A Decade of Weather Technology Delivered to America's Space Program by the Applied Meteorology Unit

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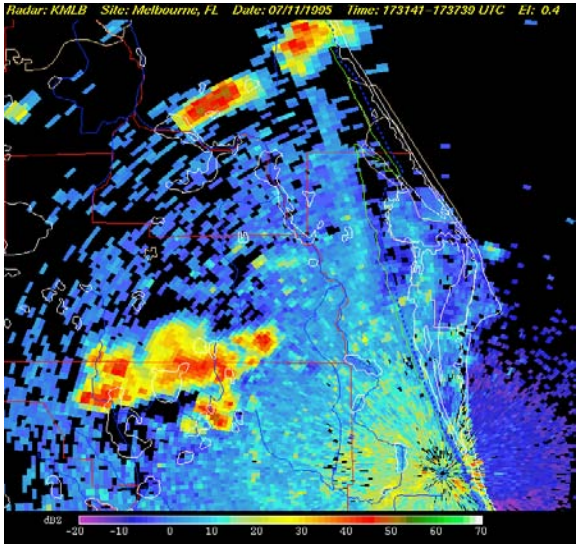
Overview

- What's an AMU?
  - Purpose
  - History
  - How it works
- Technology delivered: a sampler
  - Forecast tools
  - Numerical weather prediction
  - Sensors
  - Miscellaneous



Purpose of the AMU

- Goal: Improve weather support to Space Shuttle and America's space program
- Method: Bridge the gap between research and operations
- Technology Functions:
  - Develop
  - Evaluate
  - Tailor
  - Transition

History of the AMU

- Established Oct 1991 by NASA, USAF, NWS MOU
  - Co-located with Range Weather Operations
  - Operated by ENSCO, Inc. under NASA contract
- Nationally recognized process for tasking by customers
- Outstanding performance
  - Technical quality reflected in journal articles
  - Administrative quality reflected in corporate award
  - Customer satisfaction reflected in direct feed-back plus personal and group awards

How We Work: Tasking

- Customer-driven base-funded formal prioritized tasking
  - Quasi-annual in-person meeting
  - Teleconferences as required
  - Consensus process cited by Navy Best Manufacturing Practices Institute

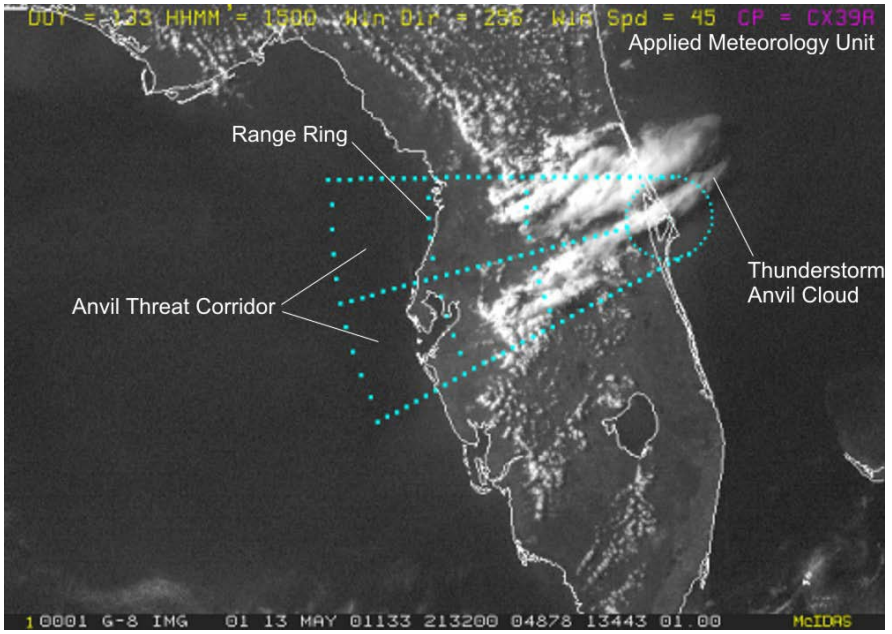
- Customer-funded options hours tasking
- Customer-requested mission immediate tasking

How We Work: Task Execution

- Customer involvement throughout
  - Design of the approach to be taken
  - Determination of the deliverables
  - Detailed technical reports quarterly
  - Teleconferences at key decision points
  - Beta testing and document preview
  - Training and follow-up after delivery
- Also cited by Navy Best Manufacturing Practices Institute

