



The Applied Meteorology Unit Operational Contributions to Spaceport Canaveral



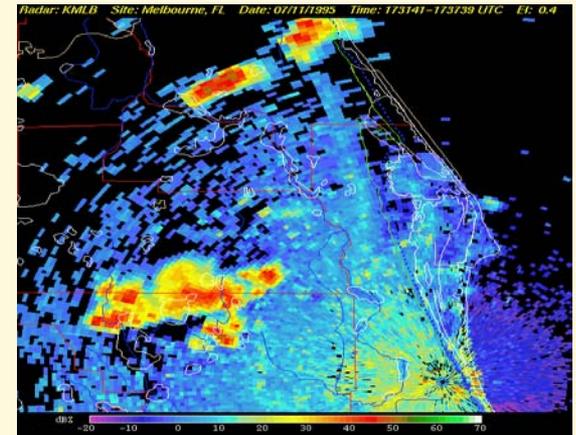
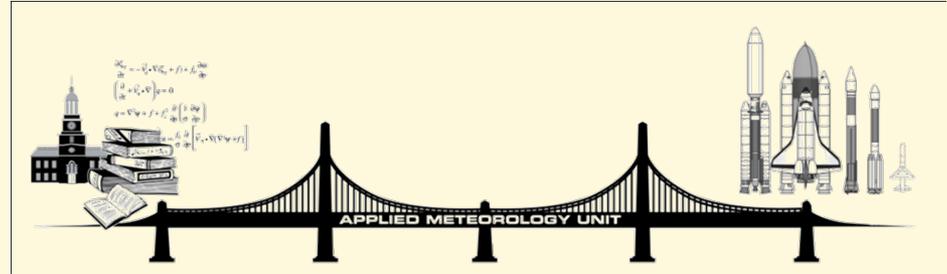
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Overview



