4.2 IMPLEMENTING THE INTERACTIVE FORECAST PREPARATION SYSTEM IN THE CENTRAL REGION OF THE NATIONAL WEATHER SERVICE

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1. INTRODUCTION

The Interactive Forecast Preparation System (IFPS) is one of the greatest challenges the National Weather Service (NWS) will face in its continual effort to improve the quality of products and services to the public. On one hand, the IFPS will provide a truly unique opportunity for NWS forecasters to use their meteorological skills to focus on developing a digital forecast database for use in a multitude of different ways by a myriad of different people or groups. On the other hand, IFPS is perceived by some forecasters to limit their ability to express their forecast in carefully worded products provided to the public.

In order to ensure an orderly transition from current forecast procedures to focusing on creating a digital forecast database, the Central Region (CR) of the National Weather Service developed an IFPS implementation plan that provides a consistent path for offices to follow. The plan was developed using input from field offices that were involved in IFPS beta testing activities and it establishes milestones and expected levels of skill to be achieved over an eight month time frame beginning from the time the local office receives their IFPS training.

This presentation will highlight the rationale behind the implementation plan and discuss the challenges associated with moving from a product suite that is centered on text to a digital database from which all current and future products can be derived.

2. DEVELOPMENT OF IMPLEMENTATION PLAN

In January 2001, CR identified the need to establish guidelines for its field office to implement IFPS. Input from three field offices active in IFPS beta testing was sought. Based upon their experiences, a timetable was developed for other CR offices to follow. Expected milestones were established based on the time the local office completed the IFPS training course at the NWS Training Center (NWSTC). After undergoing internal and external review, the plan was approved and sent to all of the CR field offices.

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3. THE IMPLEMENTATION PLAN

Table 1 shows the CR IFPS Implementation Plan. The plan was delivered to the CR field offices in March 2001, shortly after the first NWSTC focal point course was completed.

TABLE 1. The CR IFPS Implementation Plan

Suggested Timetable After NWSTC Focal Point Training (AT):

- **2 months AT:** Focal Point and any assistants should have Graphical Forecast Editor (GFE) software configured, including capability to upload graphics to web.
- **Between 2 and 4 months AT:** Focal Point travels to an established IFPS office for 3 to 5 days.
- **Between 2 and 4 months AT:** Majority of GFE training takes place. Upon completion of training, trainees should be expected to use the GFE to produce a limited set of grids for the scheduled forecast packages. A recommended initial set of grids could include temperature (at 3 hour intervals), maximum temperature, and minimum temperature out to 48 hours.
- **4 months AT:** GFE training completed; routinely post limited suite of graphics to web page; have matrices (and remainder of IFPS) configured.
- **4 to 6 months AT:** Majority of training on matrices (and remainder of IFPS, e.g. product generation, updates, sliders) takes place; proficiency check or follow-up training for GFE.
- **6 months AT:** Have matrices (and remainder of IFPS) training completed; send out 60 day Public Information Statement regarding Digital Zone Forecast (RDF).

TABLE 1. (cont.)

- **7 months AT:** Begin one month practice time in full IFPS use (produce Zone Forecast Product [ZFP], Coded Cities Forecast [CCF] and RDF) and review ZFP output for any needed configuration adjustments; begin one month practice time posting full suite of graphics on web page.
- **8 months AT:** Full IFPS use commences - IFPS used to produce ZFP, CCF, RDF and full suite of graphics for Internet.

3.1 Theory behind the development of the plan

Since IFPS represents such a marked change in NWS forecast preparation (Hansen, 2001), the CR IFPS implementation plan is designed to shift the forecasters' focus from worded forecasts to digital forecasts. The plan calls for the first half of the training and configuration to be centered on the Graphical Forecast Editor (GFE). The GFE requires forecasters to edit data grids, instead of text. The GFE offers a number of tools that allow the forecaster to create a digital database composed of grid-based forecasts (LeFebvre, 2001).

Another part of the plan that is designed to ensure forecasters think in terms of grids instead of text is the requirement of generation of images for the Internet. The GFE allows forecasters to create images of their forecasts in Portable Network Graphic (PNG) format (Dankers and Manion, 2001). These PNG files can be easily moved to a web server for public display. Graphical forecasts that are delivered to the Internet give the forecaster tangible output derived from his or her work in the grids.

