

# Airborne Recording from a Ground Station Perspective

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# Background

- Image data “centric” view
- Imagery Groundstations rely heavily on high density digital tape recording
  - Data input and long-term archival storage
  - Data bandwidths: 80 Mb/s - 2,000 Mb/s
- Input Data is recorded on-board the aircraft
  - Delivered to user upon return
  - Critical data provided via high bandwidth datalink
    - Real-time or near real-time off of tape
- The “Grail”: Seamless interchange of data
  - Common data formats
  - Interchange standards

# Interchange and Interoperability

## ● Goals

- Reproduce any recorded airborne imagery data at any imagery ground station at any time
  - Interchange and data format standards
- Minimize ground station size and cost
  - Mobility is a key requirement
- Improve ground station reliability
- Accommodate improvements in state-of-the-art off-the-shelf technology

## ● Success rate: nominal

- High reliability is expensive; requires custom equipment and packaging

# Imagery Trends

- **Increases in number of imagery collection platforms**
  - **Single and dual mode manned recce aircraft**
  - **Unmanned Aerial Vehicles**
    - **High Altitude Endurance, Tactical, Miniature and Micro**
- **Significant improvements in sensors**
  - **Electro-Optical, Infrared, Synthetic Aperture Radar, Multi- and Hyperspectral, Moving Target Indicators, etc.**
  - **Very high data bandwidths (> 1 Gb/s)**
  - **Both digital and analog data**
- **New imaging environments**
  - **Tactical fighter aircraft environment**
- **Very short timelines: “sensor to shooter”**
  - **15 minute or less “detect to kill” timelines**

# Airborne Recording Technology

- **How are recorders used today?**
  - Record and return tape to groundstation (no datalink)
  - Record and playback selected sections for datalinking
    - Backseat editing from tape and transmission
    - Automatic target locating and transmission
- **Why magnetic tape in airborne applications?**
  - Very low cost/byte
  - Very high data bandwidths
  - Very high capacity
  - Reusable
- **Standard formats in use today**
  - DCRsi, ANSI ID-1, SVHS, 8 mm

# Airborne Recording Issues

- **Recorder reliability: Power, weight, cooling, shock, and vibration requirements are becoming severe**
  - Pull tape during 4 g (or greater) maneuvers
  - Operate over very wide temperature extremes
  - Withstand carrier take-off and landings
  - Operate off of minimal aircraft power
  - Weigh next to nothing
- **Media stability and crossplay**
  - Among same model recorders
  - Across differing models
  - Largely isolated to ANSI ID-1 recorders and media
- **Rapid access to recorded data**
- **Access data while recording**

# Groundstation Recording Technology

- **How are recorders used today?**
  - Record data received over datalink
  - Reproduce data recorded on aircraft
  - Archival storage of processed imagery
- **Why magnetic tape in airborne applications?**
  - Same reasons as for airborne usage
- **Standard formats in use today**
  - DCRsi, ANSI ID-1, SVHS, 8mm for returned aircraft tapes
  - Many other formats used for archive
    - Interchange standards applied locally
    - Magnetic Hard Disk Drive based systems required for globally accessible archival storage

# Groundstation Recording Issues

- **Reliability: significantly less severe environment**
  - Transportability requirements result in shock and vibration requirements
  - No mobile operations
  - Minimal spares when deployed
- **Crossplay has been a constant “issue”**
  - Differences in aircraft recording environment and groundstation reproduce environment
  - Environmental factors required
    - Thermal and Hygroscopic coefficients (free & bulk)
    - Thermal and Hygroscopic time constants (free & bulk)
  - Standards compliance, calibration and alignment
- **Rapid Access to data**



# Airborne Recording Trends

- **Serious consideration is being given to replacing magnetic tape recording in airborne applications**
  - **Solid state recorders, magnetic hard disk drives, Other?**
  - **“Reliability and Interoperability” are key reasons**
- **NATO is collaborating on an interoperability standard for future airborne data recording and storage**
  - **Advanced Data Storage Technology Advisory Group to NATO working group is led by the US**
  - **Industry participation is and has been encouraged**
  - **The resulting standard is expected to define the interface**
    - **Removable element and unit**
  - **Accompanying documents will define and advise on typical applications**

# Summary

- **Tape recording will continue to be used in both airborne and groundstation imagery applications**
  - **Cost per Byte and data bandwidth are still key drivers**
  - **Media and crossplay issues need to be resolved**
    - **Availability of environmental data for media is key**
    - **Resolution of conflicting experiences required**
    - **Establishment of “good enough”**
    - **Standard calibration data and process**
- **Groundstations will continue to use tape for datalink data capture and archival storage**
- **Airborne recording environments may force new recording media and technologies**