Prototype Aviation Collaboration Effort (PACE)
Ft. Worth ARTCC CWSU

PACE Phase I (Convective Products) Operations Plan

A joint project between:

FAA Headquarters
FAA Southwest Region
National Weather Service Headquarters
National Weather Service Southern Region Headquarters
Center Weather Service Unit (CWSU) Fort Worth
ARTCC Fort Worth Traffic Management Unit (TMU)
NOAA Forecast Systems Laboratory

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1. Purpose

The Prototype Aviation Collaborative Effort (PACE) will take place at the Ft. Worth ARTCC/CWSU, PACE is a rapid prototype facility designed to test and demonstrate the effective employment of developing science, technology and computer communication interfaces in developing new weather products for decision makers in the Traffic Management Unit (TMU).

The PACE facility will develop a wide range of high-resolution forecast products specifically tailored to the ARTCC air traffic environment. PACE will build upon knowledge and experience gained from ongoing operations and testing such as the Collaborative Convective Forecast Product (CCFP). It is anticipated that an initial suite of graphical products would consist of convective forecasts followed by icing, turbulence, and ceiling and visibility forecasts, other parameters could then be addressed based on requirements outlined by the FAA.

The "PACE Phase I Convective Forecast Operations Plan" outlines daily functions that the CWSU, PACE Chief, NOAA Forecast Systems Lab personnel and the involvement of Fort Worth TMU.

Participation by NOAA Forecast Systems Laboratory in the PACE project will consistent with objectives established by the FAA TMU Weather Needs project and is predicated on receiving funding from the FAA Aviation Weather Research Program.

2. Objectives

The primary goal of PACE Phase I Step I – III is to establish procedures to generate automated convective forecast products for use by decision makers in the FAA ARTCC Traffic Management Unit (TMU). Accomplishing these objectives should in the end produce a more efficient use of the NAS, greater safety to the flying customer, and cost savings to the flying community. Again, automation is stressed since PACE **is not to infringe** upon CWSU operations and service to the ZFW ARTCC. Consistent with CWSUs standard operating procedures and CCFP operations, value added thunderstorm forecasts will be appended to the CCFP for the 2-6 hour periods which will encompass areas of less than 25 percent coverage of thunderstorms.

Specifically, PACE Phase I Step I-III will focus on the following areas:

1. Define a methodology of producing automated forecast guidance products

2. Establish procedures, by which, each participating office, focusing on its area of expertise, adds value to the graphical forecasts

3. Develop automated graphical forecasts and improve graphical product generation and editing tools.

4. Upon the successful completion of steps 1 through 3, PACE will then begin to establish a methodology, using collaboration technology, to promote an efficient exchange of meteorological information among CWSUs.

3. Daily Operations

The PACE Team has developed a three phased approach to develop convective products for TMU. Below is an outline of daily operations as the PACE convective forecast products develop through 2002.

It has been agreed to by the PACE participants that the "hours of operation" for the PACE facility will be Monday through Friday from 0600 to 2100 local time. This provides the greatest amount of

coverage time from the PACE Chief, CWSU meteorologists, ZFW TMU personnel and FSL developers when present.

Convective Forecasts

PACE Phase I Step I 1 Hour convective forecast for the ARTCC

Start Date March/April 2002

Product Description: Automated TMU display depicting NCWD/NCWF, Convective SIGMETs, movement vectors and speed and echo tops data.

CWSU role: Monitor automated generation of NCWD/NCWF.

TMU role: Provide feedback regarding utility and recommend enhancements.
1000Z CWSU meteorologist on duty prepares for AM briefing package for ARTCC staff. Input for CCFP, brief TMU for Strategic Planning Telcon.
1100Z Ensure FX Connect is on line, connected to server and receiving products.
1200-0300Z As time and primary duties permit, monitor PACE Convective forecast products on FX Connect and Web display.

1. The first convective product will include the NCWD with polygons from the NCWF. Added to this product will be convective SIGMET, speed and movement vectors, and echo tops data. The forecast domain will be at the ARTCC level.

2. FSL production of the NCWD/NWCF forecast will be automatic and the product will be updated once every 5 minutes. The Convective forecast product is then distributed to the CWSU FX Connect system and TMU web display.

3. There will be no additional work for the CWSU meteorologist to perform therefore no impact on work conditions is foreseen. Feedback from the TMU will be gathered through normal operational discussions between the CWSU or PACE Chief and TMU. The collected information will then be appended to the PACE Data Log. When completed, surveys will also be provided to the TMU as an additional source of feedback.

PACE Phase I Step II 1-6 Hour convective forecast for ARTCC and TRACON

Start Date: April/May 2002

Product Description: The 1 hour plan-view of graphical forecast based on NCWD/NCWF, Convective SIGMETs, storm motion vectors and speed and echo tops. Step II, introduces the 2-6 hour plan-view graphical forecasts based on CCFP. This forecast will be at the ARTCC and TRACON domain levels.

CWSU role: Monitor automated generation of 1 hour forecast. Add value to the 2-6 hour CCFP (<25% coverage areas) forecast.

TMU role: Provide feedback regarding utility and recommend Enhancements to the 2-6 hour forecast product.
1500Z Upon receipt of PACE 2-6 hour CCFP, CWSU meteorologist or PACE Chief adds value to the 2, 4 and 6 hour forecast product.
1900Z With completion of afternoon staff briefing and upon receipt of PACE 2-6 hour CCFP, CWSU meteorologist or PACE Chief adds value to the 2, 4 and 6 hour forecast product.

