AVIATION IN HIGHER EDUCATION: THE DEVELOPMENT OF A COMPREHENSIVE AVIATION MANAGEMENT AND COMMERCIAL PILOT PROGRAM IN TEXAS

Final Report

By

Jeffrey D. Borowiec

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The Texas A&M University System
College Station, TX 77843-3135

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CHAPTER 1. INTRODUCTION

As noted in the interim report entitled *A Selected Review of Aviation Management and Professional Pilot Programs at Academic Institutions and the Development of a Generic Curriculum,* Texas does not currently have a college or university that offers a comprehensive four-year degree curriculum for students interested in pursuing careers in aviation/airport management or as a commercial pilot. As also noted, these programs are available at numerous publicly owned universities across the country. This includes the bordering states of Louisiana and Oklahoma. While there are two-year associate degree programs available at a few of Texas' junior colleges, these career opportunities are not available to Texas students at any in-state university. This is potentially problematic as many professional positions in aviation/airport management as well as positions for professional and commercial pilots require a four-year college degree. Many of the jobs in aviation, both management and flying jobs, requiring specialized aviation skills and knowledge are with companies based in Texas.

The purpose of this study was to first develop the background information needed for a publicly owned four-year university to evaluate the feasibility of and to apply for approval and funding to initiate an aviation/airport management and commercial pilot curriculum. Secondly, this information was to be presented to selected Texas universities. This report documents these tasks. The interim report focused on developing information useful for universities in the early phase of establishing an aviation program. This second and final report focuses on refining that information and making formal contact with Texas universities who are likely candidates to house such a program. Funding for this project was the result of a legislative appropriation rider in the budget for the Aviation Division within the Texas Department of Transportation.

By way of summary, earlier efforts included an examination of the aviation-related programs currently offered in Texas, Oklahoma, and Louisiana. This review included both two and four year colleges and universities. The review examined the missions and objectives of the programs; the curriculum and courses offered; the number of students and the supporting faculty and staff; their job placement programs; their facilities, equipment and airplanes; the administrative and operational structures of the programs; and the costs involved in operating the various programs. The project staff visited three universities in Oklahoma and conduct interviews with key personnel.

The project staff collected the same information for selected aviation/airport management programs in other states through a variety of sources and telephone interviews, but did not visit these universities. The project staff proceeded under the assumption that if a university in Texas were to initiate a program, that university would want its program to be competitive with the best programs in the United States.

The research team also examined the policies and criteria established by the State of Texas Higher Education Coordinating Board for the development and approval of new programs. New program proposal and approval criteria as well as examples of new program proposals were examined.

A generic program or curriculum containing all the essential components but not related to a specific university was also developed. The generic application describes the program in sufficient detail so that a university would clearly understand what would be involved in establishing an aviation/airport management and commercial pilot program at their university.

The second phase of this project sought to refine some of the elements of the initial work. It also sought to identify and contact those universities in Texas that may have an interest in developing an aviation program or expanding current programs to a more complete level offering both management and flight options. This report documents the work performed under both phases of the study and includes material presented in the interim report.

CHAPTER 2. REVIEW OF CURRENT PROGRAMS IN TEXAS, OKLAHOMA, AND LOUISIANA

Task 1 of the *Aviation/Airport Management and Commercial Pilot Program* scope of work calls for a review of aviation-related programs currently offered in Texas, Oklahoma, and Louisiana. The attached summary document outlines the nature of the existing programs in these states while also providing information on some nationally recognized aviation programs. The 15 schools reviewed in this task include:

- Texas State Technical Flight College, Waco, Texas
- Central Texas College, Killeen/Fort Hood, Texas
- Tarleton State University – Central Texas, Killeen, Texas
- South West Texas Junior College, Uvalde, Texas
- San Jacinto College, Pasadena, Texas
- Texas Southern University, Houston, Texas
- Oklahoma State University, Stillwater, Oklahoma
- The University of Oklahoma, Norman, Oklahoma
- Southeastern Oklahoma State University, Durant, Oklahoma
- Louisiana Tech University, Ruston, Louisiana
- Arizona State University, Tempe, Arizona
- Parks College, Saint Louis University, St. Louis, Missouri
- Southern Illinois University, Carbondale, Illinois
- Western Michigan University, Kalamazoo, Michigan
- Embry-Riddle Aeronautical University, Daytona Beach, Florida
- Embry-Riddle Aeronautical University, Prescott, Arizona
- The University of North Dakota, Grand Forks, North Dakota

This review provides a good representation of schools in terms of size and geographic location, despite the fact that comprehensive four-year aviation education programs are not widely located at our nation's major universities and colleges. As can be seen from the list, Texas' aviation programs are primarily located at two-year institutions with some four-year

institutions offering the opportunity to finish a bachelor's degree. These "finishing" schools do not offer much specialized aviation training rather only additional general studies coursework towards meeting university degree requirements. Most, if not all, of the aviation elements of the education are provided through the two-year schools. At the other end of the spectrum is Embry-Riddle Aeronautical University, which has campuses in Daytona Beach, Florida and Prescott, Arizona. This school is devoted to aviation programs of all types including numerous management and engineering-related options and specialties. They also have a comprehensive flight-training program. It is very likely the most comprehensive aviation university in the country, if not the world. The other schools in the review fit somewhere in between the two-year institutions found in Texas and the Embry-Riddle Aeronautical University.

Both Oklahoma and Louisiana have what appear to be fairly comprehensive and successful aviation programs that include flight training and aviation management options. Of the schools in these two states, Oklahoma State University offers the most comprehensive set of degree programs that includes bachelors, masters, and doctoral degree programs.

There are a few items of particular note that warrant mention in this document. Southeastern Oklahoma State University recently purchased six new aircraft at a cost of approximately $1 million. Dr. David Conway, director of the Aviation Sciences Institute at the university, estimated their annual operating budget to be about $1 million. Based on his experience, he estimated the start-up costs of such a university-run program to be approximately $5 million. The chairman of the aeronautical technology department at San Jacinto College, Mr. Larry Tucker, expressed his concern at the numbers of students from their department that are going on to schools in Oklahoma and Louisiana. Mr. Tucker stated that he attempted to originate a program with the University of Houston roughly 10 years ago, but was unable to do so due to lack of funding. This type of history and relationship will be important as we move toward the potential implementation of an aviation program in Texas.

The programs examined thus far vary in several ways. In terms of size, the programs vary both in the number of students and the number of faculty. There are also differences in the level of support received from the university. This can sometimes be discerned by where, administratively, the program is located. It is more likely that those housed in one of the university's major colleges have better support and facilities than those that are located in continuing education programs.

Another major organizational issue pertains to how the flight training options are arranged. Some of the schools contract with fixed-base operators to provide the training but most of them appear to operate the programs themselves. This is an issue that will be delved into more thoroughly during site visits to the three Oklahoma schools and the one school in Louisiana. The advantages and disadvantages of the different types of operations will be reviewed further once site visits are completed. It is expected that this information will be updated when additional information can be obtained. This is especially the case with respect to program facility needs, staffing requirements, and start-up and operational costs. This information is difficult to obtain but we are continuing our efforts and pursuing other sources, as the information is crucial to the project.

The pages that follow summarize the aviation programs currently available in Texas, Oklahoma, and Louisiana. It also provides the same information for other programs around the country including some with international reputations. This information begins to help us identify certain key elements and understand the nature of such an educational program. It also provides us with the necessary insight needed to begin developing such a program in Texas. There is no doubt that the development and implementation of an aviation program with both management and flight options is a very large undertaking both in terms of manpower and money. Recent events surrounding the tragedy of September 11, 2001 have made the operating environment more difficult for these programs. However, many of those involved in these programs believe that the enrollment drop-offs experienced will soon level and pick up again as these institutions fill a legitimate need in many sectors within the air transportation industry. The demand does indeed exist for such graduates and enrollment levels will once again reflect that.

The following summary table includes information for the colleges and universities in Texas that offer some aviation programs as well as information for selected aviation programs across the country that are nationally known and respected. It is not an all-inclusive or exhaustive list.

Summary of Aviation Programs in Texas and Selected States

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Texas Southern University	Department of Transportation Studies	B.S. Airway Science	Airway Science Management or Airway Computer Science		6		
Texas State Technical Flight College, Waco	Aircraft Pilot Training Program Students wishing to pursue a bachelor's degree can move on to Baylor.	Associate of Applied Science Degree (A.A.S.)	21-Unit Program Aircraft Pilot Training Technology	160-165	4 ground; 17 flight	4	• 17 Aircraft o 10 Cessna 152s o 2 Cessna 172s o 2 Mooney Eagles o 1 Twin Piper Seneca o 1 Twin Piper Seminole o King Air available • Frasca 141 and 242 single and multi-engine simulators • Worldwide weather terminal with real-time weather information • Broad array of piloting tools, digital flight computers, radios, etc. • TSTC Airport owned by college (Transport D-IV Airport)
Central Texas College, Killeen, Ft. Hood, etc.	Aviation Science Department	Various Associate Degrees in Arts, Science, Applied Science, and General Studies	Aviation Maintenance Technology (Far East only) and Aviation Science	Contact Pending	Made	Info.	• Aircraft o Cessna 152s o Cherokee o Cessna 310

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Tarleton State University – Central Texas, Killeen	Aviation Program, Department of Management, Marketing, and Administrative Systems	B.S. in Aviation Science	Aviation Science-Professional Pilot	60	1	0	They do not own or operate their own aircraft. They grant Bachelor's degrees to those who have an Associate's degree and give credit for flight hours/certificates earned.
		B.S. in Aviation Science	Aviation Science-Management They offer a total of 7 Jr/Sr level courses plus business courses				
South West Texas Junior College, Uvalde	Contact Made – Information Pending						

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
San Jacinto College, Pasadena	Aeronautical Technology Technical Program	A.A.S. Aviation Management	• Basic management and business courses • Application of management and marketing principles to aviation industry problems	150	4 full-time; 6 adjuncts	1	• 3 types of simulators providing a range of instruction from basic to instrument to multi-engine training • Aircraft are contracted through Cliff Hyde Flight School • Utilizes Ellington Field for training purposes
		A.A.S. Pilot Development Program (PDP)	• Joint effort with Continental Airlines • Prepares a student for an entry-level position as a first-officer with a regional airline • After graduation, will receive further training to prepare for career as an airline pilot				
		A.A.S. Aircraft Maintenance Management Specialty					
		Certificate of Technology	• Aircraft Dispatcher • Career Pilot • Pilot Development Program (PDP)				
Louisiana Tech University	Department of Professional	B.S. Professional Aviation	Flight operations	325	8	5;	• 25 Aircraft

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
	Professional Aviation, College of Liberal Arts	B.S. Aviation Management	Operations management, personnel management, supervisory techniques, computer skills, communications, quantitative analysis, and extensive aviation instruction			25 CFIs	○ 11 Cessna 152s ○ 12 Cessna 172s ○ 2 Cessna 172RGs (All aircraft are owned and operated by the university) • Multi-engine training done through Ruston Flying Service in a Beech Duchess • 3 Frasca ground trainers • 2 AST Hawk ground trainers • 1 USAF Vertigon • Aviation Department computer lab with 30 pc computers and 2 DUAT direct access terminals • Utilizes the Ruston Regional Airport and the Shreveport Downtown Airport

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Southeastern Oklahoma State University	Aerospace Department, School of Business	B.S. in Aviation	Professional Pilot	220; 120 flying	5; 15 CFIs; 30 adjuncts	50++	• 16 Aircraft o 10 Cessna 150/152s o 2 Beechcraft C-33 Debonairs o 1 Cessna 182P o 1Cessna 182RG o 1 Cessna 310R o 1 Fairchild Fokker F-27 twin turboprop • 1 Frasca Flight Training Device
		B.S. in Aviation	Aviation Management with options in Business, Maintenance Management, Safety, and Security				
		M.S. in Aerospace Administration	Aerospace Administration	48			
University of Oklahoma	Department of Aviation, College of Continuing Education	B.S. in Professional Studies	Aviation - Professional Pilot	156; 125 flying	6	30**	• Fleet of 12 airplanes • Max Westheimer Airport (terminal building and AMNE building) • Department Hangar includes simulators and training aids • Reliever/Transport/C-II airport
		B.S. in Professional Studies	Aviation - Aviation Management				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Oklahoma State University	Department of Aviation and Space Education; College of Education	B.S. in Aviation Sciences	Options • Professional Pilot • Aviation Management • Technical Services • FAA Airway Science	260; 200 flight	27 includes adjuncts	6	• 29 Aircraft (actual fleet size is determined by student loads) o C-152 o C-172 o C-172RG o BE-76 • All aircraft are leased • Frasca 142's • Other PC simulators • Utilizes Stillwater Municipal Airport
		M.S. in Natural and Applied Sciences	Emphasizes Aviation and Space Sciences				
		Ed.D. in Applied Education	Options • Aviation and Space Management • Aviation and Space Education • Aviation and Space Professional				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Arizona State University	Department of Aeronautical Management Technology; Department of Manufacturing and Aeronautical Engineering Technology	B.S. Aeronautical Management Technology	Airway science flight management, airway science management	213	8	7; 12 CFIs	• 13 Aircraft (includes fleet growth over next few months) o 8 Piper Warriors o 4 Beechcraft Bonanzas o 1 Beechcraft Baron • 1 AST 300, Twin Engine Turboprop FTD • 1 AST 300, Twin-Engine Recip. FTD • 1 AST 201 Single-engine Recip. FTD • 8 Jeppesen-Sanderson FS-200 PCATD's • 16 person hypobaric (high altitude) chamber at no cost to enrolled students • 3 computer based "Learning Laboratories" with a broad range of computer tools and software • In negotiations with Mesa Pilot Development (current flight provider) for 2 level D-CRJ Simulators • Utilizes the Williams Gateway Airport
		B.A.S. Applied Science	Aviation maintenance management technology, aviation management technology				
		M.S. Technology	Aviation human factors, aviation management technology				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Saint Louis University - Parks College	Department of Aerospace Technology, Department of Aviation Science, Parks College of Engineering And Aviation	B.S. Aeronautics	Options • Aircraft Maintenance Engineering • Aircraft Maintenance Management • Aviation Science/Professional Pilot • Avionics Engineering • Aviation Management	256#	6#	40#	• 26 aircraft o 18 Aerospatiale Tampicos (TB9) o 5 Piper Seminoles o 2 Cessna 152 o 1 King Air B-100 (used for University transportation services) • 3 Frasca 141 FTD • 2 Frasca 142 FTD • 3 single engine and 1 Frasca 242T turboprop FTD • 2 multi engine FTD • McDonnell Douglas Hall with teaching and research facilities • Earhart Hall with 14 labs ranging from welding labs to advanced electrical systems • Center for Aviation Sciences houses flight instructors, administration and aircraft maintenance • Utilizes the St. Louis Downtown-Parks Airport

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Southern Illinois University - Carbondale	Department of Aviation Management and Flight, Department of Aviation Technologies, College of Applied Sciences and Arts	B.S. Aviation Management	Includes Airport Management and Planning Minor and Aircraft Product Support Minor as a supplement to B.S. degree	190 flight;	40 flight; 9 mgmt.	11; 3 stdnt.	• 33 training aircraft, 2 charter aircraft o 19 Cessna 152 o 7 Cessna 172 o 3 Cessna 172RG o 1 Cessna 182RG o 3 Cessna 310 o 1 Cessna 340 (charter aircraft) o 1 Cessna 421 (charter aircraft). • Various FTD's including the FRASCA 141 and personal computer aviation training devices • Aviation library • Transportation Education Center • Utilizes the Southern Illinois Airport
		B.S. Aviation Technologies	Options • Aircraft Maintenance • Aviation Electronics • Helicopter Also includes Aircraft Product Support Minor				
		A.A.S. Aviation Flight	• Prepare students for the FAA Commercial Pilot Certificate • Most graduates seek B.S. Aviation Management after graduation				
		Master of Public Administration Program	Concentration in Aviation Administration				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Western Michigan University	Aviation Science Department, College of Aviation	B.S. Aviation Flight Science	Includes professional pilot subjects, crew management, etc.	600	9	18	• 60 aircraft o 41 Cessna Skyhawk 172R o 5 Mooney Ovation M20R o 7 Piper Seneca PA34-220T o 2 Extra 300L o 2 Robinson R-22; 2 Cessna 150 o 1 PA-18 Super Club Amphibious Floatplane • Utilizes the W. K. Kellogg Airport in Battle Creek
		B.S. Aviation Maintenance Technology	Variety of aviation maintenance subjects				
		B.S. Aviation Science and Administration	• Preparation for positions in operations management or technical support • Includes courses for WMU Haworth College of Business				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
University of North Dakota	Department of Aviation, John D. Odegard School of Aerospace Sciences	Bachelors of Business Administration	Options • Aviation Management • Airport Management	1,552	21, 2-3 adjuncts	30 pilot mgrs; 205 CFIs; 20 mnt.; appr. 50 other	• Over 118 aircraft o Piper Cadet-PA-28-161 o Piper Arrow-PA28R-201 o Piper Super Cub-PA-18-150 o American Champion Super Decathlon 8KCAB o Piper Seminole-PA-44-180 o Cessna Citation II-C550 o Beechjet-B400A o Various helicopters • 4 Frasca 241 Arrow single engine trainers • 2 Frasca 242 Seminole multi-engine trainers • Air Traffic Control Simulation room • Cray J-90 Supercomputer • Scientific Computer Center • Utilizes the Grand Forks International Airport
		B.S. Aeronautics	Options • Commercial Aviation • Flight Education • Air Traffic Control • Aviation Systems Management				
		M.S. Aviation					

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Embry-Riddle Aeronautical University - Daytona Beach, Florida	• Aeronautical Science • Aerospace Studies • Applied Aviation Sciences • Business Administration • Engineering Technology • Maintenance	Associates Airway Science		4,641*	193 full-time; 79 part-time*	956*	• 89 aircraft: o 60 Cessna172R and S model o 6 Mooney M20J o 5 Piper PA28R o 8 Piper PA44 Seminole • 1 Elite Pro multi-engine PC aviation Training Device (ATD) • 10 Frasca 141 single-engine Flight Training Device (FTD) • 2 Frasca 142 twin engine FTD • 10 Jeppesen FS200 PCATD • 1 Raytheon Beech 1900D Level D. • Air Science Department: 3 computer labs • Utilizes the Daytona Beach International Airport
		B.S. Aeronautical Science	Options • Airline Pilot • Aviation Studies • Corporate Pilot				
		B.S. Aerospace Studies	Core curriculum and three minors				
		B.S. Aeronautical Systems Maintenance	Options • Maintenance Management • Avionics • Flight • Information Technology				
		B.S. Air Traffic Management	Preparation for air traffic control career				
		A.S. Aviation Business Administration	Introduction to business combined with some aviation business applications				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
		B.S. Aviation Business Administration	Options • Airport Management • Airline Management • Aviation Marketing Management • International Air Transportation Management • Flight Operations • General Management				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Embry-Riddle Aeronautical University - Daytona Beach, Florida (Continued)		B.S. Aviation Maintenance Management	Designed for students who possess certification or license in airframe and powerplant, but seeks an expertise in business				
		B.S. Aviation Management	Sound business foundation aided by aviation business applications				
		B.S. Aerospace Electronics	Options • Systems and Logistics • Operations and Support				
		B.S. Aircraft Engineering Technology	Basic engineering, aerodynamics, structures, propulsion, and integrated logistics support				
		B.S. Avionics Engineering Technology	Electronics, applied electronics engineering, applied avionics engineering, applied engineering mechanics, and integrated logistics support				
		A.S. Aircraft Maintenance	Airframe and powerplant maintenance and theory involved with maintaining aircraft in airworthy condition				

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
Embry-Riddle Aeronautical University - Daytona Beach, Florida (continued)		Master of Aeronautical Science	Options • Aeronautics • Aviation/Aerospace Operations • Aviation/Aerospace Management • Aviation/Aerospace Operations • Aviation/Aerospace Safety Systems • Human Factors in Aviation Systems • Space Studies				
		Master of Business Administration in Aviation	Aviation combined with a traditional business foundation				
Embry-Riddle Aeronautical University - Prescott, AZ	College of Aviation	B.S. Aeronautical Science	Options • Aeronautical Studies • Professional Pilot	1,724+	76 full-time; 37 part-time+	319+	• 54 aircraft o 14 Beechcraft BE76 o 1 Cessna 150 o 35 Cessna 172

School	Department	Degree	Subject	No. of Students	No. of Faculty	No. of Staff	Facilities and Equipment
		B.S. Aerospace Studies	Core curriculum and three minors				○ 2 Cessna 172RG ○ 2 Cessna 340 • 2 AST 300 twin-engine Flight Training Device • 2 Boeing B-727 Level A • 2 Cessna 172 Cockpit Procedures Trainer • 3 Frasca 141 single-engine FTD • 1 Frasca 142 twin-engine FTD • 3 Raytheon BE-76 Duchess CPT • Utilizes Love Field for training purposes

* - Includes the entire campus
+ - Includes the entire campus
# - Aviation Science Department only (Professional Pilot and Aviation Management)
++ - Includes mechanics, student workers, etc.
** - Includes flight instructors and personnel

CHAPTER 3. QUALITATIVE REVIEW OF OKLAHOMA UNIVERSITIES

This chapter documents the field visits made to three Oklahoma universities and their aviation facilities. These universities are Southeastern Oklahoma State University in Durant, The University of Oklahoma in Norman, and Oklahoma State University in Stillwater. All three visits included discussions and tours given by the program heads. The research team observed the operations of the flight center and the maintenance operations at all three schools. Also, the team was able to ask questions of students and other key personnel at all three programs in an effort to better understand their operations.

