeds 1400 parameters)
- **Evolution of recording media**
  - ⇨ Metal foil
  - ⇨ Magnetic tape
  - ⇨ Semiconductor devices (dramatic density and reliability improvements)
- **Addition of audio recording (1966/67)**
- **10 minute power supply hold up (RIPS)**
- **Proposed inclusion of video imagery recording**

Most Wanted Transportation Safety Improvements

NTSB Re: Commercial Truck and Bus Safety Recommendations

- **H-99-53 (NHTSA) Require that all school buses and motorcoaches manufactured after January 1, 2003, be equipped with on-board recording systems that record vehicle parameters……..The on-board recording system should record data at a sampling rate that is sufficient to define vehicle dynamics and should be *capable of preserving data in the event of a vehicle crash or an electrical power loss.***

Most Wanted Transportation Safety Improvements (Cont'd)

NTSB Re: Commercial Truck and Bus Safety Recommendations

- **H-99-54 (NHTSA) Develop and implement, in cooperation with other government agencies and industry, standards for on-board recording of bus crash data that address, at a minimum, parameters to be recorded, data sampling rates, duration of recording, interface configurations, data storage format, incorporation of fleet management tools, *fluid immersion survivability, impact shock survivability, crush and penetration survivability, fire survivability*, independent power supply, and ability to accommodate future requirements and technological advances.**

Crash Survivability - Physics of Crash Environment

- **Impact**
- **Penetration**
- **Static Crush**
- **Fire**
- **Fluid Immersion**

⇨ **Only the Memory Requires Protection**

Crash Environment Comparisons

Crash Sequence*	Aircraft	Ships	Trucks / Busses
Impact Shock	3400g, 6.5 msec	50g, 11 msec	300g, 50 msec
Penetration	0.25" pin, 500 lb, 10 ft	3.94" pin, 551 lb, 9.84 ft	0.50 pin, 200 lb, 3 ft
Static Crush	5000 lb, all angles	None	500 lb, all angles
High Level Fire	1100 deg C, 1 hr	1100 deg C, 1 hr	900 deg C, 20 min
Low Level Fire	260 deg C, 10 hrs	260 deg C, 10 hrs	260 deg C, 5 hrs
Deep Sea Immersion	20,000 ft, 30 days	20,000 ft, 30 days	100 ft, 10 days
Fluid Immersion	Various Fluid Types	None	Various Fluid Types

***Crash Sequences and Levels for Aircraft & Ships are established standards, and hardware is currently built to these numbers**

Levels for Trucks / Busses are our recommended levels

Crash Survivability for EDR

- **Large truck crash statistics indicate the need for EDR crash survivability**
  - ⇨ 412,000 Crashes Involved Large Trucks in 1998 (4,935 Fatal)
  - ⇨ 444,000 Crashes Involved Large Trucks in 1997 (4,871 Fatal)
- **Due to their severity and the resultant loss of life, fatal crashes will have the most attention focused on prompt and reliable recovery of the data**
- **Crashes involving Fire Occurrence, Front Initial Point of Impact, and Rollover pose the greatest threat to the survivability of the EDR data**

Large Truck Front Initial Point of Impact Collisions

- **Potential to Induce Mechanical Damage to the EDR**
  - ⇨ 1998 - 62.0% of Large Truck Fatal Crashes Involved Front Initial Point of Impact
  - ⇨ 1998 - 123,000 Front Initial Point of Impact for All Crash Severities (Fatal/Injury/Property Damage)
  - ⇨ 1997 - 63.0% of Large Truck Fatal Crashes Involved Front Initial Point of Impact
  - ⇨ 1997 - 122,000 Front Initial Point of Impact for all Crash Severities (Fatal/Injury/Property Damage)

Large Truck Rollovers

- **Potential to Induce Mechanical Damage to the EDR**
  - ⇨ 1998 13.8% of Large Truck Fatal Crashes involved Rollover Occurrence
  - ⇨ 1998 19,000 Rollovers for all Crash Severities (Fatal/Injury/Property Damage)
  - ⇨ 1997 14.0% of Large Truck Fatal Crashes involved Rollover Occurrence
  - ⇨ 1997 16,000 Rollovers for all Crash Severities (Fatal/Injury/Property Damage)

Large Truck Fire Occurrence

- **Potential to Induce Thermal Damage to the EDR**
  - ⇨1998 5.7% of Large Truck Fatal Crashes involved Fire Occurrence
  - ⇨1998 2,000 Large Truck Fire Occurrences for all Crash Severities (Fatal/Injury/Property Damage)
  - ⇨1997 4.5% of Large Truck Fatal Crashes involved Fire Occurrence
  - ⇨1997 1,000 Large Truck Fire Occurrences for all Crash Severities (Fatal/Injury/Property Damage)

Cost Differential for Crash Protection

- **Current design is a 3" cube**
- **Retains the last 96 hours of data**
- **Cost differential to crash protect this design is minimal**

The cost differential to crash protect the EDR memory is negligible and will increase the probability of recovering vitally needed data!

Overall Summary & Recommendations for EDR

- We recommend making the EDR memory Crash Survivable
- The additional cost for crash survivability is insignificant
- The additional cost to store 96 hours of data or more is insignificant
- Identify most survivable EDR installation location, however, crash survivability allows more installation flexibility

Overall Summary & Recommendations for EDR (Cont'd)

- Common data bus for parameter acquisition needed
- Analog sensors for data acquisition are already in place
- Identify data retrieval process
- Data recovery should be standardized (fewer H/W & S/W tools for NTSB or recovery team)
- Multipurpose use for recorded data (maintenance, usage, performance, time logger)
- Central repository for data storage