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

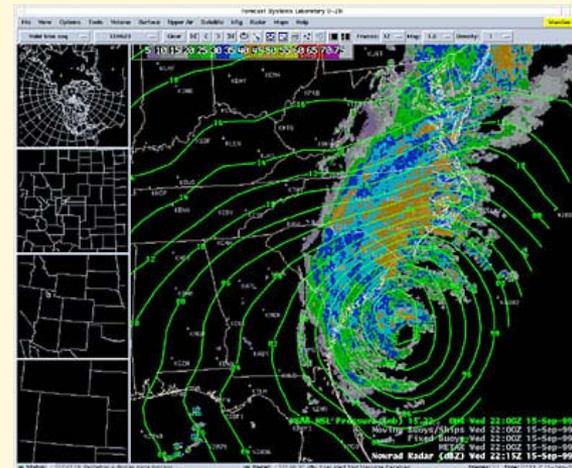




Purpose of the AMU



- 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





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

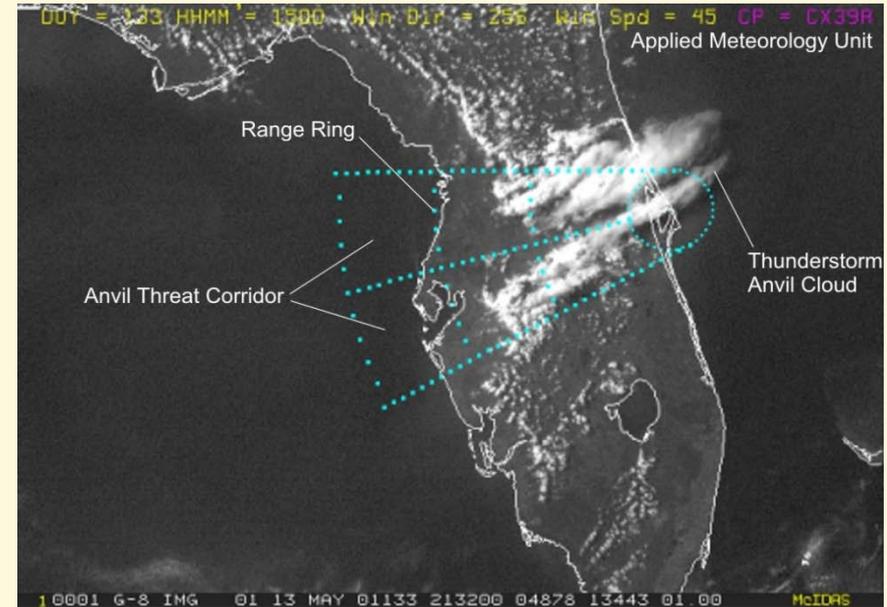




Anvil Forecast Tool



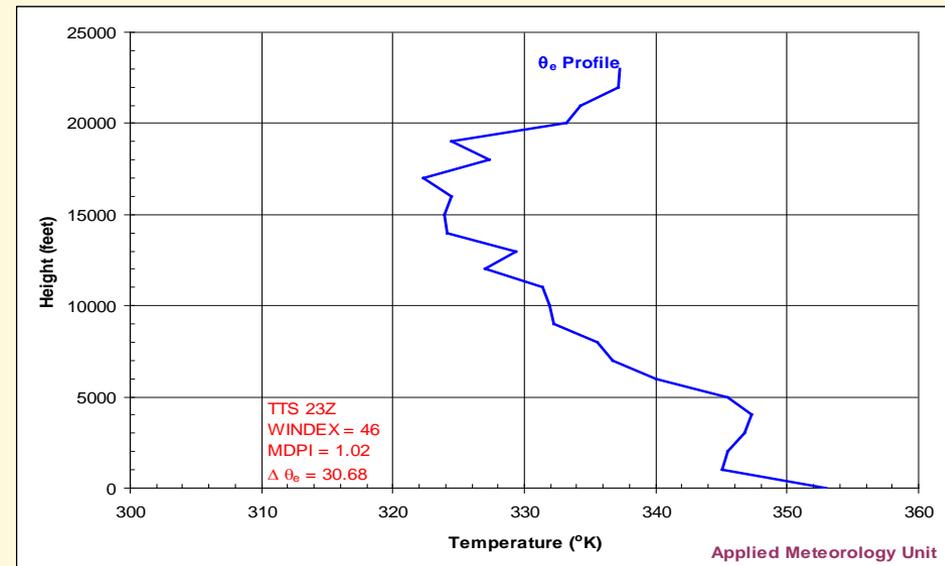
- Requirement:
 - Lightning Launch Commit Criteria
 - Space Shuttle Flight Rules
 - Avoid natural and triggered lightning
- Provided:
 - Threat corridor:
 - if thunderstorms form here, their anvils will violate rules
 - Based on:
 - o Balloon observation
 - o Model forecast
 - Timing Rings: time until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