The program heads afforded the research team access to all aspects of the program and openly discussed a range of issues from the year-to-year challenges to how to run a maintenance operation, the benefits of purchasing to new aircraft, and issues associated with recruiting and retaining faculty. An outline of the items that facilitated the discussions with the program directors is included at the end of this chapter.

Southeastern Oklahoma State University (SOSU)
Durant, Oklahoma

Dr. David Conway
Associate Professor and Director
Aviation Sciences Institute
School of Business

B.S. Aviation – Professional Pilot
B.S. Aviation – Aviation Management
M.S. Aerospace Administration

The program currently has 250 total students and 140 active flight students. The primary facilities are located at Eaker Field in Durant. This includes Aviation Sciences Institute faculty offices, flight instructor offices, dispatch station, and the maintenance operations that include an airframe and engine shop. It was estimated that the maintenance facility includes approximately $310,000 in parts inventory and the start-up costs for such a maintenance operation is approximately $500,000. The university owns 30 acres at the airport where they keep their airplanes and have their flight center. There is no airframe and power plant (A&P) school at the location but it was noted that having one there would be of great benefit. It was noted by the director that they have lost some students because of the location of the program. There is not a lot to do in the area for college students.

They currently have one desktop computer simulator for training purposes. They would like to ultimately have five but the cost of approximately $5,000 per unit is somewhat prohibitive for now. The also have a Frasca simulator that costs about $4,000 per year for maintenance. Thy pay unusually low fuel prices of $1.08 per gallon and no state taxes on the fuel. They recently installed 20 new carport-type hangars (no doors) at a cost of $200,000. The slabs were $90,000 alone. The have plans to renovate the ramp area and the main hangar soon. They also have plans to add new hangars (carport-type). That should start any day now. The fuel system was installed at a cost of $70,000 (date unknown).

The university has intern programs with American and Southwest Airlines for pilots. The American intern program is unpaid and the Southwest program pays a small stipend. For management program students, there is a non-paying intern program with Northwest Airlines. It was noted that the chief pilot of Continental Airlines is an SOSU graduate.

The university does have an alumni association that raises money and gives scholarships. They have a strong network across the state and country. Approximately 70 percent of those who go through the flight program are still flying five years later. Many former students are flying for the airlines or work in the aviation field.

Equipment for the flight program has been acquired through a variety of methods. At the time of the visit, they were in the process of taking delivery of their recent order of new airplanes. The six new airplanes were purchased for approximately $1 million. Some of the funds were from a grant and the remainder from a loan from the university in the three to four percent range. The Frasca simulator is tow years old, is a duel-place multi-engine simulator and is quite adequate for training purposes. There is no need for a motion simulator. A two-axis disorientation trainer would be nice but is costly at approximately $100,000. They have one at their facility in Tulsa. There is also a flight testing center at the facility that allows Federal Aviation Administration (FAA) exams to be taken there by computer.

The decision to buy new airplanes was made because the wear and tear on training aircraft is so great. The program has the following aircraft in their inventory:

- 15 Cessna 172s
- 3 retractable gear aircraft (Cessna 172RG and 182RG)
- 2 Beechcraft Debonairs and a Cessna 310 (multi-engine aircraft)
- Cessna 152 for spin training

The program plans to implement a 10-year replacement program for their training aircraft buying two aircraft every year and selling the old ones to help pay for the new ones. Contracting out the flight operations is not seen as a viable option as they would have no control and it would be difficult to manage. In running their own operation, they know and trust the mechanics. They have three full-time mechanics and eight student helpers. They are looking for a fourth full-time mechanic. They pay their chief mechanic approximately $40,000 per year. The annual maintenance budget is approximately $1 million.

The program director stated that if a new program were started in Texas, the program would immediately see 50 students entering the program. A program should have flight instructors at a ratio of 10:1 meaning 10 students for every flight instructor. At the outset, a new program could

be operated with three Cessna 172s, one 182RG for complex training, and one multi-engine aircraft. Having the same aircraft manufacturer and several of the same type of aircraft could simplify parts and maintenance requirements as well as reduce costs. The director noted that approximately one-third of the students should be expected to leave the program before graduation. Some will do this for financial reasons and other will leave to take flying jobs. The key to running a successful flight operation is having a strong maintenance program.

The program has five full-time faculty members including the director who holds a doctor of education degree from Oklahoma State University. Both the chief pilot and the assistant chief pilot hold air transport pilot (ATP) certification and are also members of the university faculty. The other two faculty members hold doctoral degrees in computer science and higher education, respectively. There is currently a search going on for one additional full-time tenure-track faculty member. This is a new appointment not a replacement. They have not had a problem with faculty retention and the director stated that he has filled one job since he's been here and is recruiting for a new position now. It should also be noted that the chief flight instructor and the assistant the chief flight instructor do 10-hour flight checks of students as well as checks on instructors. This is a quality control factor that cannot be achieved when contracting out at a fixed-base operation.

The program also boasts 30 part-time or adjunct faculty members and 16 flight instructors in addition to the five full-time faculty members. It should be noted that while no problems have been incurred retaining faculty, there has been tremendous difficulty recruiting for the new faculty position. The director stated that there are approximately 20 to 30 positions open across the nation and those programs are facing the same problems finding candidates who possess not only an earned doctorate with a publishing background but also the necessary flight credentials to bring the required gravitas to the program and classroom. The problem could be one of compensation as beginning assistant professors are often paid in the $42,000 per year range. The director stated that at SOSU an ATP with a master's will get you in a tenure-track position.

In the last four years, the number of students in the program has tripled. The president of the university has been supportive of the flight program and they have not had a problem maintaining their funding levels within the university structure. The strength of the program is the professional pilot program but business is the other focus of the school.

The flight program carries with it additional costs of about $20,000 for flight training. The total four-year program including tuition is around $40,000. The costs for the flight instructor are $20.00 per hour and the costs for the airplane depend on the type. Flight instructors are paid between $13 and $15 per hour, which is fairly high as far as flight instructors are concerned. Typically they are in the $10 per hour range. The flight simulator costs are $41.50 per hour and the simulator cost $60,000 new two years ago. This proved to be a very good deal as the model typically costs $140,000.

The director stated that a program of this type needs a very strong leader both in an academic sense and an aviation sense. The program has been capped until more aircraft and additional mechanics are brought in. Three percent of the current aviation students are women and one-half of one percent is minorities. The program gets its students from a variety of places not the least of which is the state of Texas. Sixty-three percent of their students come from Texas. This includes those from Texas State Technical College (TSTC) who come to SOSU to finish their four-year degree.

While engineering and technology schools are the typical academic homes to aviation and flight programs, the program at SOSU has flourished under the auspices of the School of Business. They have worked closely with the business school to develop courses for the aviation management track. There are approximately 60 students in the M.S. program in aerospace administration. They have a satellite campus at Tinker Air Force Base in Oklahoma City and had ten graduates in the first year there. Currently about 60 percent of the undergraduates in the management track are going on to graduate school. They also have a "minor" program for students majoring in other disciplines. There are some $12,000 scholarships as well as some graduate assistantships that pay $500 per month and free tuition.

Oklahoma University (OU)
Norman, Oklahoma

Mr. Glenn R. Schaumburg
Director
Department of Aviation
College of Continuing Education

B.S. Professional Studies – Aviation/Professional Pilot
B.S. Professional Studies – Aviation/Aviation Management

The Aviation program at OU currently has approximately 160 students. Of these, 125 are active in the flight program. Although the vast majority are aviation majors, you do not need to be in the aviation program to utilize the flight-training program. The program also has a full-time recruiting and advisement coordinator. The program has really grown in the last two years. The addition of an accessible student advisor has been very important to the programs growth.

The program hires both current and former students as flight instructors. Normally, they move on to commuter airlines after about a year. Typically the flight instructors have a student ratio of 6:1. Some of the full-time flight instructors have nine to ten students. The program makes use of both leased aircraft and aircraft that are purchased used. While the director contends it would be nice to be able to have new aircraft, it is not an affordable reality. A new Piper Warrior costs between $150,000 and $180,000 with fleet rates available for five or more aircraft. Currently, the program purchases aircraft that it leases and pays cash for them so as to not service debt. Airplanes that are leased are done so with a contract that guarantees 480 hours per year. This allows some flexibility for the program to expeditiously reduce costs should they recognize a reduction in flight program participation and revenue. The flight program utilizes a computerized scheduling system for its aircraft that they had developed specifically for their use and it works quite well for them.

Students come from a wide variety of areas to the program. The university had an agreement with the State of Arkansas to allow students from there to qualify for in-state tuition because no program exists in the state. This program was recently dissolved. Additionally, large concentrations of students come from California, the Northeast, and Texas. Norman has jokingly been dubbed "little DFW" due to the large numbers of students that come there from the Dallas-Fort Worth region.

The staff of the flight program largely consists of the program director, the chief flight instructor, and a secretary. They have 21 flight instructors on staff that start at $8.00 per hour and are considered temporary university employees. They are paid for flight time plus 30 minutes of ground time per student appointment. Coincidentally, Embry-Riddle flight instructors are paid more but are unionized.

The biggest challenges faced by the program on a year-to-year basis include student retention, scholarships, and the difficult educational curriculum. Last year the program saw a lot of students called up in the reserves. Mr. Schaumburg stated that they can usually tell in two semesters whether or not a student can or wants to be successful in the program. Their training syllabus calls for a student to solo at 9 hours and most do it in 10 to 12. He also said the minimum to complete the private pilot certificate was 38 hours and most OU students do it in 38 to 42 hours.

The flight program has set flight fees for the flight training. This includes a set number of hours that is typical or expected of a student within which to finish the requirements. When this is exceeded, the students are charged hourly. When asked about the minimum practical size to run a flight program the director stated that 50 would be nice but that it could be done with 30 to 35 active students. The trend of the program depends a lot on what the airlines do. Currently, it is expected that it will continue on an upward trend.

The director stated that there is a strong correlation between their graduates/seniors that are working as CFIs and the regional airlines including Continental Express, American Eagle, and Comair. It is not unusual to find students/graduates who after two years of working as CFI have 1,000 hours of total time and 200 hours of multi-engine time. He also said that they do not have a problem losing students to jobs before they graduate. Mr. Schaumburg mentioned that they also have students who transfer to OU from places such as Embry-Riddle Aeronautical University and Spartan who want to experience college or university environment. While the major airlines are interested in applicants having the flight hours and certificates along with a college degree, that is not so much the case with the commuters who are interested more in hours and certificates.

Current program constraints include the number of CFIs, the number of airplanes, and the lack of physical space including office and classroom space. They currently lease six airplanes and pay $25 per hour for their use. They also perform all maintenance work with the exception

of engine work. With additional instructors and two to three more airplanes, the program could handle approximately 50 more students.

The OU aviation program is currently going through an accreditation process through the Council on Aviation Accreditation (CAA). Many of the schools with flight training programs are CAA accredited but others are not. One potential problem for the OU program is that it has no tenured faculty in the aviation department. The program was once located in the College of Education but is now in the College of Continuing Education. The courses that aviation students take are not aviation courses or general education courses are located in the business school. It is generally believed that the provost does not like the aviation program and that this impacts the program's support at a high academic/administrative level. However, a former president of the university is a tenured business faculty member and he is a big supporter of the program. In the last few years, the program has added courses in crew resource management, history, environmental issues, legal issues, and airport management (new in the Fall of 2002).

In terms of equipment and facilities, the program three computers in their FAA test center which allows them to administer FAA flight tests. They have two personal computers used as airplane training devices ($27/hour) and one ATC-710 simulator ($27/hour). The simulator costs approximately $4,000 to $5,000 new. The program has a total of 19 aircraft and includes the following:

- 13 Piper Warriors
- 2 Piper Arrows
- 2 Piper Senecas
- 1 Cessna 152 Aerobat
- 1 Turbo Commander (1968)

The university leases three airplanes from Christiansen Aviation in Tulsa, Oklahoma. All 19 of the aircraft are IFR equipped. They charge $95/hour duel for the warriors and $78/hour solo. A used warrior costs approximately $50,000 to $60,000 and a used arrow costs approximately $62,000. The program does their own maintenance and has three full-time mechanics. They budget $40,000 per year for parts and always go over budget. They do not do their own avionics work but there is an avionics shop on the field. They schedule one or two less aircraft than they

have available to accommodate the on-going aircraft maintenance. The university's physical plant department maintains the building that houses the program on the airport. They have offices in two buildings and also have two hangars. During the visit they were in the process of moving into additional office space. The fuel is provided through an FBO who charges them the state rate for fuel and puts their airplanes in the hangar at night. The airport, Westheimer, has a contract tower that operates from 8:00 a.m. to 10:00 p.m.

The program is financed through flight fees that pay for fuel, parts, instructors, and maintenance. The program can also haul state employees on state business. The department utilizing the airplane, such as the athletic department on a recruiting trip, pays for the costs of operating the aircraft for that trip. Funding is also available to the program through loans at good rates from the university. Insurance for the aircraft is provided through the state for $1,000 per year per aircraft for liability only. The leased aircraft costs an additional $1,200 per year and includes liability and hull damage insurance.

The program offers 22 hours of aviation courses. There is also a non-degree, non-credit option just for flight education. All students will take some aviation courses regardless of whether or not they are in a degree program. The non-degree students will waive certain fees waived like the health and library fees among others. The aviation program uses the Jeppesen/Sanderson aviation materials in its curriculum.

The program has recently begun efforts to track former students. They have a lot of former students who are currently in the various military branches. They also have former students flying for many of the regional airlines and major airlines well as working for various concerns as dispatchers. A lot of their assistant chief flight instructors have had interviews with and have been hired by Continental Express. The events of September 11, 2001 have pushed back a lot of the hiring at the commuters but it is expected to resume at some point. Some students gave more recently taken jobs with Williams Companies. Some internships are available at Christiansen Aviation in Tulsa as well as with American, American Eagle, and Northwest. These are largely unpaid programs. The department is currently working on an arrangement with Southwest Airlines, as their vice president for operations is a former chief pilot in the OU program. Currently Southwest Airlines has a big program or arrangement with Embry-Riddle Aeronautical University. The internship with American is unpaid but students can get some simulator time,

can sit in on ground schools and other meetings and before the events of September 11th had some jump seat privileges.

The department is starting an annual banquet to attempt to better develop their alumni network. They indicated that the majority of their graduates are still in the aviation business and that getting them together would be good for networking and job development. Also, it would help with scholarships and funding issues which are a big challenge for many students. Cost is the biggest reason why students drop out of the program. The program has seen an increase in the number of women students recently. They make up 15 percent of the program currently and one and a half years ago they made up approximately 7 ½ percent. They have four female flight instructors and the university is 52 percent female as a whole.

Oklahoma State University (OSU)
Stillwater, Oklahoma

Dr. Steven K. Marks
Associate Professor of Aviation and Space Education
Director, Aerospace Education Services Program

B.S. Aviation Sciences (three options)
Professional Pilot
Aviation Management
Technical Services Management
M.S. Natural and Applied Science (option in aviation and space sciences)
Ed.D Applied Educational Studies (interdisciplinary studies)

The flight program at OSU began in the 1940's and was originally housed in the engineering college. In the 1950's, the program was moved to the college of Education. A master's program was added in 1990 and a doctorate was added in 1994. The program at OSU is the only one in the nation that offers a doctorate in aviation. Aviation is now housed administratively as a Program in Aviation and Space Education in the School of Educational Studies in the College of Education.

The program has seven full-time faculty members and numerous adjunct faculty including folks from various FAA offices in Oklahoma City as well as individuals from Tinker Air Force Base in Oklahoma City.

The undergraduate aviation programs have 300 to 350 students in them. The master's program has 40 to 50 students and the Ed.D. program has approximately 15 students. The flight program has approximately 150 students that are actively flying. Enrollments are back up following September 11th. The program also has a satellite training facility at their Tulsa campus where they have an additional 100 to 110 flight students. Students from other academic disciplines are permitted to take flight courses. In fact, students in the aerospace engineering program are highly encouraged to get a private pilot certificate. On the degree sheet, there are approximately 60 credit hours for aviation courses of which 25 hours are flight courses. It takes about two semesters to get a private pilot's certificate. At the end of the flight program, students typically have approximately 250 to 300 hours of flight time. It takes approximately 1,000 to 1,500 hours to get a job with a commuter airline. The program utilizes the Jeppesen/Sanderson curriculum materials.

They do not have any formal partnerships or alliances with any airlines. They make it clear that their niche is in undergraduate and graduate education. They do attempt to keep up with their alumni through an alumni newsletter called OSUAIR. There is currently a moratorium on the doctoral program, as they do not have enough current faculty to cover the current students. The university also has an articulation agreement with some community colleges in Tulsa and Oklahoma City. A high school sophomore can go to a vocational technology (VoTech) institution and get an airframe and powerplant certificate and earn up to 25 hours of credit towards an associates degree.

The flight program houses their airplanes in a large hangar located next to their flight center where the dispatch area is located and where the flight instruction occurs on the ground. They lease the hangar from the city and also pay tie-down fees. They currently have 23 aircraft that they lease from Christiansen Aviation in Tulsa. This includes three multi-engine duchesses, four or five Cessna 172s, three 172RGs, and 12 or 13 Cessna 152s. They also have an airplane that was donated to the university that is used to keep the faculty current. They maintain their own aircraft and have their own A&P mechanics on staff. They have two full-time and one part-time A&P mechanic in Stillwater along with a few mechanic helpers. In Tulsa, they have an additional two full-time A&P mechanics along with a few helpers. Their fuel is purchased from the city of Stillwater. As a side note, the university recently sold its Cessna 421 and the football and basketball programs charter jet aircraft for their road trips.

The program would like to purchase their own aircraft and think that they could save some money by doing so. They do have some options as far as getting loans for aircraft. The flight center lost approximately $100,000 last year. They do not have any simulators but do have some personal computer flight training devices. A FRASC 141 simulator is on their wish list. The dean expects that the number of master's degree students will increase in the near term. There is not an expectation that the flight program will increase in size as they are currently operating at capacity. Dr. Marks did not have any comments concerning the number of students constituting a minimum practical size to run a flight program. He also stated that they do not have problems maintaining their university funding levels. Approximately 40 percent of their students stay on campus during the summer to fly or take classes.

The most significant challenge faced annually for the program is maintaining enrollment. They also have to contend with weather problems. April and May are typically windy and rainy.

September has the best weather. They do not have any real faculty turnover problems and they get a lot of students from out-of-state including quite a few from Texas. Seven to eight percent of the program's students are female and they rely a lot on word of mouth to get information about their program out. It costs approximately $20,000 to get through their flight program that they indicate is substantially less than the $40,000 it costs at Embry-Riddle in Florida (and Arizona) and the Spartan School of Aviation also in Oklahoma.

