J7.5 DISTANCE LEARNING TRAINING FOR AVIATION FORECASTERS: IMPROVING FOG AND CONVECTION FORECASTING WITH ADVANCED SCIENCE AND TECHNOLOGIES

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I. INTRODUCTION

While distance education has many advantages, it is all too easy for students to lose motivation and not finish their studies. This is particularly true for busy professionals, such as weather forecasters. Blended learning is an educational approach that combines some of the motivational aspects and student support found in a live, instructor-led course with the convenience and flexibility of self-paced study at a distance. The goal is to take the best from both modes of delivery to give the student a better educational experience.

From June 2003 to March 2004, the COMET Program used a blended learning approach to deliver the first Distance Learning Aviation Course (DLAC1), Forecasting Fog/Low Stratus for Aviation Operations, for National Weather Service (NWS) forecasters. The course combined live teletraining sessions with distance learning modules. The primary goal of the course was to improve aviation ceiling and visibility forecasts related to fog and low stratus events and to meet NWS goals under the Government Performance and Results Act (GPRA). Specifically, the GPRA goals are to reduce the false alarm rates and increase the probabilities of detection for critical ceiling (200 feet) and visibility (1/4 mile) forecasts and for aviation terminal forecasts within instrument flight rules (IFR) and marginal visual flight rules (MVFR) categories.

During the summer of 2004, the teletraining sessions were converted to a Web format, and the course is now completely self-paced and available to the entire meteorological community through the COMET Program's education and training Website, MetEd (http://www.meted.ucar.edu). With the success of DLAC1, development has begun on a second blended course (DLAC2), which will focus on convective issues in aviation forecasting.

2. DLAC1 COURSE STRUCTURE

Originally, DLAC1 was offered entirely at a distance by blending Web-based training with live teletraining sessions. Thus, students across the country could actively participate in the course without leaving their offices.

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The course consisted of approximately 20-30 hours of instruction, including three teletraining sessions and eight online modules. It provided comprehensive coverage of ceiling and visibility forecasting topics related to fog and stratus events. Topics addressed by the course included conceptual materials on fog and stratus development, as well as tools for developing aviation forecasts, and guidance on how to best tailor forecasts to meet the needs of the diverse group of aviation forecast customers.

The online materials included audio, graphics, and Flash interactions to allow the students to practice what they learn. An example of one such interaction is shown in Figure 1 at the end of this paper. Case study exercises were used to apply knowledge gained through the modules. Table 1 lists the individual course elements:

Lesson 1: Fog/Stratus Forecasting Basics	
Fog/Stratus Forecast Approaches	Teletraining (now online module)
Radiation Fog	Online module
West Coast Fog (optional)	Online module
Lesson 2: Assessing Preconditions and Anticipating Formation/Dissipation	
Synoptic Weather Considerations	Online module
Local Influences on Fog and Low Stratus	Online module
Assessing Climatology in Fog/Stratus Forecasting	Online module
Applying Diagnostic and Forecast Tools	Online module
Case Study: New England Fog Event	Teletraining (now online module)
Lesson 3: Customer Impacts and TAFs	
Customer Impacts	Online module
Writing Effective TAFs	Online module
Case Study: Northern Plains Fog Event	Teletraining (now online module)

Table 1. Course Components for DLAC1: Forecasting Fog/Low Stratus for Aviation Operations

Teletraining sessions played an important role in applying the conceptual material and opening a dialog between the students on common challenges faced in aviation forecasting. The diverse experience of the course participants helped create a rich learning environment where less seasoned forecasters learned from those with years of forecasting experience. In addition, several of the

participants had private pilot licenses and added the customer's perspective to the discussions.

Students took quizzes after each module and earned a module completion certificate for scoring 75% or better. Upon completing all the quizzes and the teletraining sessions, the students were awarded course completion certificates.

Initially, the target audience for the course was the aviation focal points at each NWS forecast office. Based on the extremely positive response of these participants, the course was extended to all NWS forecasters. Many of the focal points encouraged their office staff to enroll in the course and acted as mentors for less experienced forecasters.