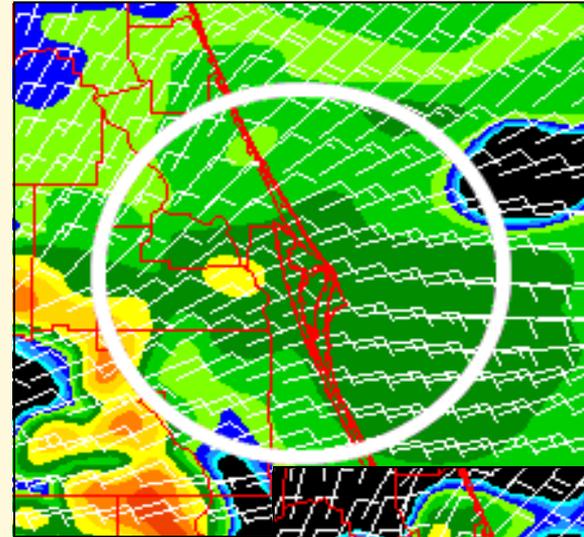




Numerical Weather Prediction

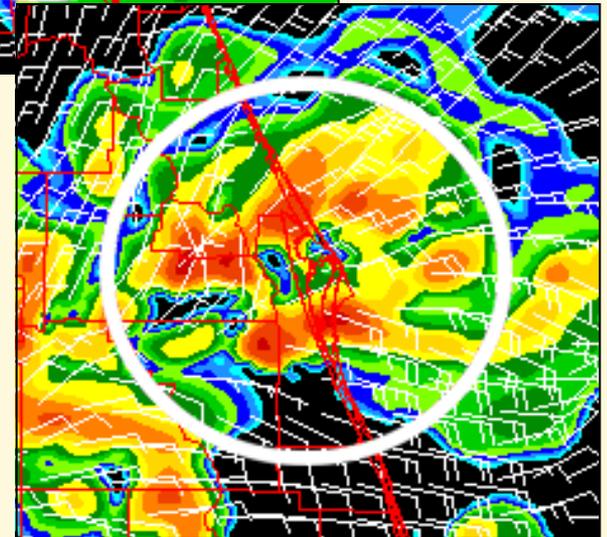


- Provided: local data assimilation software
 - All available data in one gridded database
 - Significant improvement in initialization of local forecast models
- Result:
 - Forecast improvement for all applications
 - Significant improvement in data visualization



