P1.56 A WEATHER DEGREE PROGRAM FOR THE NEW MILLENNIUM: PHASE II

Kenneth Parsons*, Mark Sinclair, Curtis James, Randy Tomkins
Department of Meteorology
Embry-Riddle Aeronautical University, Prescott, Arizona

1. BACKGROUND

In October 1999, Embry-Riddle Aeronautical University (ERAU) announced the approval of a Bachelor of Science program in Applied Meteorology (Bagby et al. 2000). This program was first offered during the Fall 2000 semester to students enrolling at ERAU's residential campus at Daytona Beach, Florida, and has since grown from eight students to 128 students in just four years. Of all degree programs offered at the Daytona Beach campus, the applied meteorology degree has the highest proportion of female students enrolled (33%). In addition, the majority of students in the major (60%) are enrolled in the Air Force Reserve Officer Training Corps (AFROTC), which now comprises the nation's largest collection of AFROTC meteorology majors.

The applied meteorology program at the Daytona Beach campus has quickly become one of the largest and possibly most gender-diverse undergraduate meteorology programs in the nation. Its growth and success may be attributed to ERAU's reputation as the world's leader in aerospace education and the expanding interest in and demand for degree programs equipping students for careers in meteorology and the atmospheric sciences. In response to this demand, and in order to better serve students in the Western U.S., the degree offering is now being expanded to the Prescott, Arizona campus of ERAU. This paper presents the background, degree requirements, and curriculum options of this unique BS degree in Applied Meteorology at the Prescott campus.

Prior to 2001, the Prescott campus had only two meteorology faculty teaching five courses in support of the Aeronautical Science major. The successful completion of these five courses qualified the student for graduation with a minor in Aviation Weather. During the period Fall 1997 to Fall 2003, the meteorology course offerings contributed to the expansion of the Aviation Weather (or meteorology) minor from 24 students to 120 students (Fig. 1). Since the commencement of the applied meteorology degree at the Daytona Beach campus in Fall 2000, there had been a growing interest in offering the degree at the Prescott campus, with some students even transferring into the program at the Daytona Beach campus. In May 2001, the Department of Meteorology was formed within the College of Aviation at the Prescott campus in anticipation of offering the Applied Meteorology degree, and shortly thereafter the department expanded to four full-time faculty offering seven meteorology courses.

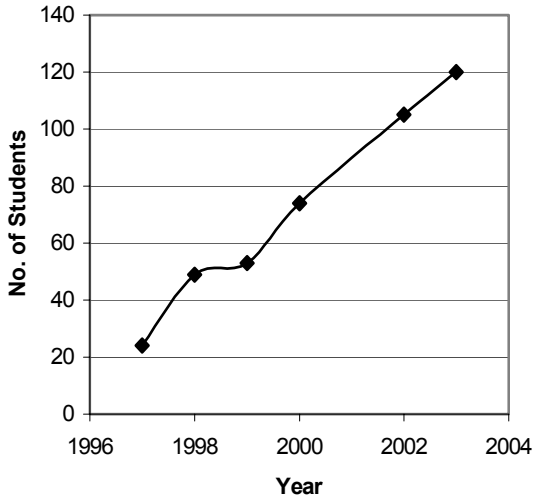

Fig. 1. Number of students with meteorology as a declared minor by academic year.

Based on the growth of the meteorology minor, the interest expressed in a B.S. degree program at Prescott, and the success of the degree program at Daytona Beach, the process to offer the B.S. degree in Applied Meteorology at the Prescott campus was initiated in 2002. With the in-place faculty and existing courses serving as a solid foundation, approval to proceed with marketing and recruiting was announced in the fall of 2003. Because of the continued need for degreed meteorologists in the Air Force, it is anticipated that enrollment in AFROTC and meteorology will be an important factor in the success of the program, similar to that at Daytona Beach. Demographic analyses have revealed that the two programs are complementary rather than competing. The Daytona Beach program traditionally draws its students almost exclusively from east of the Mississippi River, and the Prescott campus draws most of its students from the West. Preliminary data from Fall 2004 enrollment suggest this to be the case for the meteorology program at Prescott, with all students drawn from states west of the Mississippi.