OSU students take an average of 10 to 12 flight hours to solo and 48 hours to earn their private pilot certificate. Their assistant chief flight instructor, Mr. Rick Mangum, state that they had 160 active flight students and 14 flight instructors. As mentioned earlier, the Tulsa facility has another 100 flight students and 10 flight instructors. Mr. Mangum offered some comments on an optimum or practical size of a flight program. He indicated that 100 flight students was a good manageable size with seven or eight students per flight instructor if the CFIs are still taking courses themselves. He also said that they have a lot more room at their new Tulsa facility which is located in a new $37 million VoTech facility. It is tough to keep mechanics at the Stillwater facility so the program is considering moving their maintenance operation to Tulsa. The flight center utilizes software called Computer FBO to track its maintenance schedule and its student billings for flight instruction.

Summary of Key Elements

The visits to the programs at the three Oklahoma universities yielded important results that are worthy of highlighting. These results pertain to important aspects of running an academic aviation program with flight training options. They may be critical factors in developing a successful aviation program in Texas. These key elements include leasing vs. buying training aircraft, approaches to running a maintenance operation, and the challenges of attracting and keeping students.

The visits with program directors/department heads at the three Oklahoma universities provided very detailed information on the operation and administration of their respective aviation programs. They provided uninhibited access to their facilities and were liberal with their time in discussing their programs with project research staff.

All three of the directors stated that the best option for running a flight training program is to own the training aircraft. Although not all of the programs owned their own aircraft, it was

clearly the stated preference. There are some advantages to leasing as the aircraft can be easily disposed of if programs begin to decline. The benefits of owning seem to outweigh any disadvantages. The cost of owning may be less expensive considering additional insurance requirements when dealing with leased aircraft. Control is a big issue in running a program and owning gives you more control than leasing.

Hand-in-hand with owning your own aircraft is running your own maintenance operation. This may be the most important element in operating a successful flight training program. Control and trust are the major reasons. While this is an expensive proposition considering the start-up costs associated with facilities and parts inventory, it is well worth the effort. Doing so also provides an opportunity to offer airframe and powerplant courses in the curriculum which can be useful not only in developing training programs for mechanics but also in exposing future professional pilots to the subject.

Attracting and keeping students in the programs are always a concern for program administrators. More than any other reason, students drop out of flight programs because of the costs. One school noted the lack of things for college students to do in town as a reason for not staying. Schools have increased their focus on scholarships to help stem the problem. Locating schools in areas attractive to college students would also be beneficial. This typically means away from rural areas and more toward urban locations where there is still access to adequate airspace for training without concerns or issues with major urban commercial airports or military installations.

Other issues worth noting include that of faculty retention and ideal size of a program. Integrating personnel with substantial aviation experience into an academic setting is a challenge because the vast majority does not possess academic credentials often required. This primarily means a lack of an earned doctorate. This is a potential point of contention with academic administrators. Some schools will hire tenure-track faculty if they have a master's degree and an airline transport pilot (ATP) rating. Finding and hiring qualified faculty appears to be a larger problem than retaining them. The consensus on the ideal size of a flight program seems to lie between 50 and 100 students. The minimum practical size of such a program appears to be approximately 35 students. All of the schools in Oklahoma draw heavily from Texas and could likely expand themselves if they had additional resources, aircraft, and facilities. The current

environment appears to continue to be amenable or favorable to developing such a program with some modicum of success in terms of student enrollment.

Information Discussed During Oklahoma University Visits

1. Mission/Objectives of program
    a. Geared for training managers, pilots, air traffic controllers, teachers, etc.
    b. Non-degree program licenses, certifications, specializations, etc.
    c. Why do your State Legislators support these "non-traditional" programs?
    d. Do you have to be in an aviation degree program to go through flight training?

2. Administrative structure and location within the university environment
    a. Title of person responsible (Chair, Department Head, Center or Program Director, etc.)
    b. Responsibilities for student advisement
    c. Any "center' or "institute", or other non-academic administrative unit involved in administering the program
    d. Accrediting agency – program specific
    e. Are faculty there because of their aeronautical skills or academic skills?

3. Number of faculty and staff
    a. Full-time faculty
    b. Part-time faculty
    c. Graduate student assistantships/scholarships
    d. Clerical/support staff
    e. Others/specify
    f. Problems recruiting faculty
    g. Faculty turnover
    h. Traditional faculty vs. flight instructors

4. Number of students within the various options
    a. Geographical numbers/dispersion

5. Current job placement programs
    a. Opportunities and previous successes
    b. Alliances (i.e., internships with industry)
    c. Work Co-ops
    d. How do you track graduates/database of former students?

6. Programs facilities and equipment
    a. Laboratories, simulators, computers, and aircraft, indoor training facilities, specialized classrooms, etc.
    b. Libraries
    c. Other special equipment or facilities
    d. Explore issues involving the purchase and/or lease of aircraft
        1. Do they run their own program or contract with an FBO
        2. If purchased, how paid for
        3. Insurance concerns
    e. How do you budget for replacement?
        1. Every 4-5 years
        2. One-fifth every year
        f. Do simulators need to be updated regularly?

7. Costs associated with program
    a. Start-up costs
    b. Operational costs

8. Other
    a. What is the minimum practical size of a program?
    b. How do they feel about their equipment – OK for training, needs to be newer?
    c. Maintenance costs
    d. Impacts of new sport flying license
    e. Program strengths
    f. Most significant challenges faced on a year-to-year basis

g. Expectations of program size
h. Problems maintaining funding within the university structure
i. Costs of flight instruction – do the fees cover the costs
j. Is your program representative with respect to minorities/women

CHAPTER 4. IDENTIFICATION OF HIGHER EDUCATION COORDINATING BOARD PROCESS AND CRITERIA FOR DEVELOPING NEW PROGRAMS

The development and implementation of a new academic program for an institute of higher education is a large undertaking. This is likely an understatement for degree programs that currently do not exist at any university or college within a system or entire state. This is no exception for a comprehensive degree program in aviation at a four-year institution in Texas. In fact, it may be even more complicated considering the additional, capital-intensive elements often associated with an academic program in aviation not the least of which are the aircraft used in flight education and the maintenance operation that goes hand-in-hand with safe aircraft operations.

The decision to pursue such a program is made at the university level where it initially emanates from the program or department level and eventually passes through the university's administrative and academic channels where it must first clear internal reviews. This is solely a university decision. The proposal is then taken up by the university system and Board of Regents who examine such a proposal according to their own set of criteria. Such criteria typically include issues of need, demand, cost to the proposing institution and the state (in terms of potential outflow of semester-credit-hour-generated appropriations), and potential duplication with other institutions of higher education.

The Higher Education Coordinating Board (HECB) concerns themselves with the potential quality and the need in terms of both demand from students and the workforce of the proposed degree program. They also evaluate how appropriate the proposed program may be as an academic degree as opposed to a vocational education program (i.e. workforce or certificate program). The HECB is also interested in how the proposed program might fit in within the role and mission of the institution making the program request. The Board also considers the potential costs to the institution and the State to offer the program, evaluates the enrollment projections or estimates, and generally tries to determine the overall feasibility of the new program. The following offers more details to the HECB process.

Once a new program request is received by the HECB it is entered into their database of proposals and listed on their website for a 30 day comment period. Only the general details of the proposal are listed. It is during this time period that any potentially affected parties, including

other colleges and universities, may raise objections or concerns about the newly proposed program. During the 30-day period, the Assistant Commissioner for Universities and Health-Related Institutions will assign the proposal to an HECB staff member who is specifically trained to evaluate the new degree program request. This staff member will contact the institution that filed the new program request and begin an analysis of the proposal.

The timetable for reviewing the request depends on when the proposal is submitted and its level of completeness. Additional time may also be required depending on whether the assigned staff member has to address issues, concerns, and/or questions received during the comment period, or with other concerns regarding the quality, need, cost, and issues of possible duplication with other degree programs in the state. This process may take as little as a few weeks or longer depending on the complexity of the issues faced.

The HECB staff also noted that most degree program requests at the bachelor and master's level are acted upon by the Commissioner of Higher Education, on behalf of the Coordinating Board. The Board considers all doctoral-level degree requests directly, during one of their regular quarterly Board meetings. If a particular proposal does not meet the criteria for HECB approval, the Commissioner of Higher Education can deny the approval or send it to the Board for their consideration. A requesting institution can appeal the Commissioner's denial to the Board if it chooses to do so. Additionally, if there is a dispute between institutions regarding a program proposal, the Commissioner must forward it to the Board for consideration (1). The detailed proposal requirements are outlined in the HECB *Policies and Procedures* document (2). It should be noted that HECB approval is required for a myriad of academic and administrative actions. This discussion focuses on the process required for new program proposals.

In addition to what the HECB does, each individual university and system, if applicable, have their own set of policies and requirements when considering new academic program proposals. In the case of the Texas A&M University System, their *Standard Operating Procedures* document outlines the processes for both substantive and nonsubstantive program proposals and further clarifies the process and requirements of the HECB. According to the document, degree program and administrative change requests are considered nonsubstantive when the following HECB criteria are met. These are:

- No implications for changes in the institutional role and scope (mission statement/table of programs);
- No significant new costs to the institution or to the state
  - No new faculty positions added
  - No more than five new courses added
  - No new facilities required;
- No issue of unnecessary duplication with the programs at other institutions;
- Potential for a high quality program based on the institution's previous experience in the same or related fields (1).

It is quite clear that any university in Texas pursuing a new degree program in Aviation will have to follow the process for a substantive program request. The new faculty, courses, and facilities alone will trigger that requirement. The programs that currently do exist are not comprehensive enough to bypass this process and will have to comply with the substantive proposal development guidelines.

The substantive proposal development process is reviewed for based on several criteria. The Texas A&M University System *Standard Operating Procedures* document clearly identifies and describes these criteria. The Office of the Chancellor, The Board of Regents, and the Texas Higher Education Coordinating Board reviews the criteria for all new undergraduate and graduate degree program proposals. The following is taken directly from that document (1) and was based off of the rules outlined in the Texas Administrative Code as well as HECB standards and policies. The criteria are:

1. Compatibility with Institutional Mission

The proposed degree program should be within the role and scope of the institution as approved by the Chancellor, the Board of Regents, and the Texas Higher Education Coordinating Board. If the desired program is not authorized on the institution's most currently approved Table of Programs, an expansion of authority request must be submitted with the proposal.

2. Institutional Capabilities

The requesting institution should provide evidence that the curriculum, faculty, resources, supporting services, and other requirements of the degree program are comparable to those of the same or similar disciplines or subject matter offered by peer institutions. The proposal should convey a commitment to excellence in program operation by fully addressing approaches to faculty needs and other requirements.

3. Clinical Requirements

Proposals should provide evidence to document the availability of adequate numbers and breadth of experiences to meet any required clinical or in-service placements.

4. Compliance with Accrediting Standards

The details of the proposed program should be consistent with both the standards of the Commission on Colleges, Southern Association of Colleges and Schools, and any applicable specialized accreditation. A potential timetable with milestones leading to specialized accreditation is appropriate to convey the institutional commitment. The proposal should also address the requirements of any applicable licensing authority.

5. Need for Graduates and Student Interest

The institution should provide evidence of long-term student interest and job market needs for graduates of specialized programs. Surveys of potential students and employers, as well as workforce analyses, are appropriate resources for addressing these criteria. Alternatively, the program may be advocated as appropriate for the development of a well-rounded array of basic baccalaureate degree programs at the institution where the principal faculty and other resources are already present to support approved programs and/or the general core curriculum requirements for all undergraduate students.

6. Avoiding Unnecessary Duplication of Programs

The proposal should indicate the location of identical or similar programs at other institutions in the state and provide evidence that the program would not be unnecessarily duplicative of existing programs. When other campuses of the A&M system offer the

program (other than the basic ones), evidence of discussion about likely impacts and efforts to collaborate with the appropriate individuals at the institution offering the program area need to be documented.

7. Costs

The proposal must include the Coordinating Board forms that provide estimates of new costs to the institution over the first five years related to the proposed program and provide information regarding sources of the funding which would defray those costs. Institution must show non-formula sources for all new costs during the first two years of operation since formula funds are not available during that period. In addition, institution must show that at least fifty percent (50%) of the new costs will come from non-formula sources during the first five years. The proposal should also indicate whether the implementation of the program is conditional upon special item funding.

8. Certification of Adequacy of Funding

Proposals for new programs must be accompanied by (a) a statement certifying the adequacy of funding or (b) a statement regarding the need for funds not yet available to the institution. (Refer to the Coordinating Board's Rules and Regulations, Chapter 13, Subchapter B, Procedures for Certification of Adequacy of Funds.)

While there is some specific mention of the Texas A&M University System in this discussion, the rules and guidelines are applicable and of value to any university in the state since review of the criteria are also made at the state level.

CHAPTER 5. DETAILED REVIEW OF SELECTED CURRICULUM

The program that follows was not done with any specific institution in mind. Rather it is intended to be generic in its approach but specific in its content to allow any university or college to adapt it for their use. As mentioned earlier, all parties involved in the program review and approval process give special consideration to compliance with accrediting standards. This includes any applicable specialized accreditation. In addition to the standard accrediting agencies for schools, the Council on Aviation Accreditation (CAA) accredits aviation programs.

The CAA is a non-profit organization that sets standards for aviation programs in universities and colleges in the United States in an effort to maintain performance and quality. Aviation educators along with the FAA designed the CAA who judges the quality of aviation courses. When programs are accredited, they are done so for five years. Many of the top aviation programs in the country are CAA accredited. These include:

- Arizona State University
- Embry-Riddle Aeronautical University – Daytona Beach and Prescott
- Florida Institute of Technology
- Louisiana Tech University
- Parks College of Engineering and Aviation of Saint Louis University
- University of Nebraska, Omaha
- University of North Dakota
- Western Michigan University

A program's lack of CAA accreditation should not be misconstrued as being inferior or one lacking quality. There may be other reasons for not having this designation including the fact that the institution may be in the process of applying for the accreditation. What should be taken from this is that those institutions that are accredited have been determined to meet or exceed the standards set forth by the CAA. The CAA is the result of a collaborative effort between the FAA and the University Aviation Association (UAA). According to their documents, the CAA accreditation "stimulates aviation program excellence and self-improvement through uniform

educational quality standards. It increases credibility and integrity of aerospace programs throughout the aerospace community."

The University Aviation Association is a professional association made up of individuals representing or working with institutions of higher education, which have programs in aviation and is the only professional organization representing all levels of the non-engineering/technology sector in collegiate aviation education. It was founded in 1950 and has as its vision, missions and objectives, the following:

Vision

Professional association and unifying voice for promoting, and furthering aviation education as a collegiate academic discipline.

Mission

To promote and foster excellence in collegiate aviation education by providing a forum for students, faculty, staff, and practitioners to share ideas, to enhance the quality of education, and to develop stronger programs and curricula. To influence aviation education policy at all governmental levels. To provide and nurture the linkage between collegiate aviation education, the aviation industry, and government agencies

Objectives

- To be an open forum for all collegiate aviation education
- To create and influence national policies related to aviation education
- To assist students, faculty, and institutions in defining and achieving their aviation education aspirations
- To encourage individuals to choose aviation-related career
- To assist in the professional development of individual members
- To promote awareness of collegiate aviation through interactions with the aviation industry and government
- To assist institutions in meeting the needs of the aviation industry and government
- To be a media resource for accurate aviation education information

The UAA has developed generic program curriculums for different types of aviation programs including those with flight, management, and technical options. They have outlined curriculums for associate, baccalaureate, and graduate degree programs based off of survey data from the mid-1970s. Though somewhat dated, the material remains quite relevant today. Tables 1 and 2 show sample aviation curriculums with a management option and a flight option, respectively.

Table 1
Typical Aviation – Management Option Curriculum

Typical Baccalaureate Aviation Curriculums - UAA Management Option	
Aviation Course Subject	**Semester Hours**
Aviation History	3
Aviation Legislation	3
Air Transportation	3
Airport Management	3
Air Cargo Management	3
International Aviation Law	3
General Aviation Management	3
Airline Operations	3
Sub-Total	**24**
General Studies	24
Mathematics/Science	15
General/Technical Electives	25
Business	36
Total Program	**124**

Source: University Aviation Association.

Table 2
Typical Aviation - Flight Option Curriculum

Typical Baccalaureate Aviation Curriculums - UAA Flight Option	
Aviation Course Subject	**Semester Hours**
Private Flight	5
Commercial Flight	5
Instrument Flight	5
Multi-Engine Flight	2
Airline Transport Flight or Flight Instructor Airplane	5
Aviation History	3
Aviation Legislation	3
Air Transportation	3
Flight Safety	2
Air Traffic Control	3
Meteorology	3
Airline Operations	3
Airport Management	3
General Aviation Management	3
Sub-Total	**48**
Aviation Elective/Minor	20
General Studies	24
Mathematics/Science	8
General Electives	24
Total Program	**124**

Source: University Aviation Association.

As part of the process of developing a generic curriculum, the curriculums of the three Oklahoma universities visited by project staff will be outlined. The large number of Texas students attending this program and the project staff's familiarity with these programs are the basis for this approach. These programs will then be viewed alongside of the programs at other nationally respected programs to arrive at a generic curriculum for both the professional pilot and aviation management tracks.

Southeastern Oklahoma State University

The university offers a bachelor's and master's degree program. The Bachelor of Science degree includes options in the following: professional pilot; aviation management-business; maintenance management; aviation management–safety; and, aviation management–security. The university offers 37 aviation-specific courses for undergraduates and 12 additional courses that support the graduate program. Nine of these courses make up the core curriculum that is required of all undergraduates in the aviation program. Table 3 shows this core curriculum.

Table 3
Southeastern Oklahoma State University Aviation Core Curriculum

Course Number	Course Title	Credit Hours
AVIA 3003	Aviation Meteorology	
AVIA 3023	Air Traffic Control	
AVIA 3113	Aviation Legal Problems	
AVIA 3234	Advanced Aircraft Systems	
AVIA 3334	Advanced Aerodynamics	
AVIA 3173	Aviation Safety	
AVIA 4643	Physiology	
AVIA 4663	Contemporary Topics in Aviation	
AVIA 4673	Crew Resource Management	
TOTAL		**29**

The professional pilot option includes 31 credit hours of specialized course work and the management-business option includes 21 credit hours of specialized course work. The course work for these options in shown in Tables 4 and 5 respectively.

Table 4
Southeastern Oklahoma State University Professional Pilot Curriculum

Course Number	Course Title	Credit Hours
AVIA 1004	Private Ground	
AVIA 1041	Private Flying	
AVIA 2083	Advanced Ground I	
AVIA 3123	Advanced Ground II	
AVIA 3152	Fundamentals of Flight Instruction	
AVIA 3164	Commercial Flying	
AVIA 3284	Instrument Ground Instruction	
AVIA 3321	Instrument Flying	
AVIA 3202	CFI Ground Instruction	
AVIA 3241	CFI Flying	
AVIA 3362	CFII Ground Instruction	
AVIA 3401	CFII Flying	
AVIA 4562	MEL Ground	
AVIA 4601	MEL Flying	
TOTAL		**31**

Table 5
Southeastern Oklahoma State University Management/Business Curriculum

Course Number	Course Title	Credit Hours
ACCT 2103	Fundamentals of Financial Accounting	3
ACCT 2203	Fundamentals of Managerial Accounting	3
BIM 3233	Business Communication	3
ECON 2213	Principles of Microeconomics	3
ECON 2633	Business Statistics	3
FIN 3813	Business Finance	3
MKT 3233	Principles of Marketing	3
TOTAL		**21**

Additional courses exist for the graduate program but are not listed here as the focus is on undergraduate degree programs.

University of Oklahoma

The University of Oklahoma offers 19 courses in aviation that support two different degree tracks. The first is the Bachelor of Science degree in Professional Studies/ Aviation – Professional Pilot option and the second is the Bachelor of Science degree in Professional Studies/Aviation – Aviation Management. Both require a core of aviation courses consisting of seven (7) credit hours. This core curriculum is shown in Table 6.

