National Media Laboratory
Media Testing Results

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Presentation Topics:

1. Overview of National Media Laboratory
2. Results of D-1 Testing

National Media Laboratory

U. S. Government Users:

Industry:

- 3M Storage Media Laboratory
- 3M Hardware and Electronic Resources
- Ampex Recording Systems
- DataTape

University:

- Center for Magnetic Recording Research
  University of California, San Diego
- Center for Materials for Information Technology
  (MINT)
  University of Alabama

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Purposes of NML Activities

1. Help set reasonable performance/reliability expectations for advanced recording hardware and media
2. Give the PO's data to assist in making program choices
3. Help translate government program needs to recorder/media industry
4. Irritate the industry into doing better for data recording

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Critical Issues in Government Mass Storage

Skyrocketing requirements:

- **Platform data rates > 1 Gigabit/sec.**
- **Storage of terabytes/day.**
- **Archive of > 10 years.**
- **Government leads industry by 3-5 years.**

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Data Storage Comparisons

Requirement: Data Rate 800 MBits/Sec

Performance of Media

	Data Rate (MBits/Sec)	Capacity (MBits)	1 Day Storage (Units)	Parallel Hardware Requirement
Floppy Disk 	0.5	16	4,200,000 Diskettes	1600 Drives
12" Optical Disk 	2.4	6,000	11,500 Disks	334 Drives
Magnetic Cassette (DTC) 	100	232,000	298 Cassettes	8 Recorders

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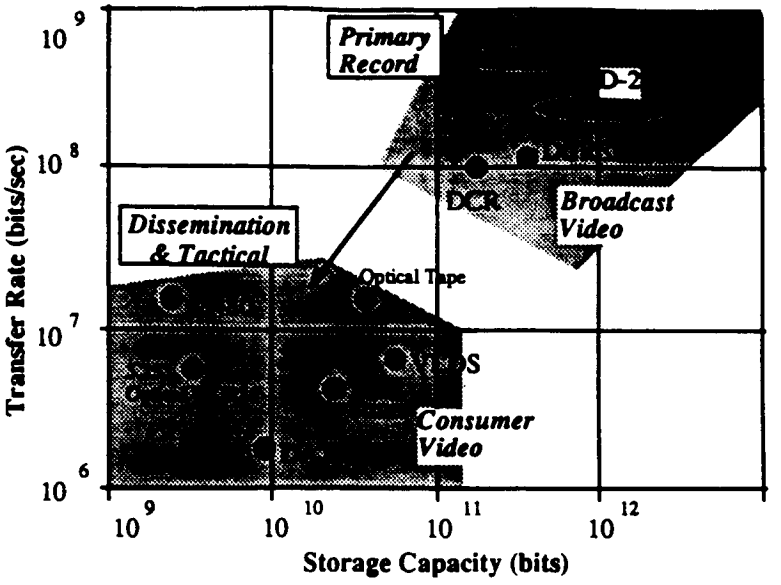

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Principal "Drivers" for Advanced Recording Systems