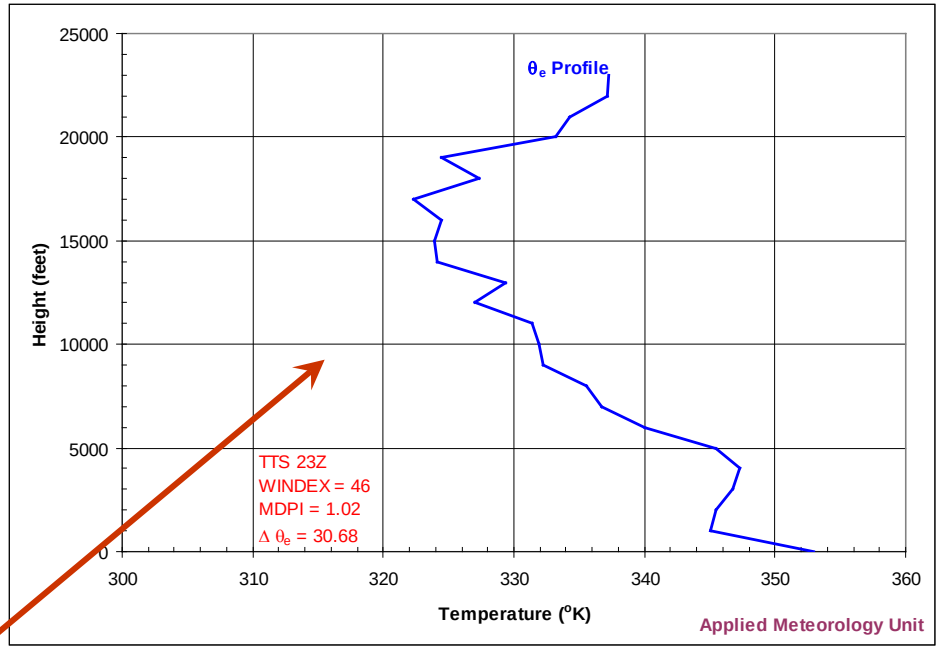
Anvil Forecast Tool

- Requirement:
  - Lightning Launch Commit Criteria
  - Space Shuttle Flight Rules
  - Avoid natural and triggered lightning
- Provided:
  - Threat corridor: if thunderstorms form here, their anvils will violate rules
    - Based on:
      - Balloon observation
      - Model forecast
  - Timing Rings: time until Launch & Flight Rules violated
    - Based on wind speed in anvil layer