Table 6
University of Oklahoma Aviation Core Curriculum

Course Number	Course Title	Credit Hours
AVIA 1113	Introduction to Aviation	
AVIA 1222	Primary Flying	
AVIA 2231	Advanced Flying	
AVIA 2341	Secondary Flying	
TOTAL		**7**

The professional pilot track has additional course requirements of 20 hours and the courses are shown in Table 7. Table 8 shows the required courses for the aviation management track (13 credit hours).

Table 7
University of Oklahoma Professional Pilot Curriculum

Course Number	Course Title	Credit Hours
AVIA 3113	Commercial Aviation	
AVIA 3133	Fundamentals of Instrument Flight	
AVIA 3572	Instrument Flying	
AVIA 3581	Multi-Engine Flying	
AVIA 4313	Turbine Transition	
AVIA 4423	Crew Resource Management	
AVIA 4552	Commercial Flying	
AVIA 4713	Aviation Field Project (Capstone)	
TOTAL		**20**

Table 8
University of Oklahoma Aviation Management Curriculum

Course Number	Course Title	Credit Hours
AVIA 3113	Commercial Aviation	
AVIA 3133	Fundamentals of Instrument Flight	
AVIA 3572	Instrument Flying	
AVIA 4552	Commercial Flying	
AVIA 4713	Aviation Field Project (Capstone)	
TOTAL		**13**

There are also opportunities to take specialized aviation electives. These courses are shown in Table 9.

Table 9
University of Oklahoma Specialized Aviation Electives

Course Number	Course Title	Credit Hours
AVIA 3113	Advanced Flight Maneuvers	
AVIA 3581	Multi-Engine Flying	
AVIA 4113	CFI Seminar	
AVIA 4313 *	Turbine Transition	
AVIA 4423 *	Crew Resource Management	
AVIA 4602	Flight Instructor – Airplane	
AVIA 4613	Instrument Flight Instructor – Airplane	
AVIA 4622	Multi-Engine Flight Instructor	
AVIA 4983	Airline Management	
AVIA 4990	Special Studies in Aviation	

* Courses are required in the professional pilot option

These two degree options are quite similar. They both require a private and commercial license and an instrument rating. They are both recognized as "flight" options with the aviation management option offering what amounts to a general business minor. This minor requires more upper division business courses and omits the crew resource management class and the multi-engine flying requirement.

Oklahoma State University

Oklahoma State University offers 71 courses that support both undergraduate and graduate programs that include what is billed as the only doctoral program in aviation in the country. Undergraduate degree program options include professional pilot, aviation management, and technical services. Their masters and doctoral degree programs will not be discussed here in detail. The three different undergraduate options all have their own core requirements as well as a list of approved electives from which to choose that complement their core classes. General education requirements comprise 43 credit hours. A summary of requirements is shown in Table 10.

Table 10
Summary of Oklahoma State University Requirements

Course Requirements	Credit Hours
Number of hours in General Education	43
Number of hours in degree program core option	62
Number of hours in guided electives	15
Total number required for degree	120

Source: Oklahoma State University Catalog

The objective of the professional pilot program is to provide flight training through the commercial pilot certificate with instrument rating, multi-engine rating, and the certified flight instructor rating. This is in preparation to become a professional pilot and participate as a member of a flight crew. The required courses are shown in Table 11.

The objective of the aviation management option is to prepare students for management positions in the aviation and space industry such as management in fixed-base operations, air carriers, corporate flight departments, commuter and air taxi flight operators and a variety of jobs associated with operating airports. The required courses for the aviation management option are shown in Table 12.

The objective of the technical services option is to prepare students for supervisory and management positions in all areas of the aviation industry. The core requirements for this option are shown in Table 13.

Table 11
Oklahoma State University Core Requirements for the Professional Pilot Option

Course Number	Course Title	Credit Hours
AVED 1113	Theory of Flight	3
AVED 1403	Basic Aeronautics	3
AVED 2113	History of Aviation or 2203	3
AVED 2203	Impact of Aviation and Space Exploration on Society or 2113	3
AVED 2122	Commercial Flight Lab I	2
AVED 2132	Commercial Flight Lab II	2
AVED 2142	Commercial Flight Lab III	2
AVED 2213	Theory of Instrument Flight	3
AVED 2313	Theory of Commercial Flight	3
AVED 3231	Theory of Multi-Engine Flight	1
AVED 3341	Multi-Engine Flight Lab	1
AVED 3243	Human Factors in Aviation	3
AVED 3333	Advanced Aircraft Systems	3
AVED 3443	Aviation Law	3
AVED 3533	Aircraft Turbine Engine Operation	3
AVED 3663	Air Transportation	3
AVED 4113	Aviation Safety	3
AVED 4133	Principles of Flight Instruction	3
AVED 4213	Current Trends and Issues in Aviation	3
AVED 4231	Flight Instructor Flight Lab	2
AVED 4303	Aviation Weather	3
AVED 4703	Crew Resource Management	3
LSB 3213	Legal and Regulatory Environment of Business	3
MSIS 2103	Business Computer Concepts and Applications	3
TOTAL		**62**

Table 12
Oklahoma State University Core Requirements for the Aviation Management Option

Course Number	Course Title	Credit Hours
AVED 2113	History of Aviation or 2203	3
AVED 2203	Impact of Aviation and Space Exploration on Society or 2113	3
AVED 3443	Aviation Law	3
AVED 3513	Aviation Management	3
AVED 3523	Airport Planning and Management	3
AVED 3553	General Aviation Management	3
AVED 3563	Aviation Marketing	3
AVED 3573	Aviation Finance	3
AVED 3663	Air Transportation: The Industry	3
AVED 4113	Aviation Safety	3
AVED 4213	Current Trends and Issues in Aviation	3
BCOM 3113	Written Communication	3
BCOM 3223	Organizational Communication	3
LSB 3213	Legal and Regulatory Environment of Business	3
MGMT 3013	Management	3
MKTG 3213	Marketing	3
MSIS 2103	Business Computer Concepts and Applications	3
Upper Division	15 hours recommended in AVED, ECON, FIN, MGMT, MKTG and/or MSIS	15
TOTAL		**62**

Table 13
Oklahoma State University Core Requirements for the Technical Services Option

Course Number	Course Title	Credit Hours
AVED 2113	History of Aviation or 2203	3
AVED 2203	Impact of Aviation and Space Exploration on Society or 2113	3
AVED 3443	Aviation Law	3
AVED 3553	General Aviation Management	3
AVED 3563	Aviation Marketing	3
AVED 3573	Aviation Finance	3
AVED 3663	Air Transportation: The Industry	3
AVED 4213	Current Trends and Issues in Aviation	3
BCOM 3113	Written Communication	3
BCOM 3223	Organizational Communication	3
LSB 3213	Legal and Regulatory Environment of Business	3
MGMT 3013	Management	3
MSIS 2103	Business Computer Concepts and Applications	3
Upper Division	ECON, FIN, MKTG and/or MSIS	7
Course Work	Aviation Applied Science	25
TOTAL		**62**

The guided electives are taken from departments across the university including accounting, aviation, computer science, economics, finance, management, and marketing. The specific courses are not mentioned as a part of this analysis.

Louisiana Tech University

The aviation programs at Louisiana Tech University are offered through the Department of Professional Aviation in the College of Liberal Arts. The department offers 40 undergraduate courses that support two degree programs. The first is a bachelor of science in professional aviation and the second is a bachelor of science in aviation management.

The professional aviation program is designed to prepare those who wish to pursue careers as professional pilots. The aviation management program is designed to prepare those wishing to pursue careers in management for aviation-related organizations in either the public or private sectors. To earn a degree, students must complete a total of 125 semester credit hours for the professional aviation program and 123 semester credit hours for the aviation management program. The program and core requirements for the professional aviation degree program are shown in Tables 14 and 15, respectively. The program and core requirements for the aviation management degree program are shown in Tables 16 and 17, respectively. Both of the programs are interdisciplinary in nature.

Table 14
Louisiana Tech University Program Requirements for the B.S. in Professional Aviation

Program Requirements	Credit Hours
Humanities	3
English	12
History	3
Psychology	3
Social Science	6
Speech	3
Mathematics	6
Natural Sciences	9
Aviation Required Courses	53
Aviation Electives	27
Total	**125**

Source: Louisiana Tech University.

Table 15
Louisiana Tech University Core Requirements for the B.S. in Professional Aviation

Course/Number	Course Title	Credit Hours
PAV 101	Private Pilot Ground I	3
PAV 102	Private Pilot Ground II	3
PAV 110	Private Pilot Flight I	1
PAV 111	Private Pilot Flight II	1
PAV 200	Aircraft Powerplant Systems	3
PAV 208	Introduction to Computers	2
PAV 239	Aviation Weather	3
PAV 240	Instrument Pilot Ground I	3
PAV 241	Instrument Pilot Ground II	2
PAV 242	Instrument Flight I	1
PAV 243	Instrument Flight II	1
PAV 340	Commercial Pilot Ground I	3
PAV 341	Commercial Pilot Ground II	2
PAV 342	Commercial Pilot Flight I	1
PAV 343	Commercial Pilot Flight II	1
PAV 344	Commercial Pilot Flight III	1
PAV 303	Aerodynamics	3
PAV 322	Aviation Law	2
PAV 331	Air Carrier Systems	3
PAV 400	Multi-Engine Ground	2
PAV 410	Multi-Engine Pilot Flight	1
PAV 411	Instructor Pilot Flight	1
PAV 414	Flight Instructor Ground	3
PAV 419	Supervised Practice Flight/Ground Instruction	1
PAV 491	Aviation Safety	3
PAV 495	Aviation Professionalism	3
Total		**53**

Table 16
Louisiana Tech University Program Requirements for the B.S. in Aviation Management

Program Requirements	Credit Hours
Humanities	3
English	12
History	3
Management	18
Sociology	3
Speech	6
Political Science	3
Psychology	12
Biological Science	3
Computer Science	2
Computer Information Systems	6
Mathematics	6
Physics	6
Quantitative Analysis	3
Professional Aviation	37
Total	**123**

Table 17
Louisiana Tech University Core Requirements for the B.S. in Aviation Management

Course Number	Course Title	Credit Hours
PAV 101	Private Pilot Ground I	3
PAV 102	Private Pilot Ground II	3
PAV 110	Private Pilot Flight I	1
PAV 111	Private Pilot Flight II	1
PAV 223	Fixed Base Operations	3
PAV 303	Aerodynamics	3
PAV 320	Corporate Aviation	3
PAV 322	Aviation Law	2
PAV 315	Airport Planning and Management	3
PAV 407	The National Airspace System	3
PAV 440	Airline Economics and Management	3
PAV 490	The Government Role in Aviation	3
PAV 491	Aviation Safety	3
PAV 495	Aviation Professionalism	3
TOTAL		**37**

Embry-Riddle Aeronautical University

Although its main campus is in Daytona Beach, Florida and its satellite campus is in Prescott, Arizona, Embry-Riddle Aeronautical University has a presence in numerous cities across the country and the world. This presence is maintained through 130 extended campus/distance-learning centers including six in the state of Texas. Additionally, ERAU operates other extended campuses in the region with three centers in New Mexico, three in Oklahoma, one in Louisiana, and one in Arkansas. These centers offer courses through a broad-based telecommunications network. A wide array of degree programs is available at the associate's, bachelors, and master's level in aviation business administration (A, B, M), aviation maintenance management (B), aviation management (B), management of technical operations (B, M), professional aeronautics (A, B), and aeronautical science (M).

These programs are typically for those who are already professionals in some aspect of the aviation industry that are looking to earn a college degree or an advanced degree in their particular field. College credit is given to applicants for prior learning. The Embry-Riddle Aeronautical University extended campus/distance learning centers in Texas and their degree offerings are listed below.

<u>Corpus Christi Center</u>

Associate in Science in Aircraft Maintenance
Associate in Science in Aviation Business Administration
Associate in Science in Professional Aeronautics
Bachelor of Science in Aviation Business Administration
Bachelor of Science in Aviation Maintenance Management
Bachelor of Science in Management of Technical Operations
Bachelor of Science in Professional Aeronautics
Master of Aeronautical Science (Management/Operations/Safety)
Master of Business Administration in Aviation

<u>Dyess Center</u>

Associate in Science in Professional Aeronautics
Bachelor of Science in Aviation Maintenance Management

Bachelor of Science in Management of Technical Operations

Bachelor of Science in Professional Aeronautics

Master of Aeronautical Science (Management/Human Factors/Operations/Safety)

Fort Worth Center

Associate in Science in Professional Aeronautics

Bachelor of Science in Management of Technical Operations

Bachelor of Science in Professional Aeronautics

Master of Aeronautical Science (Management/Operations/Safety)

Master of Business Administration in Aviation

Houston Center

Associate in Science in Professional Aeronautics

Bachelor of Science in Management of Technical Operations

Bachelor of Science in Professional Aeronautics

Master of Aeronautical Science (Human Factors/Management/Operations/Safety/Space Studies)

Master of Science in Technical Management

Kingsville Center

Associate in Science in Aircraft Maintenance

Associate in Science in Aviation Business Administration

Associate in Science in Professional Aeronautics

Bachelor of Science in Aviation Business Administration

Bachelor of Science in Aviation Maintenance Management

Bachelor of Science in Management of Technical Operations

Bachelor of Science in Professional Aeronautics

Master of Aeronautical Science (Management/Operations)

Master of Business Administration in Aviation

San Antonio Center

Associate in Science in Professional Aeronautics

Bachelor of Science in Management of Technical Operations

Bachelor of Science in Professional Aeronautics

Master of Aeronautical Science (Management/Operations/Safety)

All of these programs centers in Texas are located on current or former military installations where they appear to cater, at least initially, to those professionals associated with the military or civilian aerospace/defense industry. None of the university's extended campus locations offers any flight training. According to ERAU officials, however, credit for existing flight credentials can be awarded towards academic degree programs depending on the particular program and the credentials being awarded.

Appendix A includes detailed course descriptions for some of the universities discussed in this chapter. Appendix B includes a lengthy list of college and universities that offer aviation programs. Appendix C includes more detailed information on The Council on Aviation Accreditation while the Department of Educations Classification for Instructional Program codes and descriptions for aviation related programs is in Appendix D (3).

CHAPTER 6. DEVELOPMENT OF A GENERIC CURRICULUM

In developing a generic curriculum, many aspects of many different programs were examined. In addition to those colleges and universities listed earlier in this document, the curriculums at Ohio State University and Purdue University were examined. The curriculums and course offerings at Ohio State University, Purdue University, Arizona State University, Southern Illinois University, Saint Louis University's Parks College, and the University of North Dakota, were looked at perhaps more closely than others. This was done because of the nature of the universities themselves. They are large, state universities (with the exception of Saint Louis University) that resemble in many ways the type of university it is hoped will house such a program in the state of Texas. This includes the political and economic environments that universities must operate in to succeed. Saint Louis University is a large, comprehensive private university that is home to the first aviation program in the country.

These programs range in their total credit hour requirements from 120 to 128. These requirements are typically set by individual universities, as are their specific general education requirements. Additionally, the number of aviation courses in aviation management programs vary from 29 to 43 while the professional pilot programs sees some variation from 27 to 78. The professional pilot programs have more aviation classes as they include flight and ground school courses as part of the curriculum. The additional units in the aviation management curriculum are made up by required courses from supporting departments. These often include departments including accounting, marketing, general business, political science, statistics, computer science, and speech/communications, as well as other departments from the colleges or schools of business, engineering, or education.

From the review of these curriculums, a core set of aviation courses emerged. This core is important to both aviation management and professional pilot programs. These courses are all three credit hour courses and are typically junior-level and senior level courses. They include:

- Aviation History
- Air Transportation
- Airport Planning and Management
- Aviation Law

- Airline Administration/Operations
- Air Traffic Control
- Aviation Safety
- Aviation Weather/Meteorology

These core classes comprise 24 credit hours and provide a well-rounded background into the field of aviation. The core courses listed here are quite similar to those outlined by the University Aviation Association.

Curriculums in the professional pilot programs all have a very standard core of ground school classes as well as the accompanying flight classes. Outside of the flight requirements there is some variation with some programs offering a few non-flight aviation electives and others offering none. This standard core is listed below. It should be noted that the amount of credit given to the flight classes varies somewhat. These courses include:

- Private Pilot Ground
- Private Flight
- Instrument Pilot Ground
- Instrument Pilot Flight
- Commercial Pilot Ground
- Commercial Pilot Flight
- Multi-Engine Pilot Ground
- Multi-Engine Pilot Flight
- Flight Instructor Ground
- Instructor Pilot Flight (CFI).

Additional courses that may be part of a core depending on the extent and capabilities of the flight training program include:

- Instrument Flight Instructor Ground
- Instrument Instructor Pilot Flight (CFII)

- Multi-Engine Instructor Pilot Ground
- Multi-Engine Instructor Pilot Flight (MEI).

The professional pilot programs all include the private through flight instructor requirements. Not all of the programs include the multi-engine ground/flight courses as part of the program requirements while others do not include the instrument instructor requirements.

The naming conventions of the ground and flight courses are not universal but encompass the material required to obtain the rating or license of the same name. Often the private pilot ground and flight requirements are broken down into two courses for the ground instruction and two for the flight requirement. Some institutions break down others (i.e., commercial or instrument) in a similar way. This determination is best made with aviation flight instruction professionals who are familiar with a successful program to use as a model. This model should then be integrated into an academic setting with consideration for the time required to complete the requirements before translating it into credit hours. Examples of this are given in the appendix where the course offerings of several aviation programs are included.

Additional classes important to the study of aviation but not included in the core include the following courses derived from the review of the undergraduate programs for the schools listed above. Many of these can be included by programs as core classes or as supplementary to a core for both aviation management and professional pilot programs. These classes are typically three credit hour classes. They include:

- Air Cargo Management
- General Aviation Management
- Contemporary Issues in Aviation
- Aviation Marketing
- Aviation Finance
- National Airspace System
- Corporate Aviation
- Fixed Base Operations
- Aviation Professionalism
- Aviation Capstone (Senior Project)

- Government Role in Aviation
- Air Navigation
- National Aviation Policy
- Aviation Logistical Management
- Human Factors
- Flight Physiology
- Introduction/Orientation to Aviation
- Aviation Infrastructure, and
- Air Transport Labor Management.

While there can be some degree of latitude in determining additional aviation management program course requirements when finishing out the program, the needs of the professional pilot programs are more clear. There is little doubt that additional requirements for these programs should include, at a minimum, the following courses:

- Human Factors in Aviation
- Crew Resource Management, and
- Theory of Flight or Aerodynamics or equivalent.

While this may be considered a minimum for the curriculum, these programs can and should be expanded and/or specialized to accommodate the expertise or areas of concentration of the academic department that houses the aviation program. This can include coursework on power plant systems, aircraft materials, physiology, aircraft design, or instructional methods as well as any of the aviation courses listed above. Additional coursework for the aviation management programs should also focus on the particular programs strengths as dictated by where the program is located administratively within the university. For example, business programs should include a business core while engineering programs should include some basic engineering core. The aviation management programs at both the University of Oklahoma and Louisiana Tech University require their students to earn a private pilot's license.

Many of the university programs discussed in this report have additional coursework available in various aviation topics. Some are more advanced treatments of the topics already

mentioned and others are in addition to those offering more specialized or focused courses. Many universities also offer graduate courses across a wide-spectrum of aviation subjects leading to a fairly comprehensive program.

In reviewing aviation programs, one quickly realizes the importance of internship programs for both professional pilot and aviation management options. Information on internships is available from a variety of sources. These include the University Aviation Association (UAA), the American Association of Airport Executives (AAAE), and the National Air Transportation Association (NATA). Student organizations can also be helpful in the educational process and for future career networking. Universities with aviation programs often have student chapters for a variety of organizations including AAAE and Alpha Eta Rho, a group geared for flight students. There is also a National Intercollegiate Flying Association (NIFA) that hosts flight competitions between schools.