Without
radar
data

With
radar
data

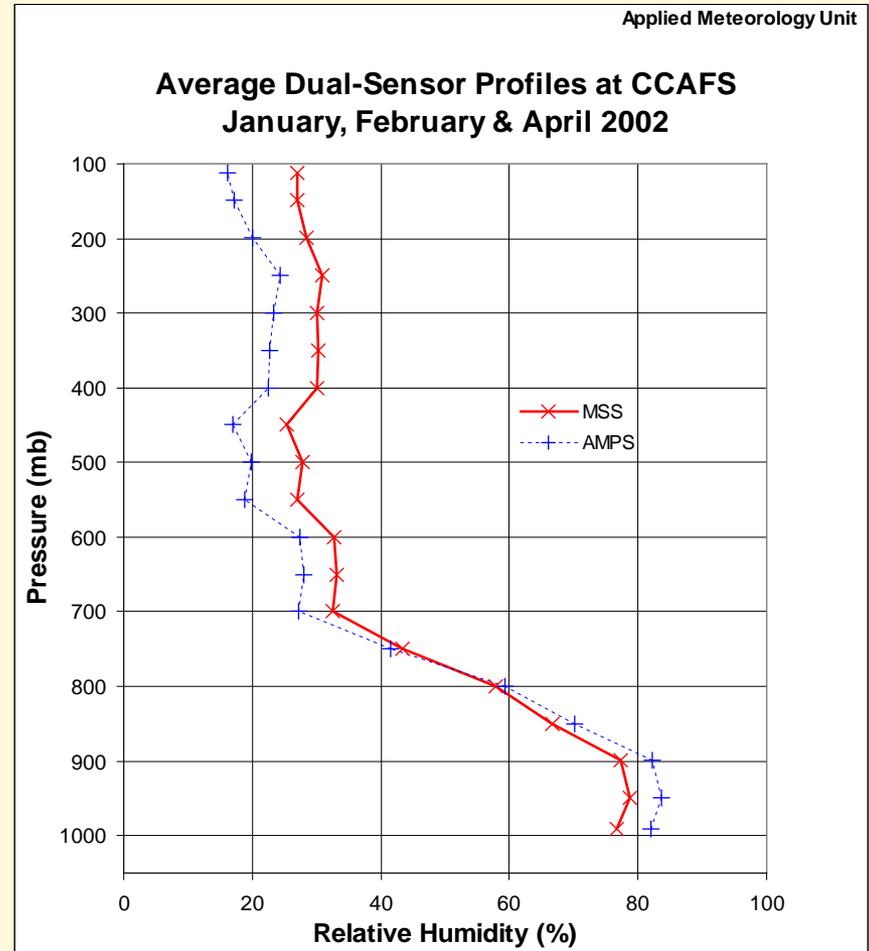




Sensor Evaluation



- 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

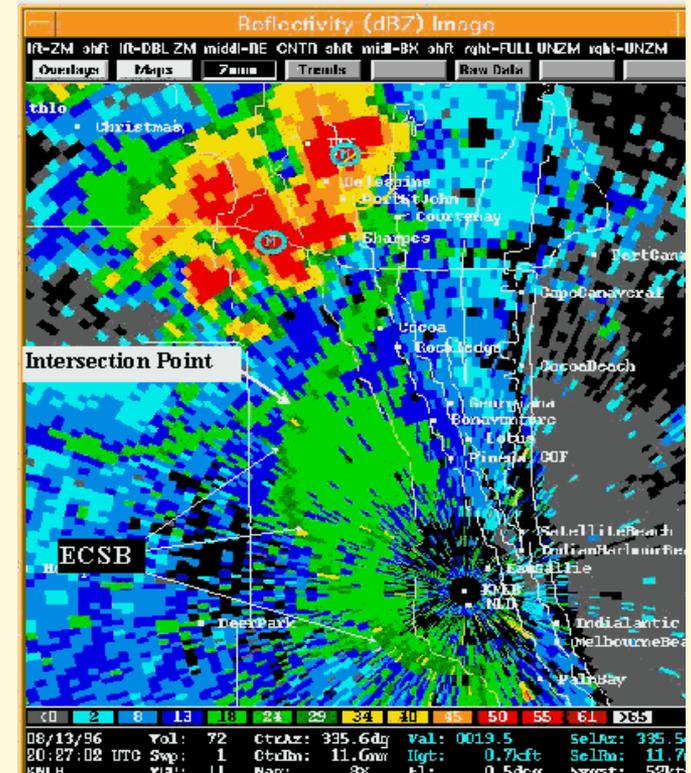




Severe Weather Event



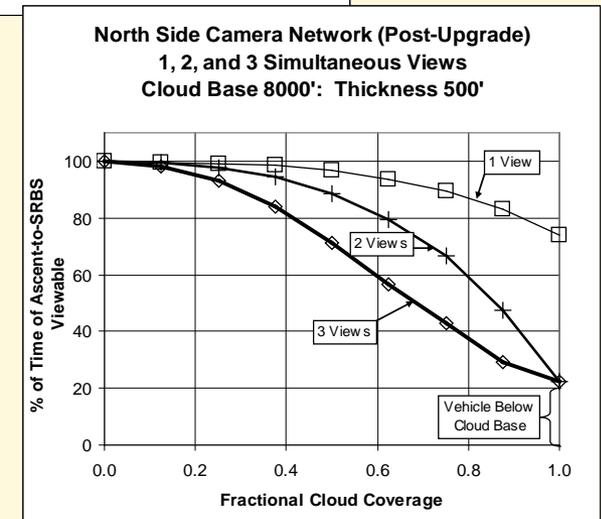
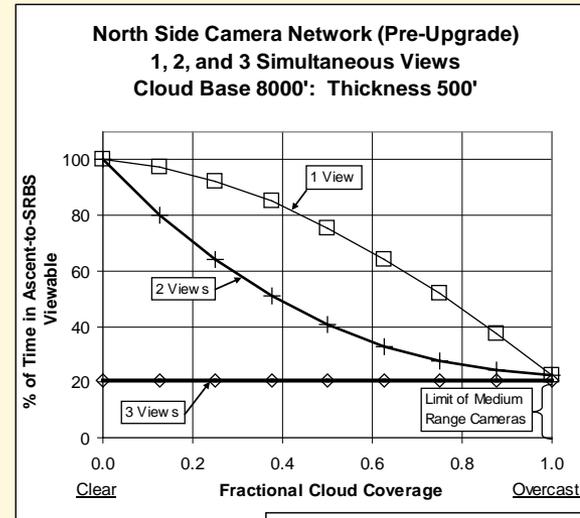
- Requirement: evaluate why tornadoes and downbursts of 13 Aug 96 were poorly forecast
 - ‘Mission Immediate’ tasking
 - Damage to many cars, several buildings, and one aircraft
- Provided:
 - In-depth case study
 - Several training briefings