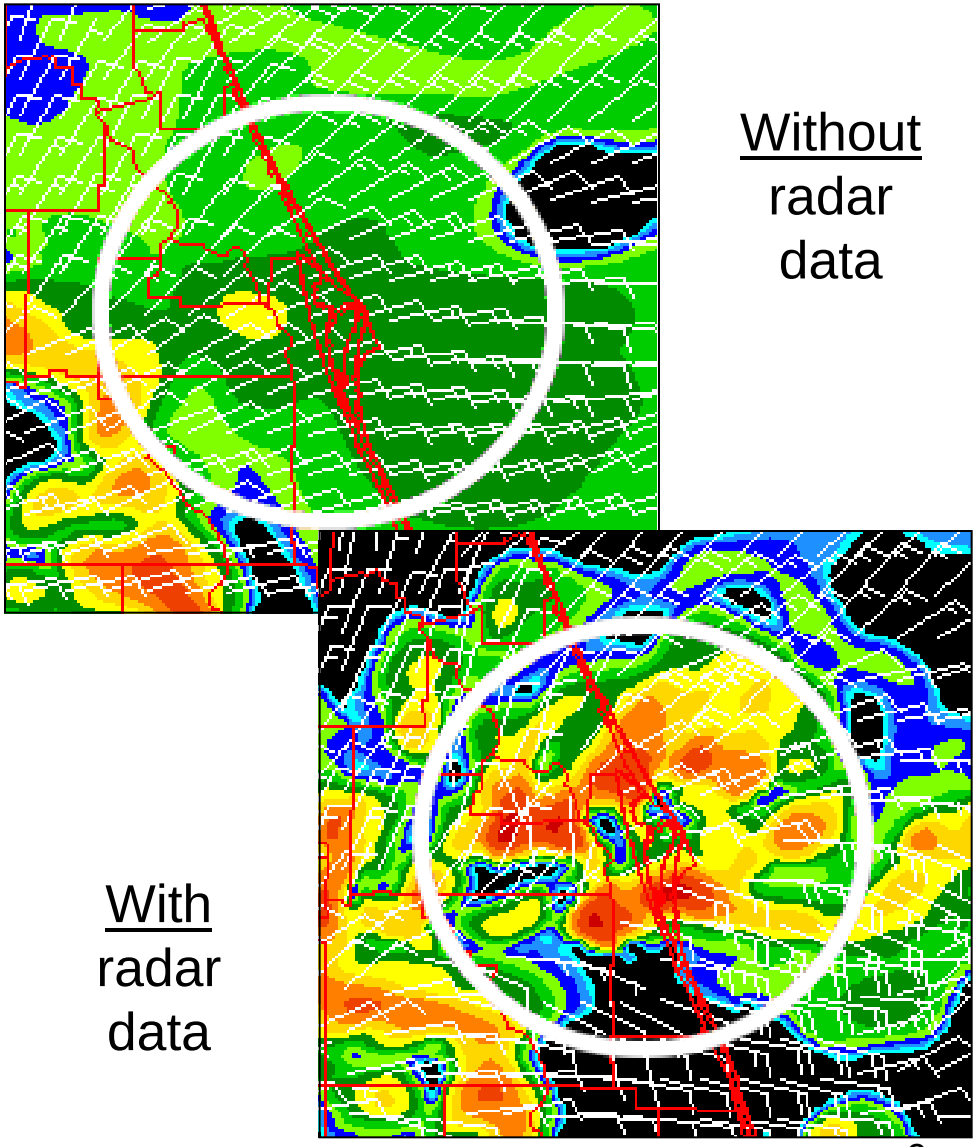
Microburst Prediction Tool

- Requirement: improve severe wind forecasts
- Provided:
  - Microburst-Day Potential Index
    - Downburst probability
  - Wind Index
    - Downburst maximum gust
  - Atmospheric stability chart



Numerical Weather Prediction

- Provided: local data assimilation software
  - All available data in one gridded database
  - Significant improvement in initialization of local forecast models
- Result:
  - Forecast improvement for all applications
  - Significant improvement in data visualization