2. DEGREE PROGRAM

The opportunity to major in applied meteorology was first offered to incoming freshmen at the Prescott campus during the Fall 2004 semester. Despite modest initial enrollment, significant growth is anticipated.

* Corresponding author address: Kenneth E. Parsons, Embry-Riddle Aeronautical Univ., Dept. of Meteorology, 3700 Willow Creek Road, Prescott, AZ 86301; e-mail: kenneth.parsons@erau.edu.

The only Area of Concentration (AOC) currently available to applied meteorology majors at the Prescott Campus is the "Research" AOC, which equips students for a variety of operational meteorology or research-related career paths. However, student demand for ERAU's highly acclaimed flight training has prompted the planning of an additional "Flying" AOC which should be available for students enrolling in the Fall 2005 semester. Table 1 lists the general degree requirements, and Table 2 shows additional course work options for the two AOCs. The specific course requirements contributing to the totals in Table 1 are identical for both AOCs and are listed in Tables 3 and 4. Both AOCs meet all the requirements for undergraduate study in meteorology recommended by the American Meteorological Society, the National Weather Service, and the U.S. Air Force. All graduates also meet U.S. Office of Personnel Management Qualification Standards for the position of meteorologist.

Table 1. Common course requirements for the degree program

Summary	**Credits**
Meteorology core	47
Mathematics core	19
Physics	7
Communications	9
Sub-total common course requirements	**82**

Table 2. Additional course requirements

Research AOC	
Summary	**Credits**
General education/open electives	35
Advanced engineering mathematics	3
Or	
General education/open electives	29
Co-op/internship	6
Advanced engineering mathematics	3
Plus	
Sub-total common course requirements	**82**
Total degree credits	**120**
Flying AOC	
Summary	**Credits**
General education/open electives	23
Aeronautical science/flight	16
Plus	
Sub-total common course requirements	**82**
Total degree credits	**121**

2.1. Research area of concentration

Practical considerations dictated that only one AOC, the research AOC, could be offered to the first enrolling class at Prescott. This AOC is overwhelmingly the most popular at Daytona Beach and has the flavor of a "traditional" meteorology program, with some subtle differences. It not only prepares the student for immediate entry into the workforce, but also qualifies the student for graduate studies toward a research and/or education career in the atmospheric sciences. In addition to the major in applied meteorology, the student who successfully completes the curriculum at Prescott will earn a minor in mathematics.

Table 3. Common meteorology core courses

Course title	**Credits**
Meteorology I	3
Applied climatology	3
Meteorology II	3
Thunderstorms	3
Satellite and radar weather interpretation	3
Advanced meteorology I	3
Advanced meteorology II	3
Atmospheric thermodynamics	3
Weather analysis	5
Atmospheric physics	3
Weather information systems	3
Forecasting techniques	3
Weather operations seminar	3
Dynamic meteorology I	3
Dynamic meteorology II	3

Table 4. Common mathematics, physics, and communications core courses

Course title	**Credits**
Business statistics	3
Calculus and analytical geometry I	4
Calculus and analytical geometry II	4
Calculus and analytical geometry III	4
Differential equations and matrix methods	4
Physics I for engineers with lab	4
Physics II for engineers	3
English composition and literature	3
Speech	3
Technical report writing	3

What sets this program apart from other "traditional" programs is the focus of the course material, where appropriate, on practical applications. In addition, all of the faculty have real-world forecasting experience that will be brought to bear on classroom topics and daily forecast discussions. Emphasis will be placed on applying theory to operational weather forecasting and decision making for weather-sensitive industries, including possible hands-on experience in an internship or co-op position. The program prepares graduating students for meteorologist positions in the government, military, or the private sector.

2.2. Applied meteorology with flying area of concentration

Because of its reputation as a world leader in aviation and aerospace education, the opportunity to fly attracts many students to Embry-Riddle. Commencing in Fall 2005, we will offer a flying AOC that continues the strong emphasis on practical meteorology of the research AOC while retaining the solid mathematics and physics foundation expected of our graduates. Exploiting this synergy between meteorology and flying will enable the degree program to be marketed alongside ERAU's flagship Aviation, Aerospace and Engineering programs. This new AOC will produce high quality graduates and is in concert with the one of the major recommendations of the National Weather Service Modernization Committee (1994): "…develop a new curriculum for pilot weather education."

