

Weather Vision: Past, Present, Future

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Wx IPT

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20 Years Ago: Aviation Weather Forecasting Task Force

- FAA Funded
- Originally looked out 15 years from 1986 (to 2001)
- Membership:
 - John McCarthy, Chair (NCAR)
 - Stan Benjamin, NOAA
 - Jim Dziuk, FAA
 - Bill Hooke, NOAA
 - Sandy MacDonald, NOAA
 - Bob Maddox, NOAA
 - Ron McPherson, NMC
 - Ralph Petersen, NASA
 - Wayne Sand, Univ. of Wyoming
 - Bob Serafin, NCAR
 - Dick Taylor, Ohio State Univ.
 - Rich Wagoner, NOAA



Recommendations

- Automated aircraft reporting world-wide
- Standardized and frequent PIREPS; support EFAS
- Improve NWP models to support aviation, etc.
- More detailed and timely regional analyses
- New objective turbulence and icing fcst products
- Develop 4-Dimensional data assimilation system

Results to date

- ACARS, MDCARS fully successful, TAMDAR
- Not even close, but TAMDAR should cover this?
- RUC (13 km) toward WRF, Very successful
- Very Successful
- Icing very successful, turbulence evolving well
- ADDS, NDFD starters, 4DDA not operational in Av



Recommendations

- More timely/consistent guidance products
- More frequent TAFS
- More graphical products
- Upgrade CWSUs
- Upgrade wx portion of airman's exam, including impact-oriented approach
- Upgrade NWS forecaster education

Results to date

- Improvements with AWRP, etc., but much needed
- Frequency increased, move toward automation
- Much accomplished but METARS, TAFS still text!!!
- No progress
- No progress
- Great progress with COMET



Wind Shear Success as Motivator for Further Success

- NCAR and MIT/LL evolvement to TDWR
- LL development of ITWS
- Airborne forward-looking system and recovery guidance - NASA Langley
- Wind Shear Training Aid - Boeing et al al
- BUT STILL TODAY:
 - MICROBURST ALERT 100 KNOTS ON THE RUNWAY
CLEARED TO LAND
- ...



What We Face

- Following the AWFTF and many lab, government, and university developments, an evolution of weather products to support aviation has occurred. Two models emerge:
 - Examine user needs looking at whole system (FAA, pilot, AOC users in parts 121 and 91) -NCAR and AWRP
 - Real-time prototyping at FAA facilities, ITWS, CIWS - MIT Lincoln Laboratory
- Many successes in both domains but without major connection to the FAA operating system, “our” most obvious failure



What We Face, Continued

- 60-80% of traffic delays have a weather connection
- If traffic counts grow anywhere near projections (JPDO NGATS), ability of current system to accommodate growth is essentially impossible
- System breakdown unavoidable unless capacity grows by 3X
- Caveat: we must plan for a future still full of unknowns, never-the-less (airline difficulties, terrorism, natural calamity, etc.)
- The system must have much more capacity and be safe



QuickTime™ and a
Cinepak decompressor
are needed to see this picture.



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NGATS/JPDO Aviation Weather IPT

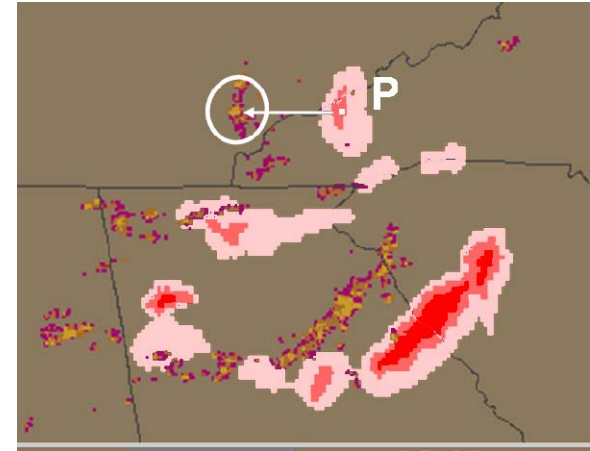
- Observations (improved suite)
- Forecasts (new science, automation, probability)
- **Integration (critical joining of weather with ATM)**
- **Dissemination (4D Weather Information System)**
- Aircraft Mitigation (harden aircraft for weather)
- Training (pilot, controller, again!)
- Policy
- Systems Engineering