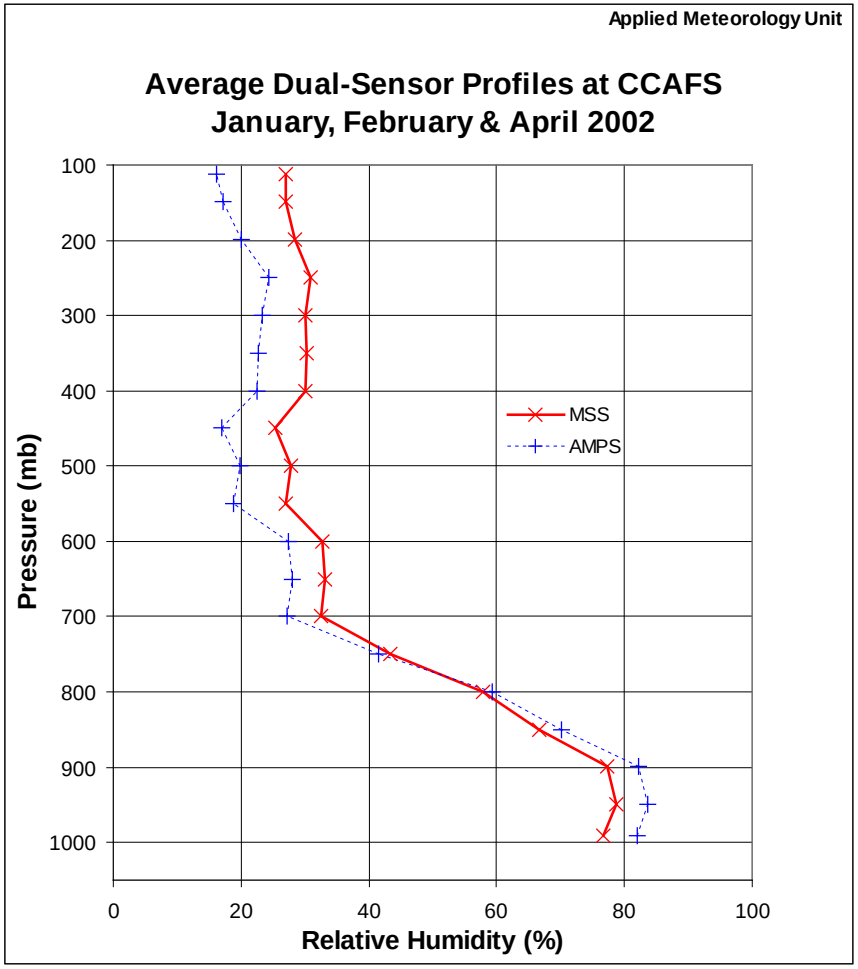


Without radar data

With radar data

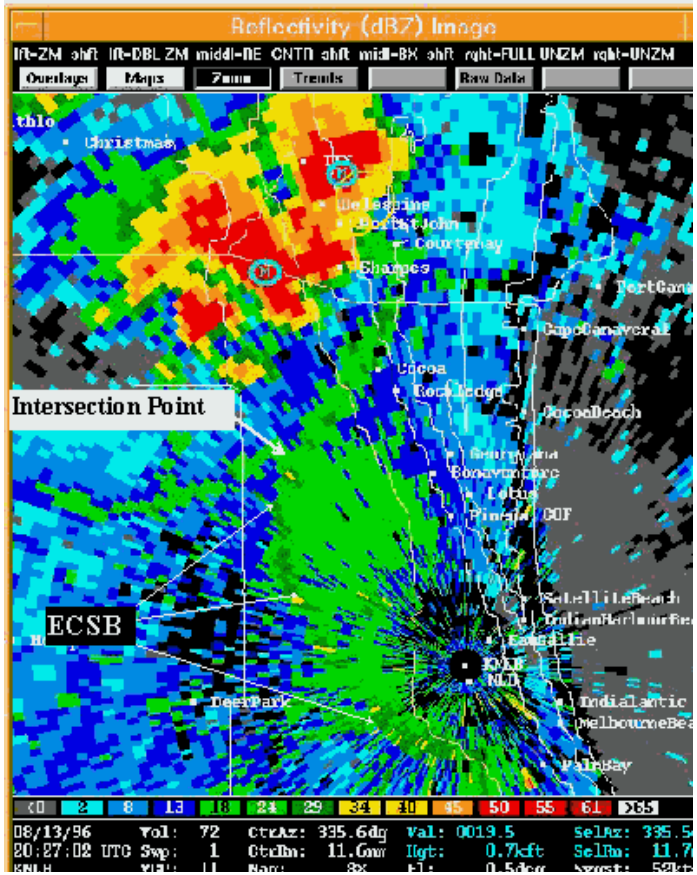
Sensor Evaluation

- Requirement: compare data from legacy upper air system with new one
  - Temperature and relative humidity differences
  - Changes in the measures of atmospheric stability
- Provided:
  - Documentation of relative humidity and temperature differences vs. altitude
  - Evaluation of impact on thunderstorm forecast indices



