Panel 2: Accident Recorder Survivability/Crashworthiness Requirements

Maritime Accident Recorders

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Aviation Recorders

Maritime Accident Recorders

Recently Introduced to Maritime Industry

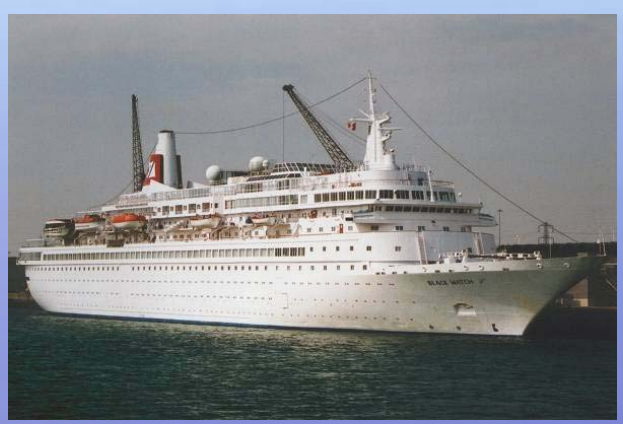
- Survivability Requirements Based on Accident Investigations "Lessons learned"
- Tailored to Marine Accident Environment
- Currently 'Best Guess' Since No Catastrophic Marine Accident Recorder Experience

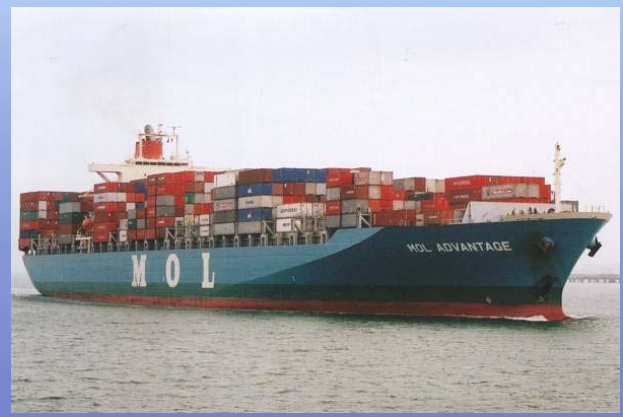
If the Data is of Value, Then It Should Be Protected

Maritime Accident Recorders

Data Recording Requirements

- 12 Hours of Bridge Area Audio
- 12 Hours of VHF Radio Audio
- 12 Hours of Radar Images Sampled 4x Per Min
- 12 Hours of Ship Sensor Data





Maritime Accident Recorders

Large Memory (1.5 to 12 GB) Crash Protection

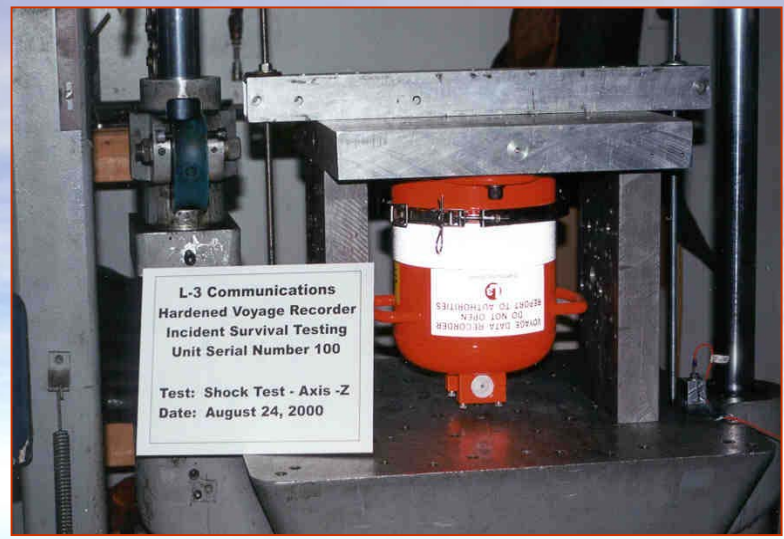
- Impact Shock - 50G
- Penetration - 100 mm Pin, 250 kg, 3 M Height
- Low Temperature Fire - 260° C, 10 Hrs
- High Temperature Fire - 1,100 ° C, 1 Hr.
- Deep Sea Pressure - 20,000 Ft. Depth
- Salt Water Immersion - 30 days

