Mass Storage Systems and Technologies for Space and Earth Science Applications

ATL Products Division's Entries Into the Computer Mass Storage Marketplace

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Odetics Background

- High Tech Company Founded in 1969, Publicly Traded
  - Serving Well-Defined Niche Markets
  - Through Variety of Product Groups

- Roots are in Space Borne Recorders
  - Own 80% of Marketplace

- Evolved Into Robotics in Mid-70s
  - AIM, Broadcast, DMS, ATL Products Divisions
  - 35% of Revenues and Growing
  - Technology and People Move From One Division to Another
Product Evolution

- **Robotics Genesis - AIM**

- **Company's High Technology Group**
  - 1979 Committed to a Six Legged Robotic System
  - 18 Months Later Demonstrated ODEX I
    - Symbol of the Corporate Commitment to Robotics
  - Demonstrates High Strength to Weight Ratios
  - All Electric, Compact, Extremely High Performance
  - Six Units Built - Three Generations of Technology
    - Predominantly for Nuclear Plant Maintenance

- **Evolution to Other Robotic Subsystems**
  - Arms, Hands, and Effectors
Product Technologies and Markets Served

- Innovators in "Small Package" Handling
- Do Not Serve General Purpose Robotics Handling Market
- Design Intent of Our Products
  - Move "Small Light Weight Objects" Very Quickly
  - Accent On Longevity of "Object" Being Moved
  - High Degree of Reliability
- Necessitates
  - Expertise in Low Mass, Light Weight, High Speed Systems
  - Requires Unique Robotic Handlers, Arms, End Effectors
  - Products Designed for Niche Markets
    - Aperture Card Storage Module Systems
    - Tape Cassettes and Cartridges
    - Optical Disks
Product Evolution
Infodetics' Aperture Storage Module Library

- First Linear Servo Based Expandable System
- Modules: 10 Ft. Long By 3 Ft. Deep By 7 Ft. High
  - 2000 Cartridges Per Two Rows or Module
  - 100 Aperture Cards Per Cartridge
  - Robotic Handler in Aisle Between Rows Within Module
- Large System With Multiple Modules and Pass-Through
- 5 Seconds Average "Pick and Place"
  - Access Cartridge and Load Into Aperture Card Reader
- Document Management System "Storage Server"
  - Cache Microfilm Images to Disk
  - Transmitted to Work Stations for Viewing
Product Evolution
Broadcast Division's TCS2000 Video Cart

• First "Tower" Based Expandable System Introduced '86
  - Designed as a TV Station or Network Automation System

• Built as Part of a Joint Venture With RCA in 18 Months
  - RCA Dropped Out, Odetics Entered End User Market

• System Consists of:
  - Robotics and Up to 6 Tape Recorders Per Tower
  - 225 to 300 Tapes Per Tower Depending On Formats
  - Switchers, Sequencers, Monitor and PC Based Work Station
  - Hierarchical Software
    - Real-Time Controller/Operating System, Relational DB, Playlist

• Supports VHS, Beta, D-2 Formats

• Robust, Redundant and Extremely Reliable
Broadcast Division's Newest Product
TCS90 Videocart System

- Bookshelf Design
  - X-Y High Speed Linear Servo System
  - One Armed Gripper With Holding Tray

- Accommodates Combination of Cassette Sizes and Format
  - Beta SP, VHS, or D-2
  - Small and Medium Sizes

- Tape Recorders are Standard: Non-Modified

- Autoloader Accommodates Up to 8 Cassettes

- Fixed Size
  - No Expansion Capabilities

- Software From TCS2000 Migrates Directly to This Product
  - 50 Man Years of Development
ATL Products Division
Marketing Strategy

- Serve the Evolving Computer Based Mass Storage Market
- Develop Tape Storage Library Subsystems
  - Robotics, Control, Storage and Computer Interfaces
  - Support a Broad Range of Tape Sizes and Formats
  - Interface to a Variety of Tape Drives in Each Size
  - Provide Low Level Library Control and Management Software
- Sell Through Distribution Channels That:
  - Integrate Tape Drives
  - Add High Level Mass Storage Management Software
  - Service a Broad Range of User Markets
  - Provide "Private Labelled" and "General Purpose" Products
- Pursue Major Market Shares
  - High Density/High Capacity Storage Market
  - General Commercial Market By Supplying a Range of Solutions
High Density Systems Business
Product Lines

• Developing Two Basic 19mm ATL Storage Subsystems
  - To Serve High Capacity Markets: Terabytes and Petabytes
  - Support Small and Medium Size D-2 Cassettes

• Expandable "Tower" Based System
  - Broadcast System as Platform
  - Auxiliary Towers for Expansion
  - Delivered March, 1991

• New Linear Aisle Based Expandable System
  - 30 Months in Development: Delivery August, 1991
  - Most Advanced Robotic System On the Market
Odetics aisle-based automated tape library subsystem. Cut-away shows robot that moves up and down aisles of tapes. Tapes are stored and retrieved by the robot and placed into tape drives.
High Density Systems Business
Product Lines

- 10 Minute Video On Two Technologies
  - Copies of Video Available Upon Request
E-Systems Business Relationship

- **Exclusive Supplier of 19mm ATL Subsystems**
  - Computer Mass Storage Marketplace Only
- **Can Market Other Odetics ATL Subsystems**
- **E-Systems is the Integrator**
  - Providing Systems Expertise - ATLs, Tape Drives, Computer Integration
  - Library Management Software for the ATLs
  - Supplying Storage Server Software
3480 "Medium Size" Library
First Commercial Product Offering

- "300" Cartridge Baseline System
  - Expandable in Increments of Approximately 300 Cartridges
  - "1500" Cartridge Maximum

- Up to 2 Tape Drives Available in Baseline
  - Up to 4 Additional Drives as System Expands
  - Supports All Low Cost 3480 Tape Drives

- Small Footprint
  - Fits Standard 28 Inches Wide By 45 Inches Deep By 78 Inches High Cabinet
  - Very High Density Storage

- Cartridge Autoloader and Bulk Loading

- RS-232C or SCSI-II Interface

- Serve the Distributed Computing and File Server Markets
Storage and Library Management

- **ATLs are Driven With "Low Level" Commands**
  - Pick From Bin and Move to Tape Drive
  - Status Provided Back Through Sensors
  - Electrical Interface: RS-232C, Ethernet, SCSI-II
  - New Software Interface: SCSI-II, Chapter 16 Jukebox Commands

- **Library Management: Physical Volume Repository**
  - Input PVS and Provide Level of Intelligence
  - Management Resource and Allocation of Bins and Drives
  - Automatic Error Recovery

- **Servers and Applications Provide Next Level**
  - Storage Servers and Bit File/Client Servers
  - Backup
Conclusions

- **Odetics is and Will Be a Major Supplier of Robotic Libraries**
  - Advancing Technologies

- **By Year End, From Broadcast and ATL Products Divisions**
  - Four Different ATL Technologies and Five Products
  - Cross "Breeding" of Technologies Across Divisions

- **In the Future**
  - Broader Reach of Products and Markets Using Robotics
  - Further Transfer of Technologies at Component Levels