3.2 Graphical Forecasts for the Internet

CR NWS offices are asked to have a mechanism in place for delivering their PNG images to the CR web server within two months after the NWSTC training is completed. This allows forecasters to see immediate results of their work during the training phase of implementation.

It is suggested that a limited suite of imagery be posted to each offices' Internet web page within four months of completing the NWSTC course. Although no particular weather elements are mandated, it is suggested that temperature, maximum temperature and minimum temperature images be posted to the web first.

Eight months after completing the NWSTC course, offices are asked to post a larger suite (or full suite as referenced in Table 1) of graphical forecasts to their Internet web pages. This "full suite" of graphics is designed to mirror the weather elements and temporal requirements that are planned for the NWS National Digital Forecast Database (NDFD). The full suite of graphics is defined as:

- Temperature, Dew Point, Wind, Relative Humidity, Weather, Sky Cover, and Wind Chill or Heat Index (depending on the season) from 0 to 60 hours at 3 hourly resolution
- Sky cover and Weather from 72 hour to 7 days at 12 hour resolution
- Probability of Precipitation from 0 to 7 days at 12 hourly resolution
- Snow Amount (seasonal) from 0 to 24 hours at 12 hourly resolution
- Maximum and Minimum temperature from 0 to 7 days at daily resolution

where the "zero" hour graphic is defined as the beginning of the valid time of the forecast. CR has an Internet web page that contains links to each of the offices' graphical forecasts at:
http://www.crh.noaa.gov/msd/ifps/progress.htm

3.3 Digital Forecasts vs. Text Forecasts and Forecaster Acceptance

Once the training for the GFE is completed and graphics are being posted to the office's web page, the remainder of IFPS training begins. Much of the focus is on an application program called the Interactive Guidance Revisor (IGR).

IGR allows the forecaster to display and edit all the relevant weather elements that combine to produce the standard NWS textual zone forecast product. The digital data are taken from the GFE, averaged and displayed in a matrix format (Ruth et al., 1998). The matrix can then be edited and product formatters will display the resulting worded forecast as edits are made. Since most NWS forecasters have spent a considerable portion of their careers composing text forecasts, IGR represents something comfortable to them. However, composition of high quality digital forecasts requires more than just mere text creation; it needs careful and insightful preparation of meteorological grids. Thus, the CR IFPS plan calls for training forecasters on the GFE before IGR to help them realize that simple text will soon no longer be the primary NWS forecast product and that the digital database will take its place.

To date, forecasters have generally accepted the automatic generation of text forecasts in order to give priority to the developing the digital forecast database. With the rapid pace of advancement on the Internet, most NWS forecasters realize that they must provide a service beyond basic text forecasts. While many forecasters have taken pride in their ability to craft a journalistically pleasing text forecast, most realize the need to focus on providing digital data to the NWS customers. Thus, the acceptance of IFPS is proceeding reasonably well.

3.4 Familiarization Visits

One of the most important parts of the plan is the familiarization visit. This portion of the plan is based upon successes that the NWS Eastern Region enjoyed during their implementation of the Interactive Computer Worded Forecast software, the immediate predecessor to IFPS.

The familiarization visits are set up to have the IFPS focal point travel to an office that has considerable experience with the IFPS software and that is using the latest version of the GFE. Two sites in the NWS Central Region that have been involved with IFPS development since the late 1990s (Pleasant Hill, Missouri and Grand Rapids, Michigan) were chosen to host most of the IFPS familiarization visits.

The goal of the visit is to supplement the information the focal point receives at the NWSTC IFPS course. Also, while the NWSTC course is fairly thorough, it does not devote much, if any, time to operational use of the software. Hence, each visit allows the focal point to see the software being used in an operational setting, and, in most cases, the visiting focal point is allowed to compose a forecast in IFPS.

Another point of emphasis during the familiarization visit is to provide training on changes to the IFPS software that have occurred since the focal point received their initial instruction at the NWSTC.

Feedback from the familiarization visits has been very positive.

In addition to sending the focal point to an experienced IFPS office, CR is offering its sites the opportunity to have a forecaster with considerable IFPS background visit them during their first week of IFPS operations. The goal of this visit is to have an individual available immediately when questions arise.