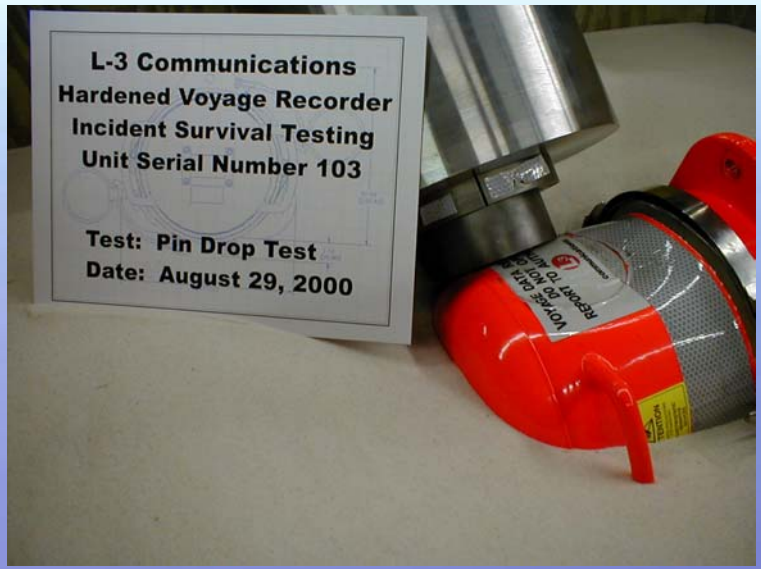
Maritime Accident Recorders

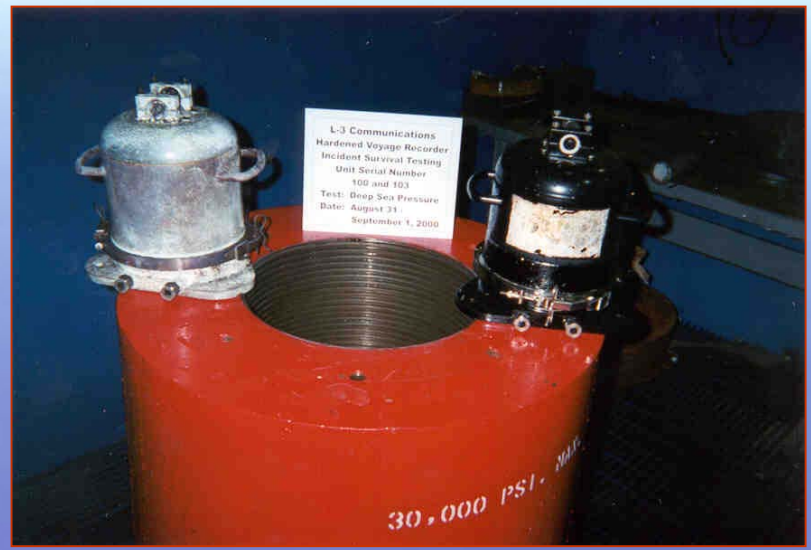
Differences Between Maritime and Aviation Crash Protection

- Impact Shock - 50 G vs. 3,400 G
- Penetration - 100 mm Pin vs. ¼" Pin
- No Crush Requirement
- No Fluid Susceptibility Requirement

Maritime Accident Recorders







Maritime Accident Recorders

Cost of Protection

Impact Shock:	Low	1%
Penetration:	High	13%
Low/High Temp Fire:	Medium	5%
Deep Sea Pressure:	Free	
Salt Water Immersion:	Low	1%

Overall, Crash Protection Is Only 20% of the Crash Recorder Costs and Less Than 5% of VDR Costs

Maritime Accident Recorders

Factors Affecting Thermal Survivability

- Large Memory Requirements
- Memory Part Density - Now Up to 2 GB / part
- Smaller Lithography - < .13 microns
- Multi-Level Cell Architectures - 2 bits / cell or more
- Lower Operating Voltages - 1.8 V VCC
- Higher Density Packaging - Ball Grid Array

Requires Greater Thermal Protection for Long Exposures