Table 2 shows the curriculum changes needed to accommodate the aeronautical science and flight courses. These include 12 fewer general education, open elective, co-op, and/or internship credits and the elimination of advanced engineering mathematics. The flight courses that are substituted will enable the student to qualify for the Federal Aviation Administration Private Pilot Certificate, Single Engine and Multi-engine Land Ratings, Instrument Airplane Rating, and Commercial Pilot Ratings.

3. FACILITIES AND FACULTY

The debut of the applied meteorology degree program coincides with a major campus modernization project featuring a new academic complex scheduled to be completely operational by January 2005. This new complex will soon be followed by three additional new buildings and represents a major investment by ERAU in the Prescott campus. The meteorology department will have a significant presence in the three-story building. A prominent feature of the design of the academic complex is a state-of-the-art weather center, where current large-format weather maps and ten dedicated computer terminals will be available for real-time weather analysis and forecasting. Other dedicated teaching facilities include a lecture classroom, a meteorology computer lab, and a synoptic lab. A rooftop observation deck and spacious new faculty offices for the Department of Meteorology will offer spectacular views of the atmosphere and the Northern Arizona Mountains. On the roof of the three-story facility will be an X-band Honeywell Primus 880 commercial aircraft weather radar, Vaisala radiosonde equipment, and other weather instrumentation.

Another aspect of the modernization was the recent acquisition of 10 Davis Vantage Pro weather stations. This equipment will be strategically placed in various locations across central Yavapai County, Arizona to form the ERAU mesonet. Four stations have already been installed with the data readily available via the Weather Underground. (See links to Current Prescott Weather at http://www.erau.edu/omni/pr/academicorgs/prmd/links.html.) Future research will use these data to study precipitation distribution in mountainous terrain, a major topic of concern in the high desert of central Arizona. Other applications will be in hydrologic analysis studies regarding flash floods in the region.

Vital to any successful degree program is high quality faculty. The faculty at ERAU Prescott has a unique combination of impressive research portfolios coupled with real-world experience. These will ensure that the meteorology program is "applied" in the true sense of the word without compromising scientific rigor. Dr. Mark Sinclair has a Ph.D. in meteorology from the U.S. Naval Postgraduate School and is the department chair. His industry experience includes six years as a scientist with the National Institute of Water and Atmospheric Research (New Zealand) and 10 years as a research meteorologist and forecaster with the New Zealand Meteorological Service, including two seasons in Antarctica. Dr. Curtis James has a Ph.D. in atmospheric sciences from the University of Washington. His experience includes research fieldwork in the European Alps and two years with the National Weather Service. Dr. Ken Parsons has a Ph.D. in atmospheric science from Purdue University. His industry experience includes 20 years as a meteorologist and forecaster with the U.S. Air Force and five years as an air quality meteorologist with a leading environmental engineering firm. Randy Tomkins has an M.S. in meteorology and oceanography from the U.S. Naval Postgraduate School. He is a retired U.S. Navy officer with global weather forecasting experience including tours of duty in Antarctica and on the aircraft carrier the U.S.S. Lexington. In future years, the department will add at least two new faculty members to handle the additional workload associated with offering new courses in the degree program.

The ERAU degree in applied meteorology is the only one of its kind in the nation and emphasizes both the understanding and application of theoretical concepts. With the discontinuation of the degree program at the University of Arizona, the meteorology degree program at ERAU's Prescott campus will be the only undergraduate program in the state. In addition, the highly desirable location of the Prescott campus and its state-of-the-art facilities provide a natural laboratory for studying a wide variety of weather regimes including mountain meteorology and the North American monsoon. All of these factors contribute to the promise

of a successful future for the applied meteorology degree program at ERAU Prescott.

For more information regarding Embry-Riddle Aeronautical University, the Department of Meteorology, and the B.S. degree in Applied Meteorology go to http://www.erau.edu/omni/pr/academicorgs/prmd/index.html or http://meteo.pr.erau.edu/.

4. REFERENCES

Bagby, R., C. Herbster, D. Schaum, J. Ernst, W. Golding, and B. Muller, 2000: A weather degree program for the new millennium. Preprints, *Ninth Symposium on Education*, Phoenix, AZ, Amer. Meteor. Soc., 58-61.

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