4. SUPPORT

Since July 2001, the primary author of this paper has worked in the Central Region Scientific Services Division as the Forecast Systems Meteorologist. Thus far, this position has been devoted exclusively to supporting the implementation of IFPS in CR field offices. Direct communication with the focal points at the local sites has been the most common form of support. Additionally, a web page was developed that contained a considerable amount of configuration and customization information. The web page was not meant to replace the documentation that arrives with the software, but to supplement it. It was developed based upon requests from the focal points that made the familiarization visits. This page can be viewed at the following address: http://www.crh.noaa.gov/msd/ifps/config.htm

5. PROGRESS AND FUTURE PLANS

When the implementation plan was developed, the time allotted for implementing IFPS at the local offices was set at eight months. Eight months allows sufficient time to implement IFPS locally while accounting for any unusual circumstances that might arise at the local office.

Some offices are indeed finding challenges to their training efforts. However, most offices will manage to implement IFPS in eight months or less as suggested by the plan. Even with unusual circumstances, no office is expected to take more than twelve months to implement IFPS. All CR offices will have completed the NWSTC IFPS course by December 2001. Thus, it is expected that by the autumn of 2002, all CR offices will be using IFPS operationally, well in advance of the beginning of NDFD operations.

The current NWS baseline of hardware that hosts the IFPS software essentially limits running the GFE to a spatial resolution of 19 km. This hardware is expected to be upgraded within the next year so that the spatial resolution of the GFE can be improved to 5 km or better. CR will make available appropriate versions of the GFE software to sites with upgraded hardware (and for the rest as they obtain the new hardware) so that they can take advantage of all available capabilities of IFPS. This is especially important for those CR sites with a greater degree of terrain variability throughout their areas of responsibility. Additionally, making the new capabilities available quickly will encourage new ideas and approaches to creating the digital forecast database.

Due to the complexity of the software, the first year or so of IFPS use is expected to have a considerable focus on basic functionality. Most forecasters will need this time to learn how to effectively use the software. Over time, it is expected that a stronger emphasis will be placed on forecast methodology and the underlying science.

As forecasters become comfortable with the basic IFPS functionality, they will begin to utilize more advanced features of the GFE software such as smart tools and smart initialization. Smart tools allow the forecaster to edit grids based upon other forecaster-edited grids or model data (LeFebvre, 2001). Smart tools can be developed by any forecaster. The tools are written in the Python scripting language. Smart tools will allow editing of grids using rules or relationships defined by the individual office or forecaster. Smart tools encourage inter-parameter consistency as well as overall efficiency in the editing process.

Smart initialization, also written in Python, will allow the forecaster or focal point to define exactly how the sensible weather elements are derived from model data. Smart initialization will likely lead to an additional infusion of science into NWS forecasts and may generate new research on how to best utilize numerical weather prediction output.

As smart tools and smart initialization are incorporated into the forecast environment, the whole process should become more efficient and effective resulting in better products and services being provided to the NWS customers and partners. The code in which smart tools and smart initialization is written is easily transferred from one office to another. Thus, it is expected as offices explore smart tools and smart initialization capabilities, they will share any improvement or enhancements they developed locally with the rest of the NWS offices.

CR is planning to manage a repository for the smart tools and smart initialization code made available by its offices. Such a repository would ensure efficient,

scientifically valid, and accurate instruments to help other offices in their digital forecast preparation.

Additional capabilities are being developed that will allow forecasters to view the forecast grids from neighboring offices. Tools will be included in the software to enhance coordination between surrounding offices and to ensure consistency across their adjacent areas of responsibility. Any additional tools or procedures that are developed by CR field offices will be made available by CR to all NWS offices.

Finally, as many IFPS users become more sophisticated, there will likely be a need to be able to discuss and share smart tools, smart initialization scripts, forecast methodology and other lessons learned. To that end, CR will consider holding or sponsoring regional or sub-regional workshops, teletraining or teleconferences to enable all offices to gain from any locally developed expertise.

6. CONCLUSION

IFPS is a substantial and very necessary change for the NWS. Because it fundamentally changes how forecasters do much of their jobs, it has been important to establish some guidelines as to how to implement the software. The implementation plan that CR developed relied heavily upon offices that were involved with risk reduction activities in IFPS. Their lessons learned, experiences and customization work guided the way for implementation across the nation. In order to help its offices move to producing digital forecast databases, CR will continue to provide whatever support possible to ensure the transition is as successful as possible.

7. REFERENCES

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