CHAPTER 7. EXISTING AVIATION PROGRAMS AT TEXAS UNIVERSITIES

The interim report detailed the programs at three Oklahoma universities while also discussing the programs at several major public universities in the country. Little mention was made of programs in Texas. This chapter will focus on the programs at two public universities in the state that currently have aviation programs. Much of the information on these programs presented here is from the author who made visits to both campuses and interviewed both program officials and administrative officials that oversee these programs. These two programs are located at Texas Southern University in Houston and Tarleton State University at their Central Texas campus in Killeen.

Texas Southern University, Houston, Texas

Texas Southern University (TSU) is home to the only airway science curriculum in Texas. According to those involved with the program, it was initially developed by Dr. Naomi Ledé as a response to the air traffic controller strike in the early 1980s. TSU was the beneficiary of FAA grants to establish the program that included funding for computer equipment and a new building to house the program. The building houses classrooms, faculty offices, and the laboratories that are discussed below. The TSU program has undergraduate focuses in airway science management and airway computer science and continues to train professional for careers in aviation. Graduates have advanced to careers as air traffic controllers with the FAA while others are now working for airports including the Houston Airport System.

The airway science program currently has approximately 70 students. They are about evenly split in the management and computer science tracks. Approximately 25 percent of them are taking flight lessons but not through a university-sanctioned program as one does not exist. This training is being conducted under Federal Aviation Regulation (FAR) Part 61 with flight instruction being provided by an unrelated contractor. The enrollment has been stable over the past several years and approximately 14 students graduate every year. Program officials stated that they have not had any problems retaining students and that 50 to 60 percent of them graduate in four years. Most of the students are from the Houston area with some coming from out of state and some from abroad.

The airway science program is run by program director that reports to the chair of the Department of Transportation Studies. This department falls under the leadership dean of the College of Science and Technology. The airway science program currently has only two faculty members. One is an assistant professor and the other is an instructor. Together, they teach the aviation courses the program offers. The program does not have a professional pilot or flight curriculum but has, in the past, made flight training available to interested students. This was accomplished through a fixed-base operator at Ellington Field in Houston. They have not had any difficulty in recruiting faculty. The last opening had 15 applicants. Most of them had master's degrees and significant aviation experience (10+ years).

The program does have other aviation resources to train students. They have three flight simulators to teach flight principles and procedures. They also have several computer laboratories. One is an air traffic control lab used in training air traffic controllers. There are five stations with each station having a pilot and controller seat. There is also a flight meteorology lab that has six stations. This lab is not currently functioning due to computer viruses. There are also two additional computer labs available to students for completing their schoolwork. One has 22 screens and the other has 12 flat screens.

The two faculty members are working to expand the existing aviation program. They are attempting to add an advanced air traffic control course to the curriculum. The program currently sends three or four students per year to Mark Academy in Minneapolis, Minnesota. This academy is an FAA contractor for providing air traffic control system training for future controllers. These students typically attend the training academy after they graduate from TSU. The faculty is also currently working on writing a flight ground school curriculum that will ultimately be integrated into a formal flight education, or professional pilot, program. They have been working with a FAR Part 141 flight school at Houston Hobby Airport to provide the flight instruction under a contract with the university. They indicated that this is also important because a Part 141 program was necessary for students to qualify for financial aid. Without this status, many students would not be able to afford to attend. They also indicated that there would be some interest from flight training provider Flight Safety to partner with and provide the flight training aspects of the program.

The program's size is down from the 80 to 90 students it had before the problems in the airline industry hit. It could accommodate more students and use adjunct faculty to meet the

teaching demand. The faculty believes that if they had a flight program and conducted some recruiting, they could double the enrollment in the program. As it is now, students in the Houston area that want a collegiate flight education go to Louisiana Tech University in Ruston, Louisiana or to Delta State University in Cleveland, Mississippi.

Currently, TSU has an agreement with Continental Express Airlines to offer some students an internship. These students typically have commercial, multi-engine, and instrument flight ratings. On the successful completion of the internship, the students will receive preference for an interview that may lead to employment with the airline. Under this scenario, it is possible for students, after graduation, to end up in the right seat of a Continental Express aircraft with 500 to 600 hours. These efforts by TSU, which is designated a Historically Black College and University, are in conjunction with Continental Express and the Organization of Black Airline Pilots (OBAP) to increase the number of minority pilots holding an airline transport pilot (ATP) rating and increase their representation in the airlines.

The placement of other graduates, as briefly mentioned above, has been good. In addition to those already mentioned, graduates have gone to work for the airlines including Continental and Southwest as well as for a number of computer companies. Program faculty believes that after five years, most of the former students continue to work in the aviation field. They do hold an annual alumni dinner in December and do maintain a partial list of their graduates. Information on the program's courses and curriculum is included in Appendix E.

Tarleton State University System Center, Central Texas, Killeen, Texas

Tarleton State University is located in Stephenville, Texas approximately 65 miles southwest of Fort Worth. The aviation science program is located at the Tarleton State University System Center – Central Texas in Killeen. Established in September of 1999, Tarleton Central Texas uses the existing facilities that were previously Central Texas College, a private two-year college. This location is also very close in proximity to the Fort Hood Army installation. The campus in Killeen serves the Temple-Killeen metropolitan area of over 300,000 people. Current programs at the System Center in Killen serve approximately 1,700 students. These students are all upper-division students and graduate students. No freshman or sophomore level courses are available.

Among the students at the System Center are those taking classes in the university's aviation science program that offers bachelor's degrees in aviation science with both a professional pilot option and an aviation management option. The school catalog also notes the availability of an option in computer science, but that will not be included in this discussion. Tarleton aviation program officials also noted that officials at Fort Hood would like them to offer an aviation technology/maintenance option.

Tarleton's aviation science program benefits from a series of articulation agreements with four community colleges. While the university's catalog provides the rules and policies employed in determining how credit hours are transferred from the community college to the university, articulation agreements provide for the transfer of credit from a specific community college to the university where it has the agreement. This is done for a specific group of students following a specific course of study intended to result in degree that has been defined in the articulation agreement.

These agreements allow for the transfer of freshman and sophomore level credits to be applied to the bachelor's degree program. Over 80 semester credit hours are granted for transfer through these agreements. These agreements are with Central Texas College, Texas State Technical College (TSTC), San Jacinto College, and Southwest Texas Junior College. There are two of these schools within 25 miles of the System Center facility. In these arrangements, the junior colleges provide the lower-division courses (flight training and ground school) while Tarleton provides the upper-level course requirements. Tarleton officials work closely with their community college partners to ensure that the program and curriculum remain current. The aviation-related courses currently offered at Tarleton and included in these articulation agreements include:

- Air Carrier Operations,
- Techniques of Instruction,
- Air Traffic Control,
- Airport Management,
- Aviation Law,
- Flight Engineer, and
- Aviation Safety.

As mentioned earlier, the remaining aviation and ground schools courses are provided by the junior colleges. These courses include flight theory, air navigation, aviation meteorology, human factors, propulsion systems, aerodynamics, and airline management. The referenced articulation agreements are found in Appendix F. This academic program is heavily front-loaded with aviation courses in the first two-years with all of the instruction being provided by the community colleges. While the articulation agreements are quite similar in terms of course requirements, they are not identical. One example of this is that Central Texas College does not require the certified flight instructor rating (CFI) for an associate's degree while TSTC and San Jacinto College do require an associate's degree.

The aviation science program currently has one full-time faculty member and occasionally makes use of adjunct faculty to accommodate demand. Currently there is not a need for an additional full-time faculty member. The cost of this program to Tarleton is basically the cost associated with the one faculty member and the overhead expenses that go with administering an academic program. In the case of this particular program, costs are nominal as any administrative support and supplies can be shared with other departments. In terms of the administrative structure, the program is under the direction of the lone faculty member who is the primary contact. It is located in the Department of Management, Marketing, and Administrative Systems in the College of Business under the direction of a department head and dean respectively. The program and department are under the guidance of the Academic Dean who reports to the Executive Director and CEO of Tarleton State University - Central Texas.

The program currently has approximately 60 active students of which two-thirds to three-fourths are in the professional pilot option. Most of the aviation management students are experienced pilots (many from Fort Hood) who are seeking to earn four-year degrees to pursue aviation management jobs following their military service. The professional pilot program seeks to prepare pilots for jobs as regional airline pilots.

Most of the students are from Texas with an occasional out-of-state and international student enrolling in the program. It is a fair assessment to say that many of the students in the program are non-traditional students, meaning that they are not directly out of high school enrolling in a four-year college program. The lack of lower-division courses and aviation training facilities at the university contribute to it not being a comprehensive four-year program. Nonetheless, the program does succeed in training professional pilots. It is one model of a university flight

program and it serves them well. Students wishing to transfer in and obtain credit for existing flight experience may get credit but will have to take the ground school courses. This is done on an individual basis.

The program has grown in terms of the number of students since the fall of 1999 and is expected to continue to grow at a moderate level. The student body in the program consists of largely white males with few women and few minorities. The program does offer internship opportunities with American Airlines. Those who successfully complete the internship program are guaranteed interviews with American Airlines and may be given a hiring preference. In the past two years, five Tarleton students have successfully completed their internships at American Airlines.

Currently, the aviation program only informally tracks its graduates. Graduates of the program have gone on to work as pilots for American Southeast Airlines (ASA) and Continental Express. In addition, there are students who graduated from the Tarleton predecessor school, University of Central Texas, that are currently flying for major airlines. A program official said that it typically takes approximately five years following graduation to build up enough flight time to be considered for employment for a major airline. This is typically done working as a flight instructor, flying as a charter pilot, and working for a regional airline. Since the Tarleton program has only been operating since 1999, it is difficult to make any assessments of the program with respect to its graduates that are now employed by major airlines. A program official also noted that the hiring outlook and employment trends are somewhat difficult to gauge now considering the events of September 11, 2001 and the current economic and airline industry problems.

The greatest challenge the program faces is keeping up with industry changes. This includes changes in flight procedures and changes in the industry trends that impact students obtaining jobs with regional air carriers. Many students leave the Tarleton program with a bachelor's degree and approximately 1,000 hours of flight time. By the time students begin attending Tarleton, they typically have significant flight time built up since their aviation courses, including flight courses, have been front-loaded at the community college. The university is aware that the major airlines want their new hires to have four-year degrees and they feel their program achieves that end.

Additional Aviation Educational Resources in Texas

While the only two aviation degree programs in the state are discussed above, there are some additional educational resources in the state pertaining to aviation at the university level. Midwestern State University in Wichita Falls offers a bachelor's degree in applied arts and sciences that has an option in aviation management. The program is designed for individuals who already have experience in the aviation field but who are looking for opportunities to complete a college degree. This includes individuals who may have technical training from vocational schools, the military, community colleges, or industry.

The program offers eight aviation courses including introduction to aviation administration, regulation of the aviation industry, legal environment of aviation, airport administration, planning and development, general aviation administration and marketing, administration of aviation maintenance, labor law and relations, and aviation safety. The program is included in the inventory of declared majors kept by the Texas Higher Education Coordinating Board (THECB).

The THECB also provides an inventory of courses by curriculum area for the schools in the state. This inventory showed aviation related courses at Southwest Texas State University, The University of Texas at Austin, and West Texas A&M University. All three of these schools had only one aviation course in the inventory. These courses are in addition to the programs at Texas Southern University, Tarleton State University, and Midwestern State University. This program and course inventory provided some of the basis for deciding what universities to contact regarding developing or expanding aviation programs at their institution.

CHAPTER 8. IDENTIFICATION OF POTENTIALLY INTERESTED TEXAS UNIVERSITIES

This chapter briefly describes the process used to identify those public universities in Texas contacted regarding their interest in developing or expanding an aviation program that would ultimately resemble the types of comprehensive aviation programs discussed in the interim report. A total of nine universities were sent letters asking them to discuss their interest in developing or expanding an aviation program. A copy of the letter they received as well as a copy of their responses is included in Appendix G.

In addition to visiting to the two-aviation degree programs mentioned in the previous section, researchers also had several conversations with Dr. Peter Hall at the University of North Texas in Denton (UNT). Dr. Hall is a member of that university's faculty where he holds a professorship in the history department. He has also served as a special assistant to the chancellor at the University of North Texas where he authored a report entitled *Aviation at the University of North Texas*. This report is included in Appendix H of this study. It addresses many issues related to aviation programs including whether or not there is a need, how such a program should be structured, and how the university should proceed. The report concluded that additional consideration should be given to such a program. It also made several recommendations regarding issues for universities to consider that remain relevant today. Aviation programs are complex and expensive compared to typical academic programs and all deliberate speed is required when contemplating their development or expansion.

Dr. Hall's report makes several recommendations that remain relevant for institutions interested in establishing or expanding an aviation program. He concludes that Texas should support a major aviation program at a public university largely due to the fact that the state is home to a very large aviation industry. This includes 300 airports, 27 of which are commercial service airports. It is also home to three major airlines and numerous defense and aerospace companies. The North Texas Commission places the aviation industry's contribution to the Dallas/Fort Worth Metroplex region at more than $23 billion. The commission also identified north Texas as a world center of aviation and their aviation promotional document is included in Appendix I. According to the North Texas Commission, north Texas alone is home to American Airlines, Southwest Airlines, Federal Express' regional hub, United Parcel Service's regional hub, Lockheed Martin, Bell Helicopter Textron, Gulfstream Aerospace, Boeing, Northrop

Grumman, Rockwell Collins, Hughes, American Eurocopter, Bell Augusta, and Honeywell Flight Systems.

Researchers contacted nine universities by mail asking them to discuss their interest in either developing a new comprehensive, four-year degree program in aviation or expanding an existing one. This comprehensive program would include both aviation management and professional pilot options. The letter was sent to the university's provost and was accompanied by a copy of the interim report written in the first year of this study that described in detail what comprehensive programs offer and how they are structured. The interim report also described a generic curriculum to give the universities an idea of what was involved in such a program. When possible, related faculty members and administrators were sent a copy of the letter so as to keep them apprised of our efforts and give them a chance to communicate and coordinate their ideas with the provost.

The nine universities were selected based on existing programs and existing status as a major educational institution viewed as having the resources, interest, and capability of developing such a program. The geographic nature of the university as well as the extent of the academic programs available influenced the list. The review of Oklahoma aviation programs and that of the others listed in the interim report noted that the breadth of academic programs is important. Aviation programs can be located in colleges of business, engineering, education, or even as a separate entity. Having any and all of these programs can enhance an aviation program and offer aviation students opportunities not available to students of universities or colleges with limited curriculums.

In addition, there may be existing synergies and collaborative resources available at the larger universities that may make an aviation program feasible or viable. Joint appointments and research centers can also contribute to new academic program development. Therefore, having vast multidisciplinary educational resources is an asset when examining the possibility of developing a new program. Because of this, the state's flagship universities were included in the list.

The review of Southeastern Oklahoma State University in Durant, Oklahoma revealed that student recruitment and retention is an issue for them due to their geographic location. Limited attractions and "things to do" are a factor they must deal with in attracting and retaining students. Therefore, a focus was placed on institutions in metropolitan areas under the logic that the major

issues of recruiting and retaining students would be removed. This issue may also be relevant for faculty members. The nine universities are:

- Tarleton State University, Central Texas, Killeen,
- Texas Southern University, Houston,
- Midwestern State University, Wichita Falls,
- Southwest Texas State University, San Marcos (now Texas State University at San Marcos),
- The University of Texas, Austin,
- University of Houston (university and system), Houston,
- University of North Texas, Denton,
- Texas A&M University, College Station, and
- Texas Tech University, Lubbock.

All nine of the universities were sent a letter as previously indicated and are included in the aforementioned appendix in generic form. Approximately a month later, a follow-up letter was sent to the same individuals. The letter asked for the university's interest in an aviation program despite the financial constraints that may exist. With the current budget picture being quite dismal for higher education and government as a whole, researchers sought an accurate a measure of interest without the added burden of the current economic and financial situation. While cost is always a valid factor in program development, an assessment of real interest was being sought in spite of the bleak outlook. This was done with the hope that brighter economic times may prevail in the future and cost may not be as big a factor in the future as many in higher education might feel it is today.

Responses

A total of eight universities responded in writing and two of those followed up with phone conversations. Only Texas Tech University did not respond. The written responses, some on university letterhead and others in e-mail form are included in the Appendix F as noted above. There were three of the responses that are worthy of additional discussion. These responses are

from Tarleton State University, Central Texas, Texas Southern University in Houston, and the University of North Texas in Denton.

The response from Tarleton State University, Central Texas came in the form of an e-mail Dr. John Idoux, the Executive Director and CEO of Tarleton State University, Central Texas. Dr. Idoux received the letter and interim report from Dr. Stephen Vitucci, the academic dean at Tarleton's Central Texas facility that houses the aviation program. The original letter was sent to Dr. Vitucci, who the author met on his visit to the campus. This was done because sending the letter to the provost of the university in Stephenville did not make sense considering the circumstances. The facility in Killeen operates as an independent system center and it appears to have a certain amount of autonomy in its operations. Sending the letter to a more local administrator who could speak for the program and was more familiar with its operations made more sense in this instance. This particular aviation program has several articulation agreements with community colleges across Texas and discussions of their future plans appeared more appropriate at a more local level.

In discussions with Dr. Idoux, researchers found that Tarleton is proud of its program and ralizes that it is the only four-year program in aviation that has an associated flight curriculum. They feel their program is doing a good job of training aviation professionals including pilots. Their program continues to grow and as it does, they will add faculty as needed. They use and will continue to use adjunct faculty when necessary and will add a second or third faculty member when the program size warrants.

Dr. Idoux noted the articulation agreements that they have in place with certain community colleges. They feel that these colleges are providing them with good students and they do not have any intention of taking over any of the functions that these community colleges currently provide, such as flight instruction. Tarleton's Central Texas facility is an upper-level and graduate institution and changing that is not something they seem to be interested in doing at this time. Dr. Idoux stated that absorbing the flight program of Central Texas College, the nearest community college with which they have an articulation agreement, is not a possibility because of the fact that they do not offer lower-division courses. He also stated that this would not happen even if Tarleton State University, Central Texas became a four-year institution, such as Texas A&M University, Central Texas, and were able to offer lower-division classes.

Dr. Idoux stated that he would be opposed to any taxpayer money being spent on a new academic program in aviation since there is already an aviation program at Tarleton with articulation agreements with Central Texas College and Texas State Technical College (TSTC) in Waco. As for expanding, he said their program is growing and they will adjust according to that growth.

Texas Southern University (TSU) is the only other university in the state with a degree program in aviation. They do not have a flight program but are working to develop one. The response from TSU came from one of their two faculty members and the only one who holds a tenure-track position. He indicated that they are not able to commit to expanding the program, but would consider such a program at TSU in the future. No response was received from the department chair, college dean or the provost who were all included in the distribution list. This response, or lack of one, makes it difficult to ascertain where the administration stands on the program and its future. Without a clear direction, one is left to guess as to how the university feels about the program and its future. It appears that the program has not had adequate attention from the university since it received grants from the FAA. There are no tenured faculty, one tenure-track faculty, no flight program, and computer labs that have been rendered useless due to computer viruses. There does seem to be interest in the aviation program from students. But the larger question for the program is one of survival not expansion. TSU has a base from which to work should they choose to move forward on rescuing and expanding the program. It does not appear they have that interest at the level needed.

UNT responded with a letter expressing interest in a comprehensive aviation program and noted their long-time interest in one. The letter also notes the significant aviation industry in the north Texas region and their belief that the region and state could benefit from such an academic program. Additionally, there were several telephone conversations with Dr. Hall who authored UNT's review of these issues in 1998. Funding is a major issue for UNT as would be of any institution seeking to expand or develop new academic programs. They do not currently have surplus funds available to fund such a program, but remain interested with clear belief that such an aviation program would be valuable in serving the industry and those wishing to pursue aviation careers.

None of the other universities contacted responded favorably to such a program and Texas Tech University did not respond at all. Reasons given by the universities centered on a lack of

interest and not fitting in with the university's mission or role as a research institution. Some clearly feel that such a technology program is not appropriate for a university and others feel the niche is already being served at other universities in the country. Some also mentioned costs, although not as a primary reason.