In addition to the teletraining sessions and online course materials, students had an e-mail alias that they could use to ask questions of the instructor and the course administrator and a second e-mail alias for corresponding with fellow students to share experiences and problems related to fog/stratus forecasting. These features were intended to reduce the isolation that distance students sometimes experience.

By the time the teletraining sessions had ended, over 450 NWS forecasters had registered for the course and 307 had completed all the requirements. Typical of the comments received from students was this one:

> *"I think this DLAC series was well prepared and am looking forward to DLAC2 tackling thunderstorm forecasting. I will be one of the first to sign up for the next set of sessions."*

We believe that the blended learning approach contributed significantly to the high rate of completion and to the students' overall satisfaction with the course.

3. CURRENT FOG/STRATUS FORECASTING COURSE

Although the blended learning approach worked very well, resource constraints dictated that the teletraining could not continue past March 2004. Several of the teletraining sessions were recorded, and online modules were created to capture and simulate the live student interactions, so that new students taking the course could have similar learning experiences as those who participated in the teletraining sessions. In July 2004, the COMET Program released the Web-based version of DLAC1 with the same course components as the original version.

The online DLAC1 course is now available to the entire meteorological community through the COMET Program's education and training Website, MetEd (http://www.meted.ucar.edu/). Although the course is meant primarily for aviation forecasters, much of the material is useful for anyone who deals with fog forecasting.

MetEd also hosts the DLAC1 course Website (http://meted.ucar.edu/dlac/website/), which explains the objectives of the course, provides access to the individual course elements and quizzes, and links to an online registration system, which all students (not just NWS employees) can use to track their record of completed COMET module quizzes. All students can earn module and course completion certificates.

In addition, the Website hosts a Resources Page, which archives papers, tools, best practices, and other information related to aviation fog and stratus forecasting. Students are invited to submit information to include on this page.

At the time of this writing, the online course had been available for three months. Many of those who had not finished the blended learning version have now completed all the required elements via the online materials. An additional 176 NWS employees had registered for the course, and the number of NWS graduates was up to 394. In addition, 69 students with commercial IP addresses and 26 with military addresses had registered.

4. DLAC2: FORECASTING CONVECTION FOR AVIATION OPERATIONS

Based on the success of the first course, the COMET Program's next aviation course, DLAC2, will also blend online training with teletraining and will later be packaged as a solely online course available to the entire community. The objectives for students in this course are to:

1. Develop an increased awareness of the various users of aviation forecasts and how forecasts of convective weather conditions impact (both positively and negatively) aviation operations within each user group.
2. Explain the significant physical mechanisms, including local effects, influencing the evolution of thunderstorms.
3. Apply an understanding of the mechanisms for convection development, maintenance, and dissipation to successfully forecast these episodes utilizing both observations and model data.
4. Recognize weather patterns associated with convection and apply that understanding to the forecast process.
5. Know and apply forecast tools and products that are useful for evaluating the environment for factors associated with convective weather.
6. Apply this new knowledge to increase the accuracy of forecasts and to write a more intelligent TAF.

The main topics addressed will be forecasting convective initiation, characteristics, duration, and hazards. Initiation from both synoptic scale and mesoscale features will be examined. Atmospheric shear and buoyancy profiles from observed and model soundings will be assessed to determine storm characteristics (e.g., isolated cells versus lines), movement, and duration. Short-term forecasting techniques using radar, surface observation mesonetworks, and satellite imagery will be applied to ongoing convection. Hazards to airport traffic will include hail, strong gust front winds, microbursts, turbulence, icing, and reduced visibility from heavy rain or blowing dust. Enroute traffic hazards will include storm top coverage and configurations. The course will also focus on how to write effective aviation products by taking customer needs and impacts into consideration. A beta test of DLAC2 is set to begin in the winter of 2005.

5. SUMMARY

The COMET Program found the blended learning approach to be very successful in the delivery of the DLAC1 course. Based on this success, additional courses are planned using the same model. The next course, DLAC2 will cover convective forecasting issues related to aviation operations.