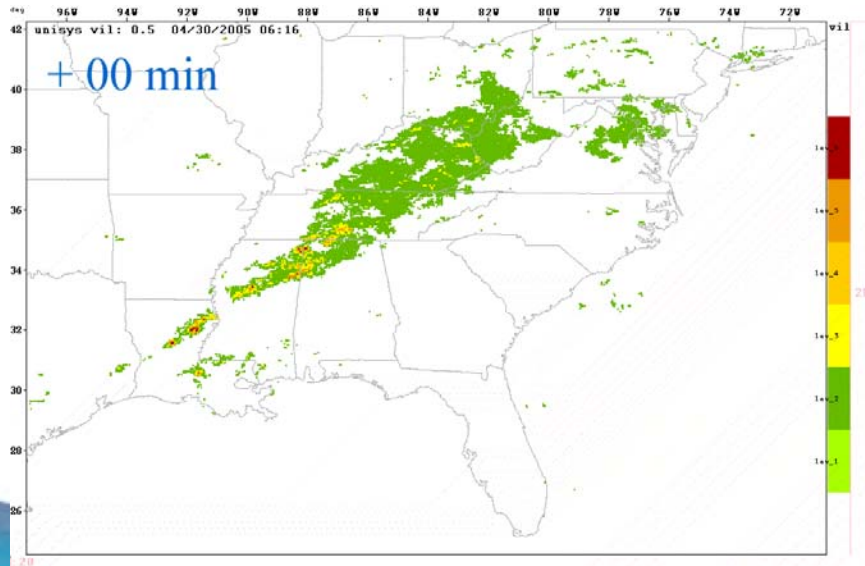
Short Term Forecasting

Currently 0-2hr Thunderstorm Nowcasts

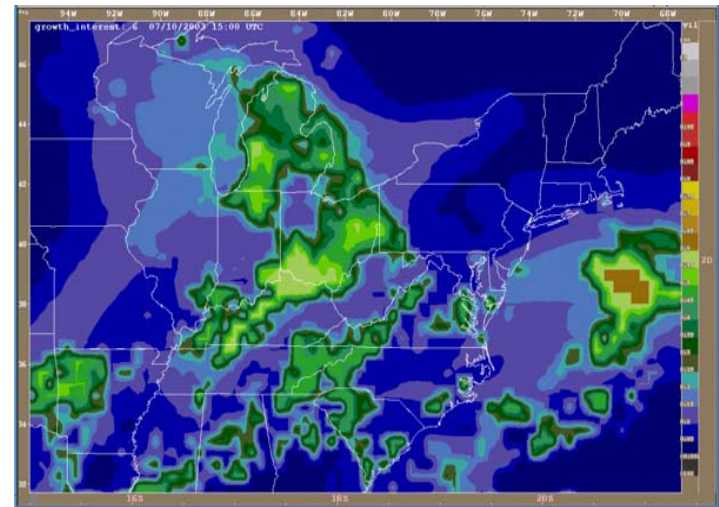
- National Convective Weather Forecast (NCWF) and AutoNowcast system
 - Probabilistic, large-scale (NCWF)
 - Trend dissipation
 - Growth based on RUC environment
 - Initiation (ANC only) based on NWP environment, observations and forecaster input



Probabilities based on spatial coverage



*NCWF-2 Experimental
ADDs Flight Path Tool*



*Convective potential¹¹
based on RUC*

Automated Avoidance of Severe Weather

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BMP decompressor
are needed to see this picture.



Additional Considerations

- Explicitly using the total atmospheric volume deemed useable for aviation (real-time and forecast) and the top level metric
 - Sub-hazard measures
 - Aircraft type and capability
- Target maximum available volume, by precise measurements of particular hazards and reducing uncertainty of forecasts.
- Count and then maximize total runway availability, broken down by various criteria



Additional Considerations

- Current system constraints are too conservative, and “directional permeability” could help
- Especially true in lines of thunderstorms
- Need to develop means of increasing capacity/flow in these situations (i.e, RAPT)
- Include wake vortex in the Wx IPT mix



Conclusion

- NGATS/JPDO is a required concept to face our future
- Weather support to NGATS is critical from both an operational and Research and Development perspective
- For me personally, this effort rivals the wind shear days in excitement and national purpose