CHAPTER 9. FLIGHT TRAINING AND PROGRAM COSTS

Flight training is a key component of a professional pilot curriculum and can be structured in different ways. This chapter discusses those options and delves into the costs of flight programs. Putting a cost on the development of a new program is difficult. The numerous ways of organizing a program and the varying costs of flight training equipment make it difficult to determine an exact dollar figure. This chapter attempts to highlight the major cost components and the options available.

Perhaps the most recommended approach for universities contemplating offering flight training is to conduct the program themselves. The majority of aviation programs operate their own flight line. This typically means that they own their own training aircraft, they run their own aircraft scheduling and dispatch office, do their own billing, and maintain their own aircraft or manage the outsourcing of the maintenance. Performing all of the functions in-house with the exception of the maintenance is not unusual. Universities who have aviation maintenance programs will typically do their own maintenance as they have already committed the requisite resources.

As noted in the section on Oklahoma universities, in-house maintenance operations require a substantial commitment to appropriately licensed personnel and an adequate spare parts inventory, which can run into the hundreds of thousands of dollars. Under a university-run program, it is not unusual for the program to lease some airplanes, especially multi-engine aircraft. This is done to balance demand for training aircraft with the expense of purchasing aircraft. Under a lease, the university will typically only be charged for the time it puts on the aircraft, which is paid for by the students. While other expenses exist, as do minimum flight hours, it remains a cheaper option for those programs not wanting or not able to commit significant resources to purchasing a new aircraft. This is true with multi-engine aircraft because a program, depending on its offerings and enrollment, may not have enough students at that level to warrant the purchase.

Some flight programs have developed agreements with fixed-base operators (FBO) to contract out their flight-training program. Students will get academic credit when they have successfully completed examinations (written and flight) for flight ratings (i.e., private, commercial, instrument rating, etc.). These programs typically operate under FAR Part 141 which allows students in a structured program approved by the FAA to complete flight

certificates and ratings in less time then those governed under FAR Part 61. This allows students to save money in the process by lowering flight time requirements. The academic administrators typically collaborate with the FBO providing the flight training over curriculum and instruction issues to ensure university requirements are being met and that the training program meets the needs of the academic program and the university.

There exists another option that has recently emerged and is now employed at Arizona State University. The university recently entered into an agreement with Mesa Pilot Development (MPD) to provide them with all of their flight training. This included equipment, facilities, and staff. MPD is a division of Mesa Airlines and is designed as an ab initio (from the beginning) program to take no or low-time pilots through their private, instrument, commercial, and multi-engine ratings and into the airlines as a first officer. This is accomplished in four years in conjunction with an academic program in aviation that results in a four-year degree. This program is discussed in more detail later in the report.

Flight Training

The cost to obtain and maintain aircraft for flight training is undoubtedly the single, largest capital cost a new program faces. Many universities and colleges choose to contract out their flight instruction while others choose to operate their own. Maintenance is another issue that schools must resolve. Those schools with maintenance education programs are capable of performing maintenance work in house while others contract it out. Operating a maintenance shop is a very expensive proposition. Costs for spare parts and certified mechanics can run into the hundreds of thousands of dollars. Data from the 1999 *Collegiate Aviation Guide* show that 57 percent of the 92 institutions reporting conduct their own flight instruction (4). A total of 43 percent contract out for flight instruction. What is not in the data is whether or not those that conduct their own instruction lease or own their own aircraft. In addition, it is not clear who is performing the maintenance.

The ideal arrangement would be to own your own aircraft and perform your own maintenance in conjunction with a maintenance education program available at the university. This situation gives the flight school and the flight program the most control over the program. The flight school directors in Oklahoma that met with the research team last year spoke of how important it is to have control. This control begins to slip when aircraft are leased. The opposite

end of the control scale is contracting out for flight instruction. Somewhere in the middle lies the combination of owning and leasing aircraft. Schools can lease multi-engine aircraft or contract them for their use if they do not have enough demand to purchase their own aircraft. Additionally, schools can lease additional single-engine aircraft to accommodate growth in their program without incurring the cost of buying a new aircraft. The same is true for maintenance. While it would be nice to conduct your own in-house maintenance, it is very expensive as pointed out in the interim report, and not a likely option when first building a flight program.

Mesa Pilot Development

Another alternative to flight education that has recently emerged is that of an industry partner or full-service contractor. An example of this is the program offered by Mesa Airlines, a regional airline based in Phoenix, Arizona. Mesa Airlines' Subsidiary Mesa Pilot Development (MPD) recently partnered with Arizona State University (ASU) to offer flight instruction and internship opportunities to ASU students. MPD has had programs at community colleges since 1989 but only recently established a program with ASU.

MPD provides all of the aircraft, training facilities, flight instructors, and maintenance for the flight education of ASU students. Successful graduates go through the hiring process at Mesa Airlines and those that are hired become first officers. This program is known as a bridge program to the airlines. The faculty at ASU works closely with the management and flight instructors at MPD to coordinate the flight education components of the curriculum with the other aspects of the four-year degree program.

General Pete Hayes, a retired Air Force General who is president of MPD, spoke to the research team for this study. He noted the importance of having the flight contractor working closely with the university. He said it was critical that the university be linked to MPD and that they have oversight and know what is going on in the flight program. The program currently has 120 flight students who fly, on average, eight flights per month. Gen. Hayes, who supervises all pilot recruitment for Mesa Airlines, indicated that the program at ASU eventually would have 300 to 400 flight students. He stated that it takes approximately two to three years to build a program up to a level that is sustainable.

MPD incurred the cost to construct a training facility adjacent to the flight program at ASU's East Campus on the grounds of Williams Gateway Airport, the former Williams Air Force Base.

In addition, it operates the aircraft used in training. These are the Piper Warrior, Beechcraft A36 Bonanza, BE58 Baron, Beech 1900D, Mooney Eagle, Frasca flight training devices, and AST Hawk Flight training devices.

Prior to the terrorist events of September 11, 2002, Mesa Airlines was hiring approximately 50 pilots a month. The subsequent drop in air travel demand has slowed that hiring but MPD expects it to return at some point in the near future (3-5 years). General Hayes made it clear that he would be interested in partnerships with other universities but believed this program and arrangement was more suitable to large, state flagship campuses.

A follow-up conversation regarding this program occurred with Dr. William McCurry the aeronautical technology department head at ASU. A summary of that conversation is provided here as it includes important information on flight program operation and development.

Dr. McCurry conferred the great relationship they have with MPD, but added that it took a lot of work over the past eight years to get it to where it is today. They are very happy with their arrangement as they did not want to own their own aircraft, as they are proponents of not owning but rather contracting out. He stated that ASU was the first school granted accreditation by the Council on Aviation Accreditation that did not own its own aircraft. He also stated that they would like to have a few airplanes to use in FAR Part 135 operations and to use for university transportation. Other schools do this and have King Air and BeechJet aircraft.

Dr. McCurry was asked about the level of support received from the university administration. He stated that their position was they were not going to help the program but they would not hinder it either. He said that most programs at the university are increasingly expected to cover their own costs. There has been more of an entrepreneurial approach adopted especially since the arrival of a new president last year. He said they currently have 250 students in their program (flight and management) with seven faculty members. Of the seven faculty members, five have doctorates. Only one of those is current in flight certificates. The other two faculty members have master's degrees and are both current flight-wise. He said at ASU they cannot get any faculty on the tenure-track without a Ph.D. where as at other schools, including Purdue and Embry-Riddle Aeronautical University, they will hire in the tenure-track with a master's degree. For their recent opening, they had 12 applicants with Ph.D.s applying for the position. They do not have all the flight ratings but they still were able to attract them. They do not have a problem attracting faculty and students to the program.

Dr. McCurry said the starting pay for tenure-track assistant professors in their department was in the $55,000 to $60,000 per year range. Lecturers were in the $40,000 range and adjuncts were being paid on the order of $1,000 per credit hour. He said some professors on campus were being paid in the mid to upper $100,000 range and mentioned a new arrival on campus making on the order of $300,000. Much of this is tied to their ability to bring in research contract money.

Dr. McCurry asked about the current status of Carswell Air Force Base (AFB) in Fort Worth. He inquired and pondered about its potential for use as an aviation education facility much like the former Williams AFB now Williams Gateway Airport that is being used by ASU for its flight program. They also have a high altitude chamber used for training and research.

He said they tried to get Comair Academy to bid on providing the flight training aspects of their program, but that did not happen. They were not interested or it did not work out for some reason. Dr. McCurry was asked about setting up a program at a specific school once one is interested. He said the best thing to do at that point is to either hire a veteran department head with experience in this area to build the program and/or hire some consultants to help set it up. He mentioned some consultant candidates all of whom have experience in the area. There were two, including himself, who are current program heads. The other program head was Dr. Tom Carney at Purdue. The third person was Dr. Ron Karp, an associate professor at ASU.

Dr. McCurry stated that the flight program is run in a very structured and disciplined manner. They restrict, or limit, who the students can take up in the airplane. They basically do not allow them to take up friends or girlfriends for joyrides. Some of the students who do not like that transfer out to the management side and fly on their own. The flight portion is serious business with a distinct purpose.

Dr. McCurry mentioned that some students occasionally have to fly at times that they may not desire. This is done for efficiency and utilization reasons. This has been recently alleviated to some extent by MPD's purchase of four new Piper Warriors. The program does not have a twin-engine airplane but they do share a Beech Baron with the Farmington campus, which is three hours away. MPD contracts out the aircraft maintenance, which makes flight costs a little higher. ASU and the program are self-insured. MPD also has its own insurance coverage.

Flight Instruction Costs

Whether schools own, lease, or contract out their flight instruction and maintenance operations, the costs are borne by the students themselves. This section shows the costs of obtaining flight ratings at various public universities who made their cost information readily available. Ultimately, the costs are driven by minimum time requirements and student skill level. Some programs may also have self-imposed minimums to accommodate their own training style or approach. Lags in training, or infrequent training sessions, can also result in more time being necessary to learn flight maneuvers. A structured disciplined approach is the most time- and cost-effective.

Some of the cost information is grouped by various ratings. This information was not always separated by individual rating, so the individual costs were unknown. Often, these costs are presented with commercial and instrument ratings combined in some manner. Occasionally multi-engine training is included. In addition, some of the costs may include simulator or flight-training device costs while others may not. When known, the simulator fees are separated. Different aircraft types are used in the various components as not all schools use the same airplanes for teaching the same elements. Also, some students may be able to find employment on career tracks without completing all of the listed flight courses.

The bottom line is that there are many factors influencing cost. Nevertheless, enough information is available for meaningful comparisons. While these costs are borne by the flight students, they can also be recognized on the revenue side of the budget for those universities operating their own flight training. It should be noted that the cost information presented below is sourced directly from the individual universities.

Arizona State University/Mesa Pilot Development

Private Pilot Certificate:	$5,488
Commercial Pilot:	$14,294
Instrument Rating:	$6,175
Certified Flight Instructor:	$3,768
Certified Flight Instructor Instrument:	$3,395
Multi-Engine:	$3,900
Multi-Crew Concepts:	$3,250
TOTAL (Includes all simulator fees):	**$40,270**

Purdue University

Private Pilot Certificate:	$4,137
Commercial Pilot:	$10,575
Instrument Rating:	$5,017
Certified Flight Instructor:	$1,442
Certified Flight Instructor Instrument:	$1,225
Multi-Engine:	$2,042
Multi-Engine Instructor:	$1,432
Airline Transport Pilot:	$2,042
Simulator Fees (all levels):	$18,146
TOTAL:	**$46,058**

Ohio State University

The cost information provided for Ohio State University is an approximation and only includes those flight ratings indicated by an "✓" below. It is an aggregate cost and is not divided by individual flight rating. The costs were obtained from the director of flight education and are expected to go up in the next year. These costs include simulator, flight training device, and instructor costs through the flight instructor rating.

Private Pilot Certificate:	$	✓
Commercial Pilot:	$	✓

Instrument Rating:	$	✓
Certified Flight Instructor:	$	✓
Certified Flight Instructor Instrument:	$	Not available (N/A)
Multi-Engine:	$	✓
Multi-Engine Instructor:	$	N/A
Multi-Crew Concepts:	$	N/A
TOTAL:	**$30,000**	

University of North Dakota

Private Pilot Certificate:	$6,228
Commercial Pilot:	$9,420
Instrument Rating:	$5,252
Certified Flight Instructor:	$4,543
Certified Flight Instructor Instrument:	$2,848
Multi-Engine:	$8,629
Multi-Engine Instructor:	$4,129
TOTAL (includes simulator time):	**$41,049**

Southern Illinois University

Private Pilot Certificate:	$7,149
Commercial Pilot:	$13,121
Instrument Rating:	$4,467
Certified Flight Instructor:	$4,042
Certified Flight Instructor Instrument:	$2,389
Multi-Engine:	$4,631
Multi-Engine Instructor:	$2,607
Practicum in Air Carrier Operations:	$5,915
TOTAL:	**$44,321**

Western Michigan University

Western Michigan University separates the information differently from other universities. They have four flight courses for credit. The first is for the private. The second is to build time for the commercial and instrument, the third is for the instrument rating, and the final course is for the commercial and multi-engine ratings. This makes separating costs by rating somewhat confusing. In addition, the flight program's curriculum goes through the multi-engine rating. Students wishing to pursue flight instructor ratings will need to register for additional courses and pay additional fees. This explains why these costs are somewhat less than other flight programs. Simulator time for the respective courses is included in the estimated costs below.

Private Pilot Certificate:	$6,213
Instrument/Commercial time building:	$7,061
Commercial Pilot/Multi-Engine	$10,574
Instrument Rating:	$6,808
Certified Flight Instructor:	$N/A
Certified Flight Instructor Instrument:	$N/A
Multi-Engine:	$See above
Multi-Engine Instructor:	$N/A
Multi-Crew Concepts:	$N/A
Miscellaneous Fee ($619 per course):	$2,476
TOTAL:	**$33,132**

Southeastern Oklahoma State University

Private Pilot Certificate:	$3,375
Commercial Pilot:	$10,890
Instrument Rating:	$3,021
Certified Flight Instructor:	$2,200
Certified Flight Instructor Instrument:	$1,633
Multi-Engine:	$3,000
Multi-Engine Instructor:	$N/A
TOTAL (minimum cost given):	**$24,119**

University of Oklahoma

Private Pilot Certificate:	$2,975
Commercial Pilot:	$9,640
Instrument Rating:	$2,425
Certified Flight Instructor:	$2,230
Certified Flight Instructor Instrument:	$1,275
Multi-Engine:	$1,200
Multi-Engine Instructor:	$3,000
Turbine Transition:	$3,000
TOTAL (minimum cost given):	**$25,745**

Louisiana Tech University

Private Pilot Certificate:	$3,421
Commercial Pilot:	$5,764
Instrument Rating:	$7,071
Certified Flight Instructor:	$2,560
Certified Flight Instructor Instrument:	$1,573
Multi-Engine:	$2,035
Multi-Engine Instructor:	$N/A
Simulator Fees (all ratings):	$20,850
TOTAL:	**$43,274**

University of Illinois, Urbana-Champaign

Private Pilot Certificate:	$6,566
Commercial Pilot:	$9,573
Instrument Rating:	$6,887
Certified Flight Instructor:	$3,135
Certified Flight Instructor Instrument:	$1,637
Multi-Engine:	$3,886
Multi-Engine Instructor:	$N/A
TOTAL:	**$31,684**

Auburn University

Private Pilot Certificate:	$4,588	($6,500 – 7,500)
Commercial Pilot:	$12,875	($14,000 – 16,000)
Instrument Rating:	$4,900	($6,500 – 7,500)
Certified Flight Instructor:	$4,010	($4,500 – 5,000)
Certified Flight Instructor Instrument:	$2,625	($3,000 – 3,500)
Multi-Engine:	$3,567	($4,500 – 5,500)
Multi-Engine Instructor:	$5,815	($6,500 – 7,500)
TOTAL: Minimum (Realistic)	**$38,380**	**($45,500 – 52,500)**

As the cost data shows, there is quite a difference in program costs depending on the amount of simulator or flight training device time that is used and the flight ratings that are included in the curriculum. Some of the programs use simulators and flight training devices to teach flight procedures instead of doing that work in the more expensive airplane. By and large, where complete cost information was available, the total cost from the private pilot certificate through the professional pilot ratings was in excess of $40,000. While some schools give estimates closer to $25,000, this information appears to be somewhat incomplete and are qualified as a minimum cost. Many of the flight schools are required to cover their operating costs with flight fees. That includes maintenance and capital costs. As a point of information, the University Aviation Association put the average use of flight training aircraft at approximately 1,000 hours per year. This estimate may vary according to weather patterns but is an appropriate number to use for cost estimation.

Overall flight program (total budget to operate program) costs vary according to their personnel and structure and can change quickly as fuel and insurance costs change. Some of the program heads interviewed indicated that insurance costs have dramatically increased in the past year and are expected to increase next year. These costs also depend on the number and type of aircraft in the training fleet, which is a function of the number of students in the flight program.

An effort was made to acquire program cost data from various programs across the country. Researchers asked nine university program heads to respond regarding start-up costs and annual operating costs for a program serving 50 students with five to seven aircraft that included adequate simulators/flight training devices and an in-house maintenance operation. Only three

responses were received, but only two provided information. Of those two, one gave very detailed information, summarized below. This particular program is at a state school:

- 200 flight students;
- 33 flight training aircraft;
- Chief Flight Instructor/30 full-time and 10 to 12 part-time flight instructors (includes 11 that are assistant chief qualified);
- maintenance staff of five (shop supervisor and four full-time mechanics);
- one parts person and a maintenance secretary;
- weather/dispatch team of two full-time and five student workers;
- a field representative/recruiter/advisor who is assisted by a scheduling clerk, a receptionist, a records office supervisor (FAA records), and a business manager; and
- overall budget: $2.8 million ($700,000 in recurring state funds and $2.1 million in student-paid flight fees).

This analysis shows that flight students are averaging approximately$10,500 per year in flight fees, which total approximately $40,000 for the duration of the four-year degree program. These fit in with the costs provided above that are in the $40,000 range. It is unclear how the $700,000 recurring funds are used, as flight programs typically have to pay for themselves. It was not clear if any or all of the faculty salaries were paid with the state funds although that would be a plausible scenario.

Another program at a large, public university has a budget in the $1.1 to 1.2 million range. They operate 18 aircraft, have 20 flight instructors and perform all of their maintenance in-house. Flight fees cover the budget. The program also receives some reduced charges on fuel and storage as well as a financial subsidy that is equivalent to 15 to 10 percent of the flight program budget. The program also has four flight training devices that are used for instruction. Their flight training costs are estimated at $30,000 through the flight instructor rating and they have 125 active students during the academic year that drops to approximately 100 in the summer. Their aircraft are used approximately 800 hours per year. Additional program cost information is included in the section on Oklahoma's university flight programs.

Non-University Based Flight Training

For comparison and discussion purposes, some costs for flight instruction are included below for those who learn to fly through FAR Part 61 programs and those that are not affiliated with a university. Part 61 and Part 141 refer to the section of the Federal Aviation Regulations that govern requirement for flight training. Some universities operate under Part 141 to save students money but others prefer to operate under Part 161 for some ratings.

The intention here is not to discuss the merits, advantages, or disadvantages of Part 61 and Part 141. That debate should be an internal one once it has been decided to pursue a flight training program. It should, however, be clear that there are advantages to operating under Part 141 that revolve around lower flight time requirements for flight ratings that result in potentially lower overall costs to flight students. It should also be mentioned that establishing a Part 141 operation requires appropriate personnel and experience and is not easily achieved. Whether or not flight schools at universities choose to operate under one or the other is a decision specific to their preferences and internal policies and guidelines much like other decisions in how to operate or conduct their flight-training program.

For comparison purposes, the costs of obtaining the various flight ratings using a flight training company at a local airport are presented below. This particular company, United Flight Systems, operates at two locations. One is at David Wayne Hooks airport just north of Houston in Tomball, Texas and the other is in College Station, Texas at Easterwood Airport. The costs are categorized by flight rating. The company points out that these costs reflect their training philosophy of training pilots to "maximum proficiency, not minimum standards."