Shuttle Optical Imaging

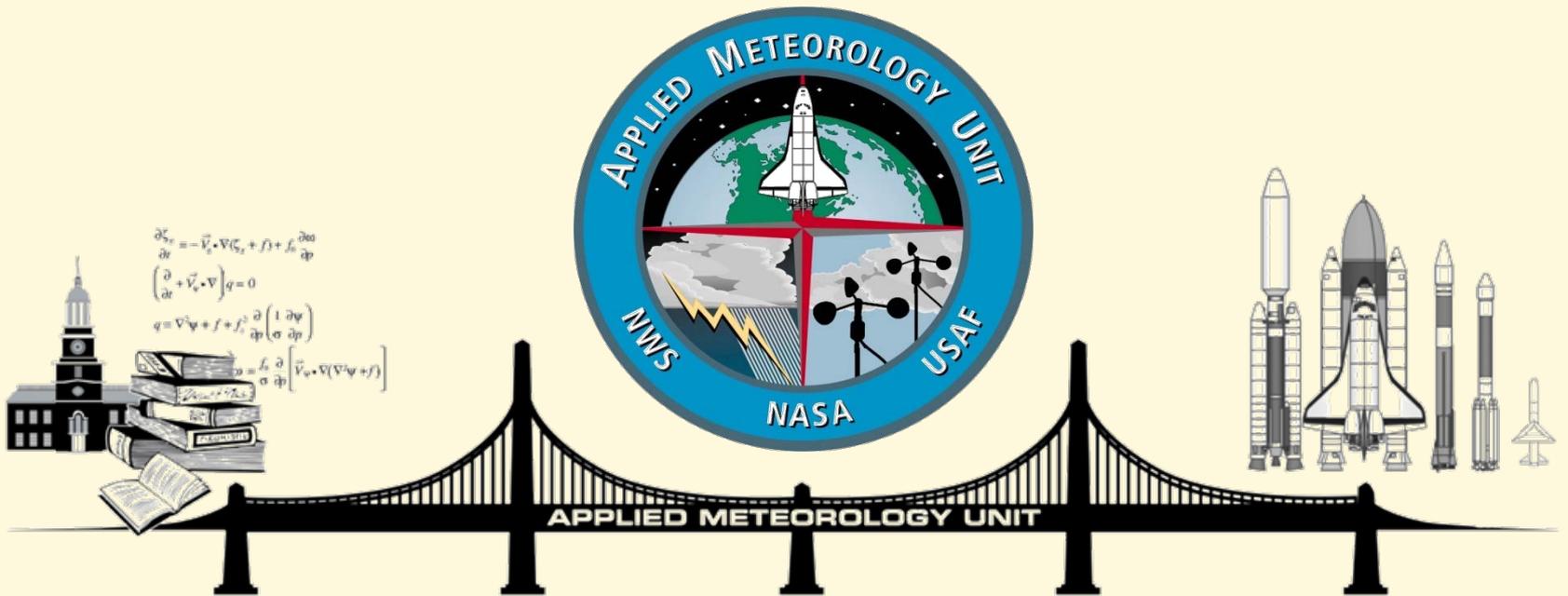
- Requirement:
 - CAIB Report: NASA needs “three useful” camera views of the Shuttle during launch
- Providing:
 - Statistical model of cloud field
 - Forecast decision aid for the Space Shuttle Launch Weather Officer?





Conclusion

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



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