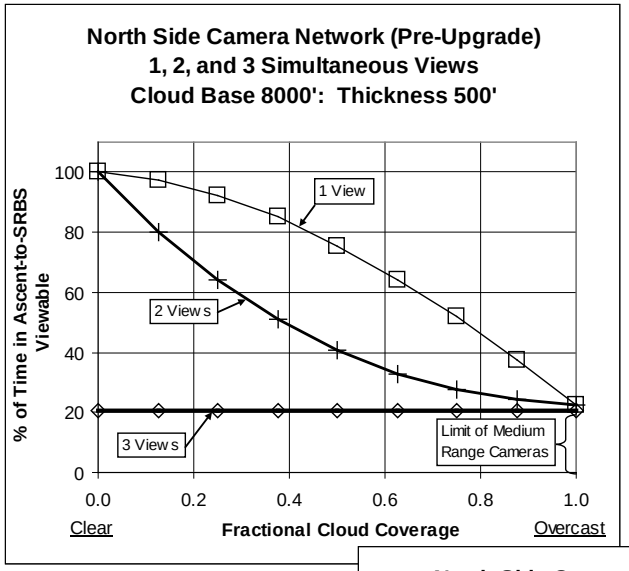
Severe Weather Event

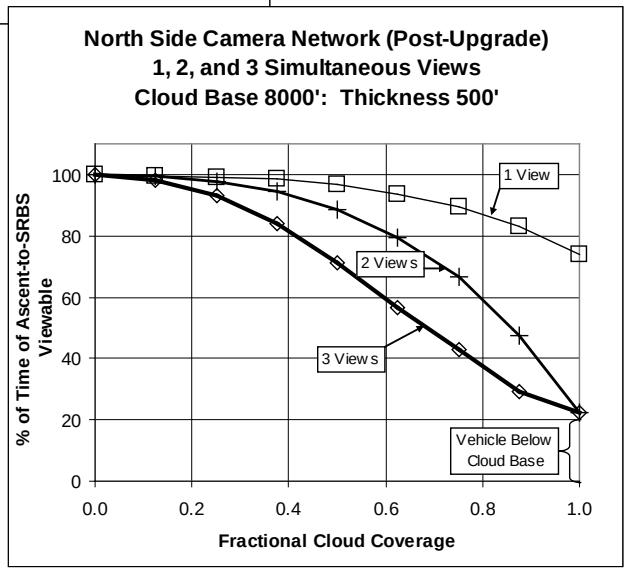
- Requirement: evaluate why tornadoes and downbursts of 13 Aug 96 were poorly forecast
  - ‘Mission Immediate’ tasking
  - Damage to many cars, several buildings, and one aircraft
- Provided:
  - In-depth case study
  - Several training briefings



Shuttle Optical Imaging

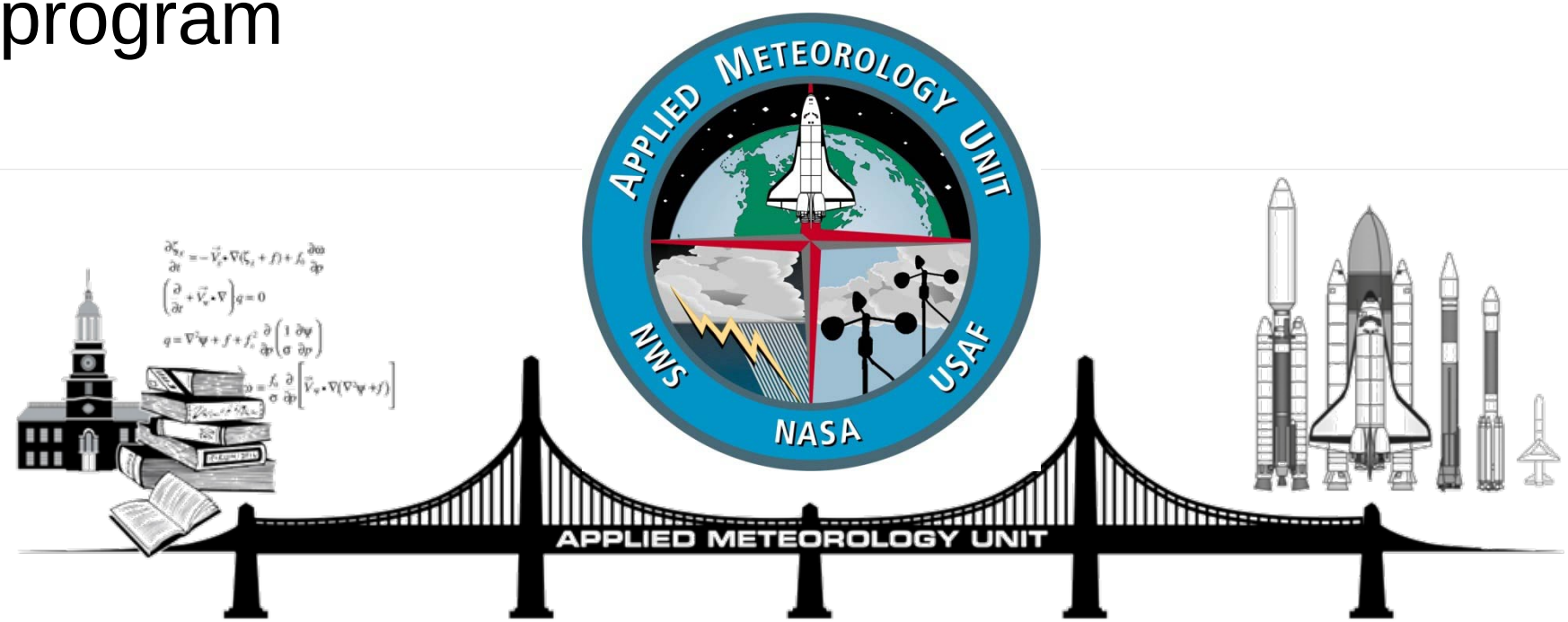
- CAIB Report
  - NASA needs “three useful” camera views of the Shuttle during launch
- Providing:
  - Statistical model of cloud field
  - Forecast decision aid for the Space Shuttle Launch Weather Officer?





Conclusion

The AMU is a model for a successful strategy to transition technology to America's space program



http://science.ksc.nasa.gov/amu