- Private Pilot Certificate: $4,500 – 5,000
- Commercial Pilot: $8,660
- Instrument Rating: $6,970
- Certified Flight Instructor $3850
- Certified Flight Instructor Instrument: $2100
- Multi-Engine: $3425
- Multi-Engine Instructor: $3225
- **TOTAL** **$32,730 – 33,230**

In addition, the hourly aircraft and instruction rates are included.

- Cessna 150/152 $50/hour
- Cessna 172 $68/hour
- Cessna 172R ('98 Model) $75/hour
- Cessna 172RG $80/hour
- Cessna 182RG $125/hour
- Geronimo PA23 $145/hour
- Cirrus II Simulator With Instructor $79/hour
- Primary Flight Instruction $25/hour
- Advanced Flight Instruction $30/hour
- Primary Ground $20/hour
- Advanced Ground $25/hour

It is unclear how much simulator or flight training device time is included in these cost estimates from United Flight Systems. Nevertheless, the costs seem fairly comparable with those listed earlier for the various universities.

It should be noted that an advantage of flight training that does occur in a professional pilot program is the systems approach that is used. The programs are designed to train professional pilots and not recreational pilots. There are differences in teaching approaches, methods, and outcomes in training a pilot to work as a member of a cockpit crew.

Aircraft for Flight Training

The most common aircraft used today for single-engine flight training include the Cessna 152, the Cessna 172 (various models and configurations), and the Piper Warrior. Popular multi-engine training aircraft include the Cessna 310, the Beechcraft (Beech) Duchess, the Piper Seminole, and the Piper Geronimo. For single engine training, the Cessna 172 models appear to among the most popular. Researchers contacted a regional sales manager for specific information on the Cessna 172 and to discuss aviation flight programs at universities and the operation of such a program's aircraft.

The aircraft recommended by Cessna for aircraft flight training is the Cessna 172 S Skyhawk SP. This aircraft ranges in price from $165,000 (standard equipment) to $234,000 (NAV II avionics, horizontal slope indicator, automatic direction finder, air conditioning, multi-function display). The typical flight training organization equipped aircraft sells for $187,000 and includes NAV II avionics. The NAV II package includes the standard avionics package plus the following: KLN 94 GPS-IFR, 2nd KX 155A Nav/Comm with glideslope, KI 209A VOR/LOC/GS indicator with GPS interface, MD 41-231 GPS-Nav selector/annunciator, and KAP 140 two-axis autopilot with altitude preselect. For additional information on the standard or enhanced aviations, the Cessna website or representative should be consulted.

The Cessna Aircraft Company has significant experience in working with flight training organizations and universities across the country. Some of the organizations they have worked to equip are included in Table 18. The list includes some of the universities mentioned elsewhere in this report. Several key issues regarding flight training aircraft were discussed with a Cessna representative and are summarized below.

Table 18

Universities and Other Organizations Using Cessna Aircraft

United States Air Force Flight Training Centers
Navy Flying Clubs
American Flyers
Central Missouri State University
Daniel Webster College
Embry-Riddle Aeronautical University
Kansas State University
Kent State University
Louisiana Tech University
Spartan School of Aeronautics
Ohio State University
Western Michigan University
LeTourneau University
Ulster Flying Club
Delta State University
Seneca College
Southeastern Oklahoma State University
Moody Bible College
Airline Training Academy
University of Dubuque

Source: Cessna Aircraft Company.

Specifically, issues related to aircraft cost and affordability, the recommended number of aircraft, and issues of used vs. new aircraft were discussed. First, with respect to aircraft affordability, Cessna outlined a scenario illustrating the purchase and operation of a new Cessna 172SP. This was their recommended aircraft configured for flight training purposes and costs

$187,500. Under the following assumptions, break even can occur with the aircraft being flown 56 hours per month. These assumptions include:

- initial purchase price of $187,500;
- down payment of 10 percent;
- 4.50 percent interest rate over 12 years; and
- average retail costs (2003) for lease management, insurance, inspections, fuel, cleaning, parking, and engine reserves.

This appears to be quite reasonable considering many flight programs operate their aircraft around 80 hours per month with some closer to 100 hours per month. The 56 hours per month seems like an achievable goal. Utilization of 80 hours per month translates to a return on investment of 6.0 percent. Utilization of 70 hours per month brings a 3.5 percent return on investment while 50 hours per month is a negative 1.50 percent. Discussions with Cessna concluded that flight programs should not have any problems obtaining utilization rates that bring profitability for owning new aircraft.

Cessna also recommended a ratio of one airplane for every five to seven flight students. This is range is in line with other ratios and is reasonable. Table 19 provides other student/aircraft ratios based on the best available data collected from the individual schools. This can be a tricky number to ascertain as often programs will lease some aircraft to meet demand or certain requirements. Often, a program may not want to purchase a multi-engine aircraft and will lease or contract out to another company for use of an aircraft. Also, it may be difficult to obtain a good count of the number of active flight students. Some may quit or slow their training due to financial reasons and others may slow or stop in the summer as they go home to work. Nevertheless, these numbers are in an approximate range and are fairly consistent throughout.

Table 19

Student/Aircraft Ratios from Selected Universities with Flight Programs

Institution	Approximate Student/Aircraft Ratio
Ohio State University	6.5
Oklahoma State University	6.9
Southeastern Oklahoma State University	7.0
Southern Illinois University, Carbondale	6.0
University of Oklahoma	6.6
Cessna Aircraft Company (Recommended)	5 - 7

In considering new or used aircraft, Cessna points out the advantages of having new aircraft. While it is clearly advantageous for them to promote new aircraft, there reasoning is included here as it does hold merit. They argue that new aircraft are more cost-effective to purchase and operate. New Cessna aircraft have a two-year warranty with no time limits (hours) on parts and have many safety improvements not installed on older aircraft. New aircraft also attract more students than older aircraft. This is reasonable as any prospective student would be more attracted to new aircraft with the latest technology and avionics.

Cessna also pointed out that the rate of change in avionics is high and that pilots and instructors need to be trained in the latest equipment. If a contractor is used to provide flight instruction, the university must ensure that a flight systems approach is taken in training and that a minimum level of professionalism is employed. This is often the reason why universities run their own flight programs.

Finally, with the two-year warranty on new Cessna aircraft, flight schools could put significant time on the aircraft in those two years and still have a high residual value left on the aircraft. The aircraft could then be sold with the profit going to fund a new aircraft. Cessna asserts that this is a scenario that has been employed by some institutions that like to keep a new fleet.

As a side note, the time before overhaul on the Cessna 172SP is 2,000 hours or 2,200 hours on high utilization aircraft. Managing aircraft operations including the maintenance and turnover can be quite a chore in enduring the most advantageous outcome. Currently, Embry-Riddle Aeronautical University obtains new aircraft every three years while others do so every five years. Cessna indicated that every three to five years is a good interval for upgrading aircraft. This helps keep aircraft that have the latest technology while maintaining a new fleet to attract and retain students in a competitive business environment while making the best financial sense. Cessna recommends examining the cost of a new aircraft with a five-year time frame in mind.

They have developed detailed business and income expense worksheets for their aircraft as well as breakeven utilization analyses. Much of this discussion is based off of that work. While it was made available to the researchers, it is not included in this document. Those wanting to further discuss the cost analyses should contact the Cessna Aircraft Company. The researchers believe the analysis to be reliable as many universities have new aircraft and replace older aircraft with new ones on a regular basis.

Flight-Training Devices – Frasca International, Inc.

Frasca International, Inc. located in Urbana, Illinois, is a major provider of flight training devices to both military and civilian flight schools across the world. The company manufactures and sells a wide variety of training equipment for multiple market segments including general aviation, business aviation, helicopters, the airliner, and the military. Many types of aircraft specific training devices are available for each of the segments. This means several type-similar or generic training devices to type-specific training devices. Some of the type-specific equipment available for each of the segments is listed below.

<u>General Aviation</u>

- Cessna 172
- Beech Bonanza A36
- Piper Warrior
- Piper Arrow
- Piper Malibu
- Beech Baron

- Piper Seminole (multi-engine)
- Piper Seneca (multi-engine)

Business Aviation

- Beech King Air (90, 200, 300, 350)
- Turbo Commander 690
- Cessna Citation
- Hawker 800

Helicopters

- Robinson R22
- Bell 206 Jet Ranger
- Bell 407
- Bell UH-1 Huey
- Hughes 300
- Bell 212 (multi-engine)
- Bell 412 (multi-engine)
- Bell 427 (multi-engine)
- MBB BO 105 (multi-engine)
- Eurocopter AS 365 (multi-engine)

Airlines

- CRJ Regional Jet
- DC-9
- Boeing 737-400

According to the company, military customers of Frasca devices include the U.S. Army, U.S. Air Force Academy, the Defense Helicopter Flying School, the Columbian National Police, the Mexican Navy and the Indonesian Army as well as others. Frasca also offers various levels of visual systems that can provide the user with more advanced graphics and motion systems as

well as customized graphics ranging from generic airports to the use of satellite imagery for a specific airport location.

The use of flight training devices can reduce overall costs of obtaining pilot ratings. According to Frasca, the average number of hours logged toward receiving a private pilot certificate is in the range of 60-to-65. With the minimum required being 40, flight-training devices offer an economic approach for some lessons or refresher time that do not require actual flight time. Additional uses include procedural training for other flight ratings including instrument training and emergency procedure training.

In consultation with a representative of Frasca International, Inc., it was learned that one flight-training device could replace three airplanes. The rationale for this centers around the time and cost savings associated with pre- and post-flight lesson activities, and the additional flight hours needed to master flight requirements (but that exceed minimum flight time requirements mandated by the FAA).

For a program with 50 flight students, Frasca representatives recommend one training device to start. The model recommended is the Frasca 142P. This is the Frasca Model 142 Twin-Engine Flight Training Device – Preferred Configuration. Appendix J provides the specifications for this device. One of the main attractions to this device is the capability to use it as both a single-engine and twin-engine training device. It is equipped with the appropriate flight and navigation instrumentation for both as well as a graphical instructor station and a visual system. The graphical instructor station is important for pre-programming lesson plans, recording or replaying lessons and practicing for flight competitions using National Intercollegiate Flying Association (NIFA) scoring methods. The 142P is considered by the manufacturer to be the staple of the university industry for flight trainers. It has very low maintenance costs and can be converted from single to twin-engine in a matter of minutes.

Frasca representatives will install and calibrate the device upon purchase and will also train staff on how to use it. The cost to buy the 142P is currently $140,000 new, which is discounted from its original list price of $166,985. Additional training devices are available for substantially more money and can used to substitute for actual flight hours under certain FARs due to the level of complexity of the trainer. Such devices are not recommended for initial development of a university flight program.

Faculty Salaries

Perhaps the most expensive recurring cost is that of the faculty and staff that administers and teaches in the aviation management and flight programs. Faculty salaries are known to vary according to academic discipline and faculty rank (professor/associate professor/assistant professor). With aviation programs around the country existing in business, engineering, and education colleges, faculty salaries are likely to vary somewhat.

Aviation programs also present another consideration in that they are specialized aviation skills and experience that are required to run such programs and are likely to increase the personnel costs. This section will present current faculty salary data for various schools in Texas as well as for some out-of-state universities. This information is meant to provide a starting point for attempting to develop preliminary program cost information. The salary information for the nine universities cited in Chapter 8 is included in Table 20 below. The data comes from the THECB. Data for other public universities in Texas is included in Appendix K along with average salary information from other states in the country disaggregated by the types of institution as defined by the by Carnegie Classification.

Data for instructors is included as it is not unusual to see aviation programs with instructors on the faculty. This may be because in aviation, it is often difficult to get a faculty member who possesses both an earned doctorate and the significant flight experience needed to administer and teach in an aviation program. Consequently, it is not unusual for faculty with significant experience and a master's degree to be enrolled in a doctoral program and hold a faculty rank of instructor.

Table 20

Faculty Average Salary Data for Selected Texas Universities – 2003

University	Professor	Associate Professor	Assistant Professor	Instructor
University of Texas, Austin	$103,157	$65,913	$61,674	$58,090
Texas A&M University	$93,572	$65,872	$58,855	$47,996
Tarleton State University	$63,733	$51,281	$44,952	$38,816
University of Houston	$98,941	$65,358	$56,419	--
Midwestern State University	$77,473	$60,833	$50,698	--
University of North Texas	$77,786	$59,759	$49,824	$45,150
Texas Southern University	$69,024	$55,407	$45,132	$38,406
Texas Tech University	$86,898	$60,780	$52,544	--
Southwest Texas State University (Texas State University – San Marcos)	$69,083	$57,155	$46,527	$43,263
State (weighted average)	**$84,693**	**$60,343**	**$52,130**	**$45,377**

Source: Texas Higher Education Coordinating Board.

The data presented for other states are averages and only serve to give an idea of where Texas may fit in with respect to other states. As already mentioned, this data is disaggregated by Carnegie Classification, which will be briefly discussed.

Carnegie Classification and Rating

Much debate has occurred over the years regarding where academic programs in aviation belong at the university level and, if the even belong at all. The alternative was to have aviation education at community colleges and vocational educational institutions. While this may have been a legitimate debate at some previous point in time, it appears that it is no longer such a point of contention. The debate appears to have moved on to what types of institutions are best suited for these types of programs. There seems to be acceptance of aviation as an academic field serving the needs of aviation and aerospace firms in a field that is growing ever more complex requiring highly skilled and trained work forces.

There are some problem areas, however, for having these types of programs at large research universities. There are two issues that repeatedly arise – the lack of faculty holding earned doctorates, and the lack of research funding that leads to other issues with faculty member opportunities for publishing research that is critical to move forward in their career paths.

Publishing is a large part of the job at research universities and that is difficult in aviation where externally-funded research opportunities are not widespread. As a side note, there are faculty members in aviation programs that do hold doctoral degrees but they are often not in aviation or related fields but rather in various education fields. This includes educational administration, higher education, and educational leadership.

These concerns have not stopped large, public universities from having aviation programs. Many of the programs included in various sections of this report hold the highest level of classification from the Carnegie Foundation that rates universities in the country according to their range of academic programs and the number and type of degrees awarded. These classifications are listed below and are fully defined in Appendix L. They include, from the highest category to the lowest the following levels:

Doctorate-granting Institutions

- Doctoral/Research Universities – Extensive
- Doctoral/Research Universities – Intensive

Master's Colleges and Universities

- Master's Colleges and Universities I
- Master's Colleges and Universities II

Baccalaureate Colleges

- Baccalaureate Colleges – Liberal Arts
- Baccalaureate Colleges – General
- Baccalaureate/Associate's Colleges

There is also a category for Associate's Colleges and Specialized Institutions. Appendix L explains these classifications. Table 21 lists the various four-year universities referred to in this report and their corresponding Carnegie Classification. Those with an asterisk (*) next to the name currently do not have an aviation program or any aviation course offerings.

Table 21

Select Universities and Their Carnegie Classifications

University	Carnegie Classification
Arizona State University	Doctoral/Research Universities – Extensive
Auburn University	Doctoral/Research Universities – Extensive
Embry Riddle Aeronautical University (Daytona)	Master's Colleges and Universities I
Louisiana Tech University	Doctoral/Research Universities – Intensive
Midwestern State University	Master's Colleges and Universities I
Ohio State University	Doctoral/Research Universities – Extensive
Oklahoma State University	Doctoral/Research Universities – Extensive
Purdue University	Doctoral/Research Universities – Extensive
Saint Louis University – Parks College	Doctoral/Research Universities – Extensive
Southeastern Oklahoma State University	Master's Colleges and Universities I
Southern Illinois University, Carbondale	Doctoral/Research Universities – Extensive
Tarleton State University	Master's Colleges and Universities I
Texas A&M University *	Doctoral/Research Universities – Extensive
Texas Southern University	Doctoral/Research Universities – Intensive
Texas State University, San Marcos	Master's Colleges and Universities I
Texas Tech University *	Doctoral/Research Universities – Extensive
University of Houston *	Doctoral/Research Universities – Extensive
University of Illinois, Urbana-Champaign	Doctoral/Research Universities – Extensive
University of North Dakota	Doctoral/Research Universities – Intensive
University of North Texas *	Doctoral/Research Universities – Extensive
University of Oklahoma	Doctoral/Research Universities – Extensive
University of Texas, Austin *	Doctoral/Research Universities – Extensive
Western Michigan University	Doctoral/Research Universities – Extensive

* Does not currently offer an aviation program or any aviation courses.

Table 21 illustrates that many of the aviation programs are at doctoral granting institutions. While this in itself may not mean much, it certainly indicates to some extent that they have been accepted as academic programs. Most importantly, the success or presence of an aviation program is more likely to be dependent on the level of support it receives from a particular institution. If there is proper support and funding, internally and externally, aviation programs are likely to be successful and that is more important than its Carnegie rating. While the Carnegie ranking may be important in terms of the overall picture of the university and its ability to attract scholars, students, and funding, it is not necessary that an aviation program be located at such an institution. However, doing so can have an added benefit for such a program and its ability to utilize faculty and other resources from departments and colleges across campus to provide a more enriched teaching and research environment.

Summary of Key Elements

This chapter addressed several key cost areas regarding the establishment of an aviation flight program ranging from costs of new aircraft and flight training devices to faculty salaries and the necessary number of aircraft and flight instructors. While each program will be somewhat different in size and need, this information is useful in serving as an initial point of discussion when considering the costs of such a program. It is simply not possible to outline a specific cost for a program considering the number of variables in the equation. The policies and regulations of each individual university will come into play in determining the structure and costs of a new program. But knowing much of this information will enable a university to understand the type of costs they are facing and to make an informed decision to further their study and analysis of such a program or abandon it altogether. Table 22 summarizes the key information developed in this chapter.

Table 22

Summary of Key Metrics Associated with Flight Training Program Costs

Key Metric	Typical or Approximate Value or Range
Student/CFI ratio	5 to 10 students per CFI
Training cost for students	$30,000 to $40,000
Aircraft/student ratio	5 to 7 aircraft per flight student
New aircraft cost	$187,500
Flight training device cost (new)	$140,000
Average faculty salaries for Texas	$45,000 to $85,000

Major Airlines in Texas

Texas is home to three major airlines, which are all major employers in the state. American Airlines is based in Fort Worth and had hub operations at Dallas/Fort Worth International Airport. Continental Airlines is based in Houston and has hub operations at Houston Bush Intercontinental Airport. Southwest Airlines is based in Dallas and operates widely at many airports in the state with hubs at Dallas Love and Houston Hobby airports.

Researchers contacted all three airlines by letter and informed of efforts to examine the issues associated with establishing a four-year degree program in aviation. They were asked to provide some insight into the desired background and qualifications for prospective pilots and other job candidates. Continental and Southwest responded to the inquiry and American Airlines did not respond. Continental described some of their requirements in the letter while Southwest simply referred to their website for the latest information. Southwest did indicate that they recruit heavily from Texas schools for candidates but that they often looked elsewhere for needs where specialized backgrounds in aviation were needed. They specifically mentioned Embry-Riddle Aeronautical University that has extensive flight training programs. They also noted Ohio State University, Auburn University, the University of North Dakota, and Purdue University.

Continental noted in their response that all of their new pilot hires have four-year degrees, many of which are from schools that offer specialized aviation programs. Embry-Riddle was

specifically mentioned again. These letters are included in Appendix M along with a copy of the text letter sent to the airlines.

CHAPTER 10. GAUGING PROFESSIONAL PILOT NEED

The task of determining the future need of professional pilots has become more difficult over the past few years. The events of September 11, 2001, followed by, or in conjunction with, a national economic downturn, and aviation industry difficulties related to both the terror attacks and the economy in general, have made airline operations tenuous. With a large amount of employees being laid off and furloughed, the future employment picture is quite cloudy. In many respects, the airline industry has rebounded and in some cases emerged more efficient than prior to September 11, 2001. But overall, activity measures show that the industry is not yet operating at levels before those terrorist attacks.

Professional pilots are most often thought of as being airline pilots, flying large commercial airliners carrying hundreds of people. While this is true, it is only part of the picture. Professional pilots also include corporate pilots, freight pilots, fractional ownership pilots, charter pilots, certified flight instructors, traffic patrol pilots, forestry pilots, pipeline patrol pilots and a myriad of pilots performing services for government agencies including customs, the Federal Bureau of Investigation, and other law enforcement agencies.

