CONVECTIVE WEATHER RESEARCH TEAM (#3)
TECHNICAL DIRECTION (ESRL)
FY 2007

General Instructions:

1. A detailed quarterly Progress Report will be submitted by the 15th of October 2006 and January, April, and July 2007 describing efforts performed in support of all Convective Weather Research Team (CWRT) tasked activities. A high level Monthly Progress Report will be submitted by the 15th of November and December 2006 and February, March, May, June, August, and September 2007 summarizing CWRT efforts towards goals and milestones, and include its financial status report.

Quarterly Progress Reports shall contain efforts **by activity** presented as follows:

a. Current Efforts (quarter just completed)
b. Planned Efforts (for next reporting period)
c. Problems/Issues/Schedule Changes Encountered or Anticipated
d. Interface with other organizations (other than Core RT member organizations)
e. Summary of funding status, planned versus actual expenditures

Monthly Progress Reports shall contain a high level summary (about one page in length) of **overall CWRT activities** presented as follows:

a. Current Efforts (month just completed)
b. Planned Efforts (for next reporting period)
c. Problems/Issues/Schedule Changes Encountered or Anticipated

2. The CWRT Plan shall be updated to include activity planning for the seven year period from FY 2008 through FY 2014 **no later** than April 1, 2007. It shall be sent to Gloria Kulesa by that date.

3. Program Reviews as scheduled by the Program Office will be conducted per the agenda to be supplied by the Program Office prior to the scheduled review.

4. All deliverables, technical reports, documentation to industry, press releases, and briefings shall be reviewed and approved by the Program Manager (PM) or designee, **prior** to **External** distribution. Approval shall be requested of the PM or designee **before** exhibiting at conferences, symposiums, etc. The following statement shall be included in all research papers, journal articles, documents, announcements, etc.:

"This research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA."

5. In taskings specifically stating "as authorized by the Program Office", authorization must be

in writing from the Program Manager, or designee.

6. The CWRT shall not contact any FAA regional, headquarters, or air traffic control facility, in writing or orally, without first notifying the program office to obtain approval.

7. Copies of all monthly and quarterly Progress Reports, technical papers, etc., shall be submitted electronically to Gloria Kulesa with copies to the CWRT and to the following: (see Attachment 1 for e-mail addresses) **(note: distribution list updated; ensure new addressees list is instituted)**

- FAA Operations Planning R&D (Warren Fellner, Jackie Queen)
- FAA Weather Policy and Standards (Rick Heuwinkel, Debi Bacon)
- FAA William J. Hughes Technical Center (Tom Carty, Starr McGettigan, Victor Passetti)
- FAA Operations Planning Systems Engineering (Cheryl Souders)
- NCAR (Bruce Carmichael, Marcia Politovich, Roy Rasmussen, Bob Sharman, Greg Meymaris)
- NOAA NSSL (Kim Elmore)
- NOAA ESRL (Mike Kraus, Lynn Sherretz, Stan Benjamin, Jennifer Mahoney)
- NRL (Ted Tsui)
- NWS HQ (Mark Andrews, Kevin Johnston, Celia Miner)
- NCEP AWC (Clinton Wallace)
- NCEP EMC (Geoff DiMego)
- MIT LL (Mark Weber, Marilyn Wolfson)
- OFCM (Mary Cairns)
- NASA (John Murray)
- CIMSS, Univ of Wisconsin (Wayne Feltz)
- WARP Program (Jim Stobie)
- ITWS Program (Thad Carpen)

8. Costs not to exceed $235,000 (which are the cumulative amount of old and new funds allocated from Dec '07 – Sep '07) shall be expended by ESRL in performance of the specific taskings of this Technical Direction.

9. Any funding identified as contingent funding may be funded if the indicated conditions are reached; as with all funding decisions, contingencies will be subject to Program Office consideration reflecting evolving priorities.