Video

- Increasing Capacity/Cassette
- Decreasing System Form Factor

Data

- Reliability
- Environmental Stability
- Archivability

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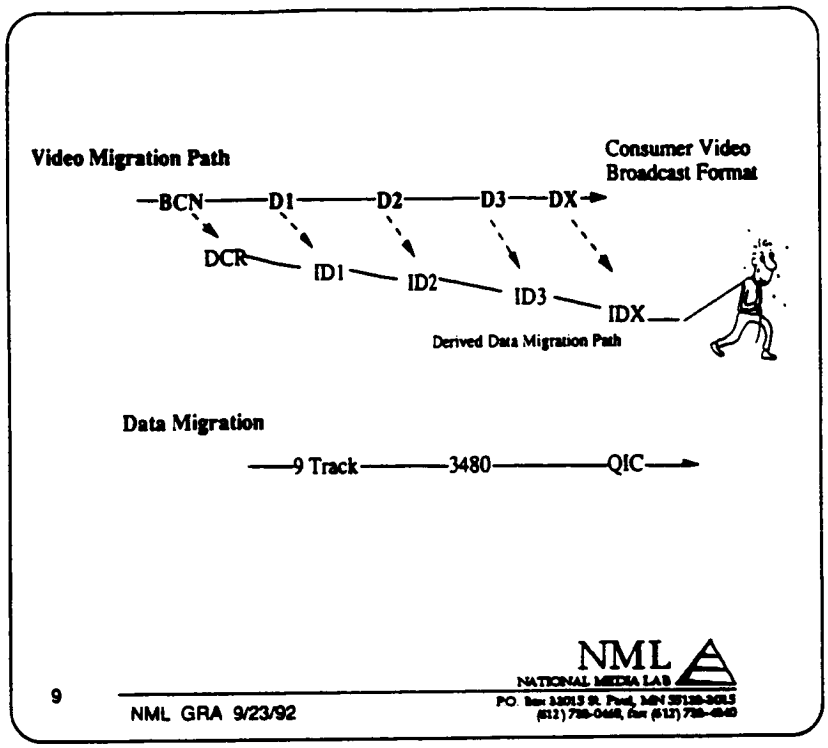
Video Migration Path
Consumer Video Broadcast Format
BCN
D1
D2
D3
DX
DCR
ID1
ID2
ID3
IDX
Derived Data Migration Path
Data Migration
9 Track
3480
QIC
NML
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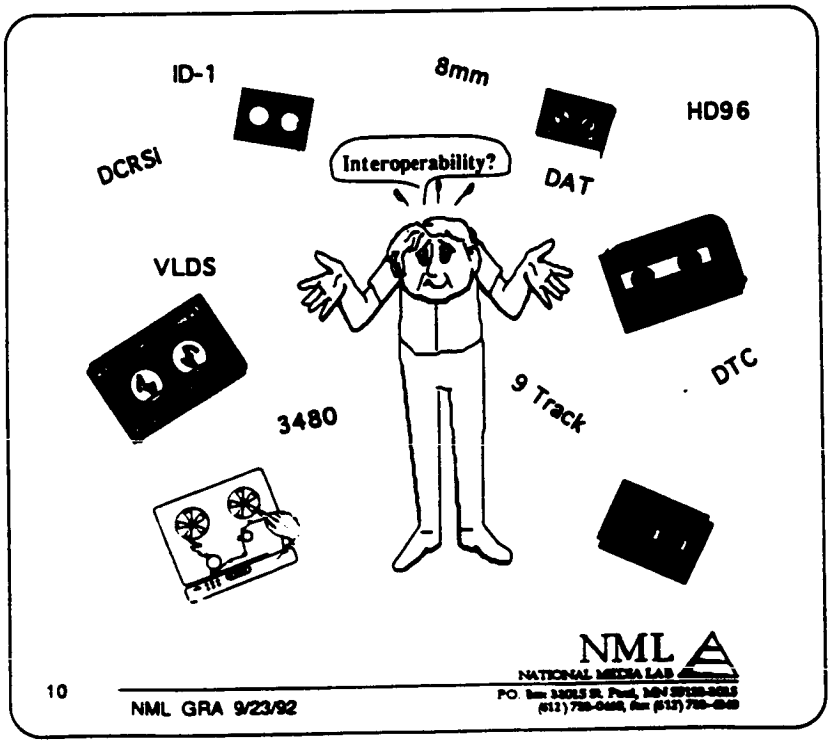
9
NML GRA 9/23/92


ID-1
8mm
HD96
DCRSI
Interoperability?
DAT
VLDS
DTC
9 Track
3480
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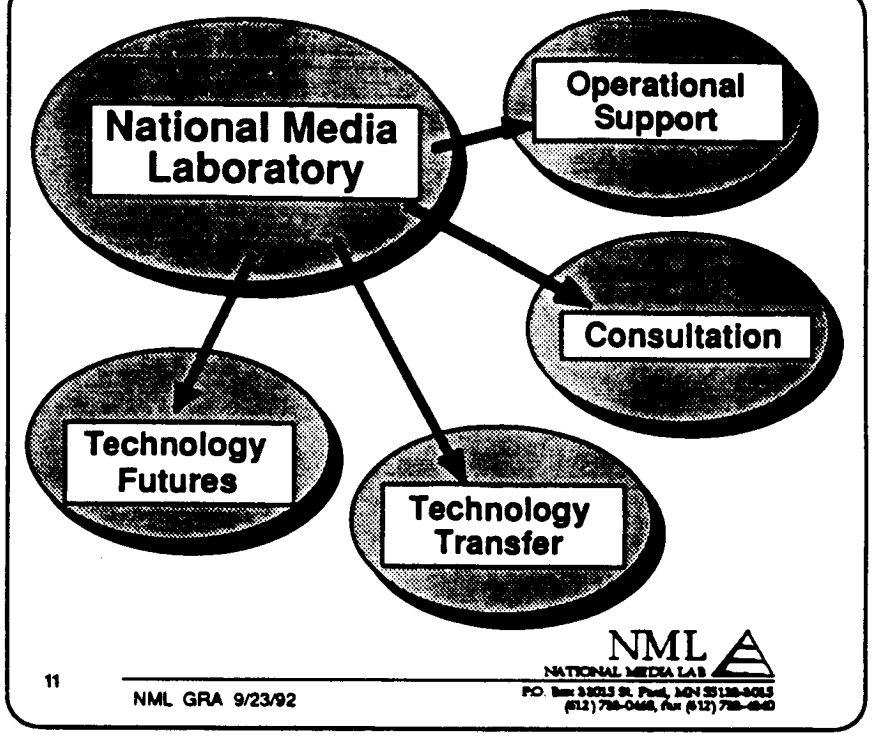