Although teletraining sessions are no longer available for DLAC1, the course has been adapted to package the interactive experience in online modules and registration has been opened to the entire meteorological community.

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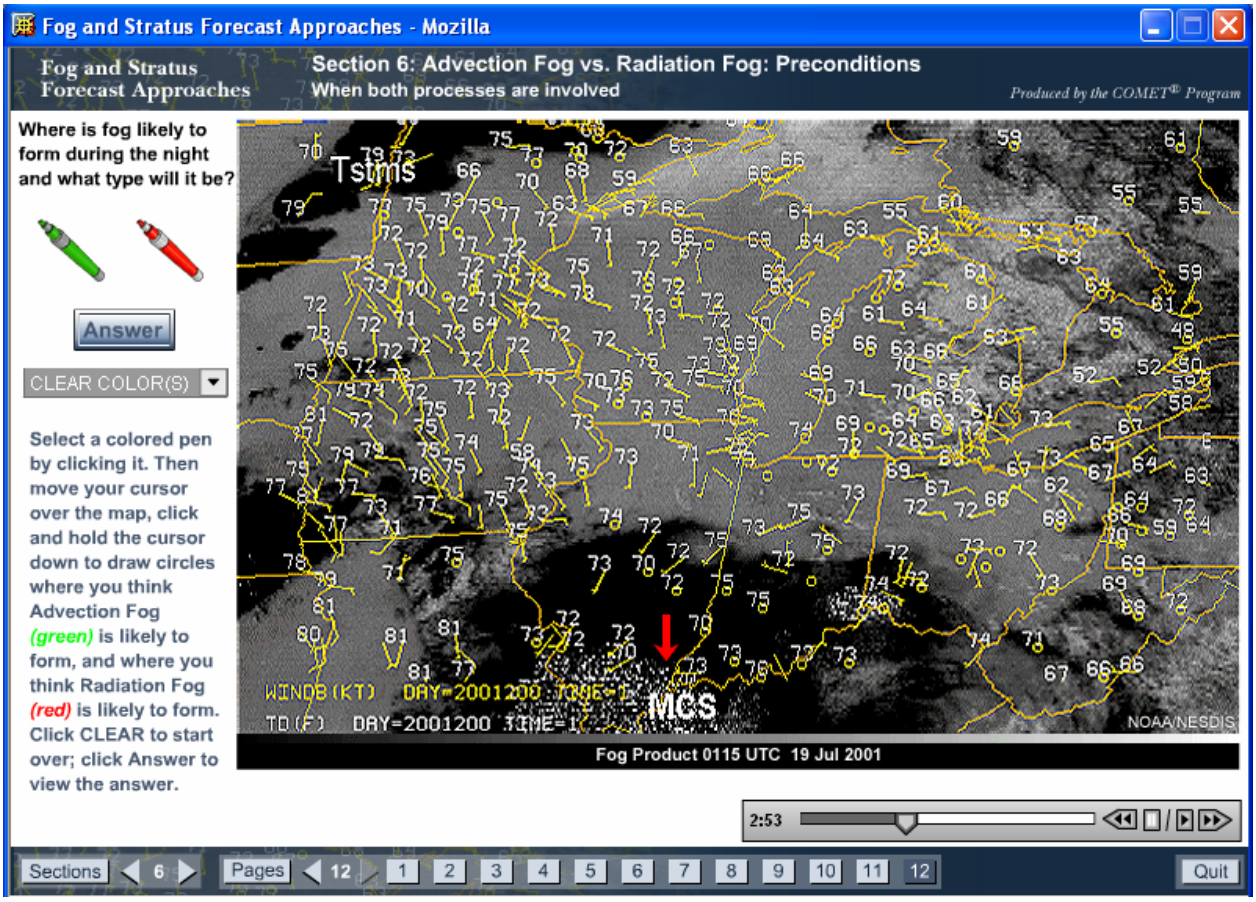

Figure 1. An example of an instructional interaction from one of the online modules in the COMET course on forecasting fog and stratus.