10. Although it is intended that funding allocated per fiscal year be expended within that specific fiscal year, consideration will be taken for taskings not completed due to unforeseen circumstances. Upon receipt of written notification from the Program Office, funding for uncompleted tasks shall be carried over to the next fiscal year.

11. ESRL shall notify the FAA CO (Elisa Brown) and the COTR, via e-mail, whenever they have reason to believe that the costs they expect to incur in the next 60 days, when added to all costs previously incurred in FY07, will exceed 80 percent of the amount allocated to them for CWRT tasking. ESRL shall also indicate whether exceeding the 80 percent level is a positive or

negative variance based on their budget plan.

12. Until further notice all travel must be approved in advance by the COTR, and funding to attend any conference, symposium, etc. will not be approved. Additionally, contractual travel vs. overhead travel shall be broken out on the monthly financial status report.

13. **MIT/LL is the leader of the Convective Weather Research Team.**

FY 07 CWRT Specific Tasking for ESRL

Task 07.3.4 Forecast Algorithm Technology

07.3.4.1 Real-Time research Systems (off-line)

A key activity will be the design and development of a new software module that will optimally combine the various predictor fields to produce the 0-4 hour forecast. Statistical techniques will be used to help determine the optimal predictor fields to utilize. The weights used to combine the predictor fields will also be determined statistically. Predictor fields and methods shown to be of utility in the research system will be transferred to operations. ESRL operates both the Space-Time Mesoscale Analysis Scheme (STMAS), which is used as part of the MIT LL Automated Front Detection (AFD) and an experimental version of RUC, which provides 15-min output and improved convective forecasts.

07.3.4.1.1 Implementation and Logistical Support **($5K old $20K new to ESRL)**

07.3.4.1.1E1 May '07: Maintain, implement new modules and support prototype CoSPA system in order to test and evaluate new algorithms and techniques (MIT/LL, NCAR)
07.3.4.1.1E2 May '07: Implement numerical model on Linux cluster for testing improved radar data assimilation schemes and high resolution modeling capabilities (NCAR)
07.3.4.1.1E3 May '07: Implement and support experimental version of RUC and adapt to provide 15 minute output for better derived product continuity and improved forecasts of convection out to 8 hours (ESRL)
07.3.4.1.1E4 May '07: Implement ESRL's STMAS as part of automatic front detection capability into prototype CoSPA adding new features as applicable and providing data to collaborators and NCEP (MIT/LL, ESRL)

07.3.4.1.2 Scientific Review, Support, and Analysis **($5K old, $20K new to ESRL)**

07.3.4.1.2E1 Nov '06: Present report of demonstration results at science meeting (MIT/LL, NCAR, ESRL)
07.3.4.1.2E2 Sep '07: Scientific review of the prototype CoSPA demonstrations (MIT/LL, NCAR)

07.3.4.1.2E3 Sep '07: Scientific review of numerical model results for summer and winter storms for 2+ hour forecasts (NCAR, ESRL)
07.3.4.1.2E4 Sep '07: Scientific review of experimental RUC as part of the 2+ hour forecast demonstration (NCAR, ESRL)
07.3.4.1.2E5 Sep '07: Scientific review of STMAS/AFD as part of the CoSPA demonstrations (MIT/LL, ESRL)

07.3.4.2 Sensor Mosaics

07.3.4.2.2 Gridded Surface Observations **($15K old, $60K new to ESRL)**

07.3.4.2.2.1 Improve STMAS analysis near lake shores or ocean coasts. Mitigate the need to do terrain and coastal filtering or masking by modifying the code to filter coastal/terrain effects. (ESRL)

07.3.4.4.2.2 Establish Kalman Filter QC scheme for STMAS surface data. Retool the QC scheme developed within LAPS based on Kalman filtering to support thousands of observations, either through parallelization or sectorization. Establish for STMAS a fully QC'd, reliable data set not dependent on a particular synoptic time that has gone through. (ESRL)

07.3.4.4 Forecast Techniques

07.3.4.4.4 Blending Observations with Numerical Forecasts **($15K old $60K new to ESRL)**

07.3.4.4.4.1 Determine how to optimally combine observation-based forecast with model forecasts of each aviation hazard field. Options include blending using statistical performance to determine the weights, statistical performance and heuristics, auto-blend using object matching and stats to determine weights, rules-based blending with human-added value, using fuzzy logic based on multivariate regression techniques, and using temporal and spatial corrected bias from NWP forecasts

07.3.4.4.4.2 Test whether incorporating storm climatology information into blended 2+ hour forecasts provides improvements in forecast skill.