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National Media Laboratory Testing Results:

Moisture Content of D-1 Tapes When Delivered

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Overview

1. Why Look at D-1 ?
2. Goals
3. Information Available
4. Moisture Content
5. Conclusion

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1. Why Look at D-1 ?

New Format With Little Experience And Data

- MIL-STD-2179
- ANSI X3.175-1990 (Tape Format)
- ANSI X3B.5/90-133 (Tape Cartridge)

Professional Video Use ≠ Data Storage Use

Military Use ≠ Commercial Use

ATARS And JSIPS Use Of D-1 Cassettes

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2. Goals

Evaluate D-1 Media And Cassettes

ATARS & JSIPS

Determine Environmental Window

Measure Media Properties

Improve Packaging

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3. Information Available

Initial Evaluation of D-1 Tape and Cassette Characteristics

Packaging Plan for D-1 Cassettes

Packaging Tests of Commercial D-1 Cassettes and Cases

Relative Humidity of Sony and Ampex D-1 Tapes when Delivered

Resistivity Characteristics of Ampex and Sony D-1 Tape

Modulus (Stress-Strain Curves) of Sony and Ampex D-1 Tape

Width and Weave Characteristics of Sony and Ampex D-1 Tape

Shrinkage of Sony and Ampex D-1 Tapes

Friction Characteristics of Ampex and Sony D-1 Tapes

Vibrating Sample Magnetometer (VSM) Tests on Sony and Ampex D-1 Tape

M-H Meter Tests on Sony and Ampex D-1 Tape

Surface Roughness of Sony and Ampex D-I Tape

Coating and Substrate Thickness of Sony and Ampex D-1 Tape

Stiffness of Sony and Ampex D-1 Tapes

Magnetic Print-Through Effects in Sony and Ampex D-1 Tapes

Thermal and Hygroscopic Time Constants of Sony and Ampex D-1 Tape Cassettes

Data Diskette of: Commercial D-1 Cassettes & Media Test Data: 1990 - 1991 Data

Data Diskette of: Commercial D-1 Cassettes, Media, & Packaging Test Data: 1991 - 1992 Data

To Request Reports Contact:

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4. Interest in Moisture Content

Conditioning Needed ?

Time To Condition ?

Archive Evaluation

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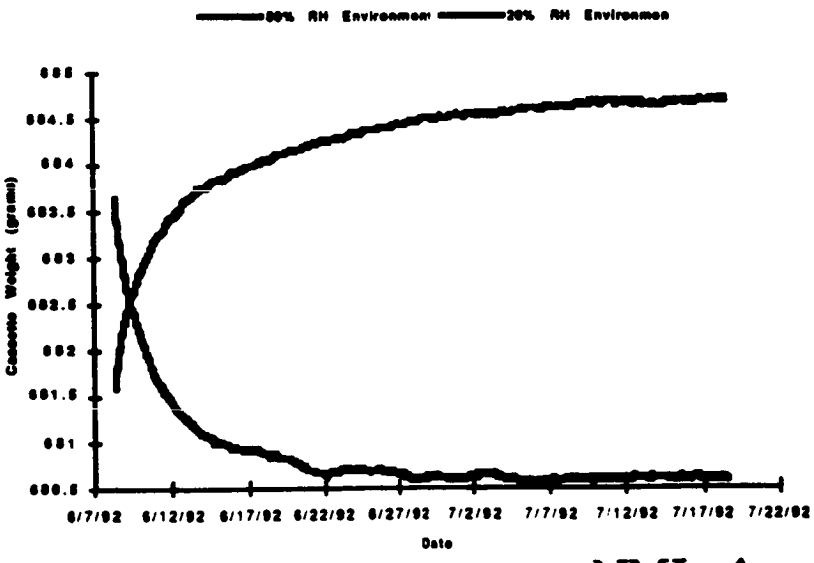
4.1 Behavior of D-1 Cassettes