2300Z Upon receipt of PACE 2-6 hour CCFP, CWSU meteorologist or PACE Chief adds value to the 2, 4and 6 hour forecast product.

1. The team has defined a 1 to 6 hour forecast product for Phase II. FSL will produce an initial 1 hour NCWF forecast with Convective SIGMETs. Then a 2 to 6 hour plan-view product based on the CCFP forecast. The forecast domain will be at the ARTCC and (Terminal Radar Approach CONtrol) TRACON domains.

2. The CWSU or PACE Chief will monitor the 1 hour automated product. Upon receipt of the 2 to 6 hour CCFP forecast the CWSU personnel can add value to this product using the FX Connect drawing tools. These results will then be mounted on the FSL web server for distribution to the TMU web display and on the CWSU FX Connect system.

3. Although, the CWSU meteorologist will be performing graphical editing in Phase II, we don't see this as a workload item since part of the duties of the CWSU meteorologist encompass participating in the CCFP discussions. In fact, performing the chat room discussions at the FX Connect system will actually streamline and enhance the current operations as stated above. Adding value to the 2 to 6 hour CCFP product is a logical extension covering thunderstorms below the threshold (<%25 coverage) of the CCFP product.

PACE Phase I Step III Enhancing 1-6 hour convective forecasts for ARTCC and TRACON

Step III is intended to bring more focus to the TRACON level convective forecast. To address this the following plan of action has been developed:

- Enable FX Connect to acquire and display 1-min ASOS/AWOS observations from the WARP WINS server.
- Enable FX Connect to acquire and display layer composite radar reflectivities from WARP WINS server. This step will be approved after feasibility study is completed.
- Develop and test prototype products for high and ultra-high sectors that have lower radar reflectivity thresholds. This step will be approved after feasibility study is completed.
- Enable FX Connect to acquire and display (TRACON Convective Weather Forecast) TCWF developed by MIT Lincoln Labs. This step will be approved after feasibility study is completed.

Time: 1 to 6 hour

Start Date: August/September 2002

Product Description: The same product suite as outlined in PACE Phase I Step I and II will be produced, in addition, a PACE (TRACON Weather Forecast) TCWF, display of ASOS observation data and composite radar reflectivity data specifically addressing the high and ultra high air traffic through ZFW airspace.

CWSU role: Monitor automated generation of 1-hour convective forecast NCWD/NCWF. Add value as needed to 2-6 hour forecast. Monitor TCWF is an algorithm generated product from MIT L/L, therefore it will only require monitoring from the PACE facility.

TMU role: Provide feedback regarding utility and recommend enhancements

1. PACE will continue to use a 1 to 6 hour forecast products as in Phase II. FSL will produce the products as outlined in Step I and II with the addition of the (TRACON Convective Weather Forecast) TCWF. The 2 to 6 hour plan-view product will be based on the CCFP forecast. The forecast resolutions will be at the ARTCC and TRACON domain levels.

2. As with Phase II the CWSU will only monitor the 1hour forecast product. And, when appropriate will add value at the ARTCC and TRACON domains using the drawing tools provided through FX Connect. Those results are then distributed to the TMU web display through the FSL web server.

4. Evaluation/Feedback

Throughout the life of the PACE program evaluation will be conducted on the developed forecast products. Of paramount importance is the delivery of a forecast system and weather products that directly aid the decision makers in TMU, therefore products developed by PACE should require little if any interpretation. An additional benefit will be a streamlined forecast system within the CWSU providing rapid assimilation of weather analysis and forecast data with the ability to effectively collaborate amongst individual weather units. To perform evaluation of the PACE products following steps should take place:

1. PACE members will gather TMU feedback (after considering operational constraints) during the "hours of operation" from one-on-one interaction between the PACE Chief and CWSU meteorologists with TMU supervisors and Traffic Management Coordinators (TMCs). Feedback will be gathered through surveys/questionnaires received from TMU. One-on-one feedback will be logged electronically, this will enable the CWSU to capture forecast imagery and append that data to the log to better describe improvements that could be made to a forecast products(s).

2. Upon funding and resource acquisition, NOAA FSL should apply RTVS to the forecast product output to verify the validity of data. However, we need to proceed with caution when using NCWD/NCWF and then applying RTVS to such a small domain. The convective forecasts within the ARTCC and TRACON levels at the 2 through 6 hour time frames will be at a resolution below the 25% coverage areas covered by the CCFP forecast. That domain falls into the mesoscale diurnal thunderstorm category, it is that level where NCWD/NCWF does not show significant success in detection therefore RTVS will show an equally low probability of detection.

It is anticipated that this daily operations plan will be modified to meet the needs of both the PACE developers and users as product development proceeds during PACE rapid prototyping operations.

Appendix 1

Acronyms

ARTCC	Air Route Traffic Control Center
ASOS	Automated Surface Observing System
AWOS	Automated Weather Observing System
AWRP	Aviation Weather Research Program
CCFP	Collaborative Convective Forecast Product
CWSU	Center Weather Service Unit
FAA	Federal Aviation Administration
FSL	Forecast Systems Laboratory
MIT L/L	Massachusetts Institute of Technology Lincoln Laboratory
NCWD	National Convective Weather Detection
NCWF	National Convective Weather Forecast
NOAA	National Oceanic Atmospheric Administration
RTVS	Real Time Verification System
SIGMET	Significant Meteorological Advisory
TCWF	TRACON Weather Forecast
TMC	Traffic Management Coordinator
TMU	Traffic Management Unit
TRACON	Terminal Approach Radar Control