07.3.4.4.4E1 Mar '07: Incorporation of intermediate grids including VIL, Precip, Echo Tops, Motion Vectors, Growth and Decay trends, CI Likelihood, CI Stability, Forecast grids, etc. and will incorporate any additional grids required to be used as primitives (MIT/LL)

07.3.4.4.5 Winter Storms (MIT/LL, NCAR)
Develop CONUS calibrated precipitation rate based on a real-time calibration of ASOS surface precipitation gauge data (one-minute data) with radar data.

07.3.4.4.5E1 Jan '07: Communication in real-time intermediate grids from the 0-2 hour CIWS forecasts including a data quality edited surface reflectivity mosaic, map of

likelihood of snow, and 1-minute ASOS data.

07.3.5 Forecast System Outputs

The currently planned output fields from the CoSPA are: storm intensity and location, growth and decay trends, echo tops, weather avoidance fields, lightning, precip type, precip rate, strong surface winds, and windshear/microburst.

07.3.5.1 Verification

07.3.5.1.1 Automated Verification Compatible with RTVS **($7.5K old $27.5K new to ESRL)**

07.3.5.1.1.1 Design automated verification system in collaboration with RTVS team to provide scores to users in real-time, verify forecast performance and to provide error statistics for probabilistic forecasts. System will verify storm location, organization and intensity, area coverage, echo tops, precipitation type and rate, sector capacity, etc. as given above.

07.3.5.1.1.2 Design automated reporting capability with user-selectable range of dates and coverage domains for plots. Comparison of forecast scores with persistence and extrapolation forecasts over the same time period will be provided.

07.3.5.1.1.3 Review MIT/LL scoring mechanism.

07.3.5.1.1E1 Aug '07: Report on review of MIT/LL mechanism

07.3.5.1.1E1 Sep '07: Provide software and documentation for real-time verification of CoSPA forecasts

FY07 CWRT FUNDS ALLOCATION FOR ESRL

Task Number	CONVECTIVE WEATHER, FY2007	ESRL
07.3.2.1	System Architecture	
07.3.2.2	Software & Documentation Standard	
07.3.3.1	Demonstration Prototype Forecast	
07.3.3.3.1	Spring and Fall Release of CoSPA	
07.3.3.3.2	Scientific Review, Support & Analysis	
07.3.4.1.1	Implementation & Logistical Support	$25,000
07.3.4.1.2	Scientific Review, Support & Analysis	$25,000
07.3.4.2.1	Radar Reflectivity Mosaics	
07.3.4.2.2	Gridded Surface Observations	$75,000
07.3.4.3.1	Automated Front Detections	
07.3.4.3.2	Convective Initiation Regimes	
07.3.4.3.3	Satellite Convective Initiation Products	
07.3.4.3.4	Lightning Flash Rate as VIL Proxy	
07.3.4.3.5	Weather Classification	
07.3.4.4.1	Extrapolation Vectors	
07.3.4.4.2	Storm Initiation and Evolution	
07.3.4.4.3	Numerical Modeling	
07.3.4.4.4	Blending Observations w/Numerical Forecasts	$75,000
07.3.4.4.5	Winter Storms	
07.3.4.5.2	Improving Existing NWS Operational Products	
07.3.5.1.1	Automated Verification Compatible with RTVS	$35,000
Total		$235,000

Attachment 1, Email addresses

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