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4.2 Solution to Diffusion Equation

$W(r,t) = Wa + (Wi - Wa)\, F(r,t)$

Wa = Equilibrium Weight in Ambient Humidity

Wi = Initial Sample Weight

$F(r,t=0) = 1$

$F(r,t=\infty) = 0$

$\partial F(r,t=\infty)/\partial t = 0$ (Steady State at $t=\infty$)

Sample Geometry Is In F(r,t)

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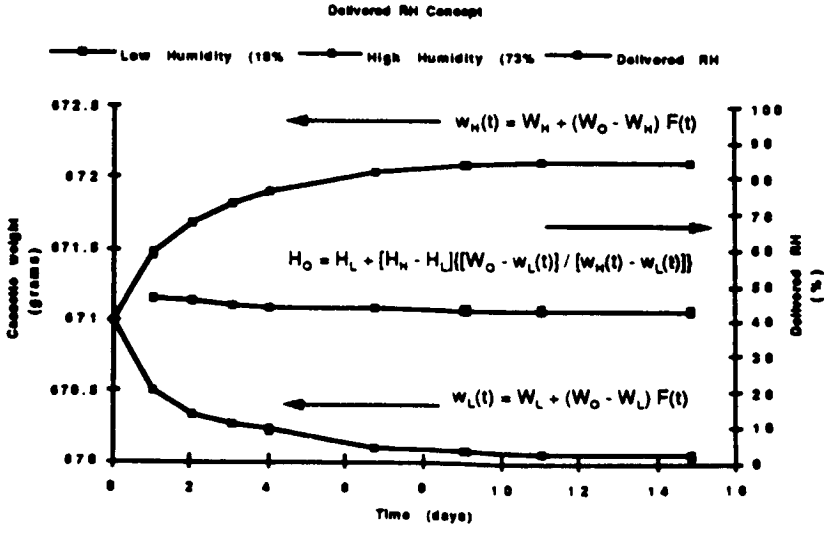
4.3 Moisture Content Theory



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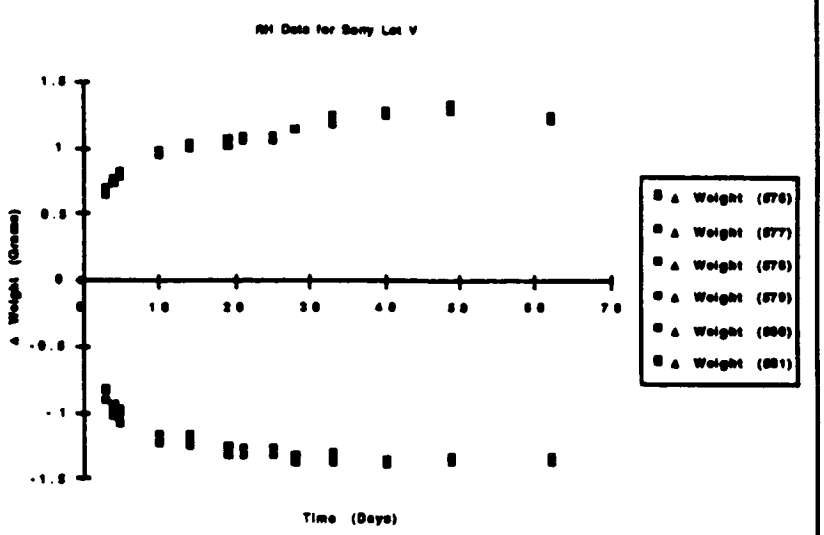
4.4 Moisture Content Data



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4.5 Moisture Content Results

		Relative Humidity (%)	
Size	Lot	Average	Std. Dev.
Ampex Large	J	52.60	1.8
Ampex Medium	X	52.63	0.6
Ampex Medium	Y	55.14	1.4
Ampex Medium	Z	51.10	1.3
Sony Large	L	54.05	1.8
Sony Medium	T	45.90	2.7
Sony Medium	U	45.48	4.0
Sony Medium	V	52.6	1.0

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5.0 Conclusion

NML's Charter

D-1 Media Information is Available

Moisture Content Determination

Basic Understanding of Tape Moisture Experiment

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