The demand for professional pilots, however, is not solely dictated by the hiring and firing of airline pilots. The terrorist attacks created many inconveniences for commercial air travelers including increased security and scrutiny of passengers and baggage. This resulted in longer check-in times for passengers and added more time to an already delayed air transportation system. Prior to the attacks, there was growth in general aviation and the business jet market as more and more companies utilized their own aircraft for air transportation. Fractional ownership of aircraft was already in the growth stages as well.

Business jet activity, through fractional ownership programs and corporate owned and operated aircraft, surged following the attacks and the resultant delays and inconveniences now associated with commercial air travel. Additionally, economic factors in the industry have driven demand in the regional jet market. While there has been some negative impact in the airline industry with respect to what may influence pilot hires, there is also growth in other sectors of aviation that have positively influenced professional pilot hires. There does, however, appear to be reason for optimism in the job outlook for professional pilots. This is explored in more detail below.

As mentioned earlier, the terrorist events of September 11, 2001 had a negative impact on U.S. civil aviation. Prior to that date, the industry was facing some difficulties related to the economy and other factors including the high cost structure mostly related to labor and fuel costs. The terrorist events only compounded this. Despite all of this, the outlook for the aviation industry was still favorable in terms of growth. This all changed on September 11, 2001 but how much and for how long remains to be seen. Every year, the FAA provides aerospace forecasts for numerous aviation activity measures. These forecasts are revised every year as the industry changes and considers the latest economic and aviation industry data. These forecasts may provide the best insight into future professional pilot demand, as the activity levels of the nation's airlines will be a key element in any new pilot demand. Another key element will be pilot retirements. With forced retirement at age 60 for airline captains, this will fuel additional demand for new pilots.

Before examining historical and forecasted data, it may be useful to examine where the industry was headed prior to the terrorist attacks in 2001, both in terms of pilot retirements and pilot hires. Table 23 shows major airline retirements for the 12 major airlines by year.

Table 23

Projected Pilot Retirements at Major U.S. Airlines

Year	Number of Pilots
1998	1,382
1999	1,591
2000	1,615
2001	1,545
2002	1,637
2003	1,529
2004	1,443
2005	1,614
2006	1,919
2007	2,192
2008	2,063
2009	1,988
2010	1,847
Total	**57,584**

Source: Air, Inc, 1998

These data re from 1998 and was developed by Air, Inc., which provides industry forecasts. It is somewhat dated but serves a purpose in illustrating where the industry was headed prior to September 11, 2001. Air, Inc. is one of the nation's leading aviation forecasting firms, especially with respect to pilot demand.

The following discussion and analysis often refers to airlines and operators according to a specific category. For clarification purposes, major carriers are those with $1 billion or more in sales. National carriers are those with sales between $100 million and $1 billion. The regionals/commuters are those with sales less than $100 million and they are often further defined by the type of aircraft they fly. These include the jet operators and the non-jet operators.

As with any forecast, there is a series of assumptions that must be made in order to set the context of the forecasts. Additionally, there are risk factors that can threaten to invalidate the forecasts should certain events occur or not play out as expected. These assumptions and risk factors were laid out by the director of the FAA Office of Policy and Plans, John Rodgers (7). These assumptions include:

- modest recovery in the U.S. economy in 2003 and strong growth in 2004 and 2005;
- long run growth in excess of 3 percent;
- energy prices rising less than inflation in the U.S.;
- controlled inflation in the U.S.;
- rebound in world economy in 2003;
- long run world growth averaging 3.3 percent
- no more terror attacks in the U.S.;
- no additional major airline consolidation;
- continued increases in domestic and international capacity;
- load factor improvements;
- no change in long run relationship between traffic, GDP, and yield; and
- carriers being successful in reducing unit costs.

The risk factors for these forecasts include:

- security issues;
- international tensions;
- ability of carriers to cut costs; and
- the return of the business traveler.

For more information in these assumptions and risk factors, consult the FAA Aerospace Forecasts 2003-2014.

Tables 24 through 28 show historical data for a variety of aviation activity measures for Large U.S. carriers, regionals/commuters, and air cargo carriers. The historical data for these

three tables show where the industry was heading prior to September 11, 2001 and following those events. The forecast numbers take these events into consideration. Table 24 shows that, for most of the demand measures for the large U.S. carriers, the industry is not quite back up to 2001 numbers. The downward trend has reversed, however, and the industry is showing signs of recovery.

Table 24

Aviation Demand for Large U.S. Air Carriers (Historical and Forecast)

Aviation Activity	Historical			Forecast		
	1995	2001	2002	2003	2004	2014
Enplanements (Millions)	522.0	599.9	536.9	549.5	573.7	822.1
Aircraft Fleet	3,897	4,335	4,180	4,129	4,093	5,261
Hours Flown (Millions)	12.0	14.4	12.9	12.8	13.2	18.7
Load Factor (Domestic)	65.4	70.0	70.0	72.5	72.9	75.5
Revenue Passenger Miles (Billions)	532.0	666.1	601.3	620.1	641.4	953.2
Average Aircraft Size in Seats (Domestic)	149.9	147.1	147.9	148.4	149.2	159.2

Source: FAA Aerospace Forecasts 2003-2014.

Table 25 presents activity data for regional and commuter airports. Activity has continued to grow despite the terrorist events and the economy. The number of regional jet aircraft in the fleet continues to grow and is expected to do so in the future. All of the activity measures show some measure of growth.

Table 25

Aviation Demand for Regional/Commuter Airports (Historical and Forecast)

Aviation Activity	Historical			Forecast		
	1995	2001	2002	2003	2004	2014
Enplanements (Millions)	57.5	83.6	90.7	97.1	106.6	174.1
Aircraft Fleet (Jets/Total)	78/2,109	782/2,363	1,032/2,521	1,289/2,704	1,538/2,879	2,890/4,034
Load Factor (Domestic)	49.4	58.6	61.3	60.3	59.8	64.0
Revenue Passenger Miles (Billions)	12.4	25.2	30.8	35.3	39.9	75.1
Average Aircraft Size (Seats)	31.0	40.6	42.8	44.6	45.4	50.4

Source: FAA Aerospace Forecasts 2003-2014.

Table 26 presents air cargo activity data. Air cargo showed a dip in 2002 both in revenue ton miles and in the number of air cargo aircraft in the fleet. Both of these measures are expected to pick up with 2003 data expected to surpass that of 2001. This growth is expected to continue through 2014.

Table 26

Aviation Demand for Large Air Carriers – Air Cargo (Historical and Forecast)

Aviation Activity	Historical			Forecast		
	1995	2001	2002	2003	2004	2014
Revenue Ton Miles (Millions)	23,228	28,481	27,346	28,616	29,969	48,956
Aircraft Fleet	824	1,039	1,034	1,052	1,082	1,547

Source: FAA Aerospace Forecasts 2003-2014.

Table 27 shows historical and forecast aircraft operations by category. All of the categories except air carrier are expected to at least remain the same or increase. Air carrier operations are not expected to return to 2001 levels until after 2004.

Table 27

Total Aircraft Operations by Category

Aviation Activity (Millions)	Historical			Forecast		
	1995	2001	2002	2003	2004	2014
Air Carrier	13.6	14.8	13.2	12.9	13.4	17.1
Commuter/ Air Taxi	10.2	10.9	11.0	11.3	11.8	15.3
General Aviation	35.9	37.6	37.6	37.6	38.3	43.6
Military	2.6	2.9	3.1	3.1	3.1	3.1
TOTAL	**62.4**	**66.2**	**64.9**	**64.9**	**66.5**	**79.1**

Source: FAA Aerospace Forecasts 2003-2014.

Table 28 shows historical and forecast data for pilots. While the total number of active pilots has increased from 2001 and is expected to continue to do so, the number of instrument rated pilots dipped in 2002 from 2001. It is expected to reverse that trend and begin growing, exceeding the 2001 number by the year 2004. Often forecasts of professional pilots are based, in part, from forecasts of student pilots and private pilots. Rising numbers of pilots is a good indicator that there may still be interest in the profession in the years to come. What remains to be seen is how to train future professional pilots. With fewer pilots coming from the military ranks, a greater need is placed on civilian training and the structure of this training (5) (6).

Table 28

Total Active Pilots

Pilots	Historical			Forecast		
	1995	2001	2002	2003	2004	2014
Total Active	639.2	657.5	661.4	664.8	670.9	777.7
Instrument Rated	298.8	321.0	317.4	319.6	323.5	385.9

Source: FAA Aerospace Forecasts 2003-2014.

Table 29 provides a perspective about how the events of September 11, 2001 and perhaps other factors at the time (i.e., economy, industry problems, etc.) impacted the forecasts for the aviation industry. The table includes several widely-used activity measures for air carriers, regionals/commuters, air cargo, aircraft operations, and pilot statistics and shows what the growth expectations were prior to the events of September 11, 2001 and how those growth expectations changed.

The table shows large U.S. carriers still growing but at a lesser rate. Enplanements growth is approximately the same with the other measures still showing steady growth. The measures for regionals/commuters are all showing higher rates of growth than before. This appears to be more related to changes in the economy and the industry than to the terrorist events. Air cargo activity is still expected to grow steadily but at slightly lower rates. Overall aircraft operations and pilot numbers, as with air cargo and air carrier activity, are still expected to grow steadily albeit a little slower than prior to September 11, 2001.

Table 29

Comparison of Aviation Demand Before and After September 11, 2001

Aviation Activity Measure	Projected Annual Growth Rates From 1999 to 2011 (%)	Projected Annual Growth Rates From 2002 to 2014 (%)
U.S. Air Carriers		
Enplanements (Millions)	3.8	3.6
Aircraft Fleet	3.3	1.9
Hours Flown (Millions)	4.0	3.1
Revenue Passenger Miles (Billions)	4.6	3.9
Regionals/Commuters		
Enplanements (Millions)	5.5	5.6
Aircraft Fleet (Jets/Total)	3.0	4.0
Revenue Passenger Miles (Billions)	7.4	7.7
Air Cargo		
Revenue Ton Miles (Millions)	5.9	5.0
Aircraft Fleet	4.0	3.4
Aircraft Operations		
Air Carrier	2.8	2.2
Commuter/ Air Taxi	2.6	2.8
General Aviation	1.7	1.3
Military	0.0	0.1
Total	2.0	1.7
Pilots		
Total Active	2.1	1.4
Instrument Rated	1.7	1.6

Source: FAA Aerospace Forecasts 1999-2001 and 2003-2014.

Table 30 shows levels of employment for various categories of certificated air carriers. Variations within some categories appear to be related to the changes in make-up of the categories themselves, which may change as airlines move into and out of categories as they grow or shrink. The key in this table is the steady overall growth in the "majors" category and the overall total. This changed in 2001 and became worse in 2002. This is not a positive sign for the employment outlook, as the bottom has not yet been seen. If the various aviation demand measure forecasts hold, the industry is on the verge of a recovery and the employment levels are likely to follow in the near future.

Table 30

Employment Levels of Certificated Air Carriers by Category 1995-2002

	1995	1996	1997	1998	1999	2000	2001	2002
Majors	533,313	564,631	597,953	623,389	650,267	672,294	607,857	585,890
Nationals	59,444	56,586	47,662	59,414	66,368	56,056	41,865	52,470
Large Regionals	15,415	10,890	9,553	11,471	6,687	2,177	2,426	3,285
Medium Regionals	2,191	2,759	1,075	1,928	2,338	1,522	1,340	1,152
Total	610,363	634,866	656,243	696,202	725,660	732,049	653,488	642,797

Source: Air Transport Association.
Note: United Parcel Service employment data for 2001 is not reported in this data. It appears to be approximately 5,500 to 6,000 if extrapolating from 2000 and 2002.

Fractional Ownership Programs

While the ultimate goal for many professional pilots is to fly for the airlines, there are other career alternatives. Chief among them is business aviation which includes flying for a corporation and flying for a fractional ownership company. Fractional ownership is an arrangement where an aircraft is owned by more than one person or company and is professionally managed. Fractional ownership emerged in the mid 1980s and has been fueling growth in the business aircraft market for the past several years. The number of aircraft operated

by fractional companies has continued to grow (8). Table 31 shows the number of aircraft operated by these companies since 1995.

Table 31
Number of Aircraft Operated by Fractional Ownership Companies and the Number of Fractional Owners

Year	Number of Aircraft	Number of Owners
1995	37	234
1996	69	439
1997	113	713
1998	171	1,113
1999	242	1,846
2000	313	2,778
2001	385	3,530
2002	450	4,157

Source: Jet Solutions (8)/FAA

As the table shows, the growth of these companies has been explosive. This has had an impact on the number of pilots hired and has made it a much more reliable source of jobs for professional pilots. This is in addition to corporate pilots that fly for a single company that owns and/or operates their own aircraft. According to Air Inc., the Atlanta-based aviation consulting and forecasting firm, there were 15,337 corporate pilots and 11,798 corporate aircraft in early 2001 (9). At the same time, there were eight fractional ownership companies that operated 433 aircraft and had 1,478 pilots. While not up to the numbers of corporate aviation, fractional ownership programs have a large potential for growth. According to Jet Solutions, there are 175,000 potential customers who have the financial resources to participate in fractional ownership programs (8). Currently, only two percent of this market has been tapped. The future of this market and eventual pilot demand could be fueled by a changing structure. This includes lease options for fractional programs, various charter arrangements, and the introduction of micro jets (8).

One example of a micro jet is the new Eclipse Jet, whose less than $1 million price tag has fueled speculation about low cost charter operations. Many of these alternatives could lead to the demand for professional pilots as they would be intended to be as affordable as or cheaper than commercial aviation but more convenient. They would also increase the potential customer base as the threshold of affordability/personal resources would be less than they are today for fractional ownership programs.

Most Recent Pilot Hiring Data

The most recent publicly available information from Air Inc. revealed that as of June 2003, various airlines and operators hired 2,455 pilots. This is in addition to the 5,845 pilots hired in 2002. According to Air Inc., approximately 68 percent of these pilots came from civilian backgrounds as opposed to military backgrounds. Table 32 shows this information in more detail.

Table 32

Summary of Most Recent Pilot Hiring Data from Air Inc.

Airline/Operator	Number of Pilots Hired	
	2002	Year-to-Date June 2003
Majors	549	312
Nationals	1,698	904
Jet Operators	1,145	595
Non-Jet Operators	1,108	303
Fractional Ownership	997	103
Helicopters	243	178
Crew Leasing/Foreign Operators	18	60
Upstarts	87	0
Total	5,845	2,455

Source: Air Inc.

In recent years, more pilots had been hired than in 2002. The numbers have declined substantially, especially in 2001 following a year where more than 19,000 pilots had been hired. Table 33 shows the recent history of pilot hiring and what may be the beginning of a reversal of the negative trend that began in 2001. Recent forecasts of pilot hires do not appear to be publicly available. While some forecasts have been located, they are quite dated and do not consider the terrorist events of September 11, 2001 or the recent economic and industry downturns. Therefore, they have not been included here. But as the economy and industry recover, as the forecasts suggest, pilot hiring appears likely to recover as well. This, coupled with pilot retirements, required at age 60, creates a more favorable outlook for professional pilot jobs. When a more accurate forecast for pilot demand becomes necessary to justify the existence or development of an academic program in aviation in Texas, Air Inc. can perform this specialized or customized analysis for pilot demand by airline/operator category. Table 33 presents a summary of pilot hires.

Table 33

Summary of Recent Annual Pilot Hires – 1995 to 2003 (Estimated)

Airline/Operator	Number of Pilots Hired								
	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003E**
Majors	2,377	3,080	3,854	3,646	5,000	4,779	3,318	549	800
Nationals	2,508	2,773	3,194	4,698	5,397	6,601	4,026	1,698	2,000
Jet Operators	1,735	2,205	1,946	2,573	2,251	2,805	1,716	1,145	1,200
Non-Jet Operators	1,745	1,825	1,762	2,256	2,507	2,782	2,065	1,108	1,200
Fractional Ownership	-	-	-	-	-	1,363	1,038	997	1,500
Helicopters	-	-	350	365	256	515	509	243	275
Crew Leasing/Foreign Operators	373	366	732	477	193	115	83	18	50
Upstarts	76	276	98	128	143	67	11	87	50
Total	**8,814**	**10,525**	**11,936**	**14,143**	**15,747**	**19,027**	**12,766**	**5,845**	**7,075**

Source: Air Inc.

Pilot Furloughs

An assessment of the current pilot demand picture would not be complete without introducing and briefly mentioning the notion of furloughed pilots. Recent events in the aviation industry have forced airlines to furlough pilots until a sustained recovery is underway. Without getting into the recall process, it is at least necessary to include these numbers in the analysis as airlines will likely recall many of these pilots before hiring new and less experienced pilots. How this ultimately influences pilot demand is not completely clear as some may simply leave the profession while others may not get a chance to return. Nevertheless, it is a factor that needs consideration and one that could be more fully understood through a more customized analysis.

Table 34 shows the number of furloughed pilots according to airline/operator type as of June 2003. Currently more than 9,000 pilots have been furloughed and the vast majority of those are with the major airlines.

Table 34
Current Level of Furloughed Pilots By Airline/Operator – June 2003

Airline/Operator	Number of Pilots Currently Furloughed
Majors	7,427
Nationals	1,465
Jet Operators	172
Non-Jet Operators	32
Fractional Ownership	0
Helicopters	0
Crew Leasing/Foreign Operators	78
Upstarts	0
Total	**9,174**

Source: Air Inc.

Although the pilot hiring outlook is currently somewhat cloudy, there are reasons for optimism. The aviation industry is expected to recover and is beginning to show signs of a

recovery. Also, the structure of aviation is changing with growth in the regional and fractional market segments. Finally, there is no replacement in sight for an air transportation system that allows people to travel the country and the globe and ship cargo efficiently and effectively. There is no alternative and it will likely remain a reliable and well-utilized mode of transportation for the foreseeable future.

Framework of Pilot Hiring Requirements

In his FAA Commercial Aviation conference presentation on pilot shortages, Air Inc. president Kit Darby outlined the pilot hiring requirements for the different categories of airlines and operators (9). This information is included to provide insight on what these employers seek in pilot candidates. The data include information on both pilots coming from civilian and military backgrounds and includes averages and ranges of flight hours for the pilot hires.

Fractional Ownership Operators

- Total time requirement: 1,500 – 2,000 for First Officers (co-pilots)
  2,500 – 4,000 for Captains
- Jet time: Usually required for Captains
  500 – 1,500 hours with 300 hours in type
- Other: Air Transport Pilot rating, Class I medical certificate, six months currency, and a four-year college degree

Non-Jet Operators

- Age range: civilian: 24-53 (avg. 36); military: 42-53 (avg. 47)
- Air Transport Pilot rating: civilian: 26 percent, military 50 percent
- Total time: 600-15,500 (avg. 2,558) civilian
  1,554 – 12,200 (avg. 5,097) military
- At least 200 hours of multi-engine (avg. 1,107 civilian, 3,613 military)
- Some turbine time preferred

Jet Operators

- Age range: civilian: 23-56 (avg. 36); military: 31-62 (avg. 41)
- Air Transport Pilot rating: civilian: 63 percent, military 100 percent
- Type rating: civilian 44 percent, military 68 percent
- Total time: 900-14,575 (avg. 4,084) civilian
  2,341 – 28,000 (avg. 6,254) military
- Four-year degree: civilian 64 percent, military 94 percent

National Airlines

- Age range: civilian: 21-53 (avg. 34); military: 26-57 (avg. 37)
- Air Transport Pilot rating: civilian: 43 percent, military 59 percent
- Type rating: civilian 12 percent, military 22 percent
- Total time: 500-19,863 (avg. 2,680) civilian
  601 – 7,846 (avg. 2,834) military
- Turbine: 800+, Civilian 985, military 1,228
- Four-year degree: civilian 70 percent, military 91 percent

Major Airlines

- Age range: civilian: 23-54 (avg. 34); military: 29-53 (avg. 37)
- Air Transport Pilot rating: civilian: 97 percent, military 96 percent
- Type rating: civilian 67 percent, military 51 percent
- Total time: 1,800-19,863 (avg. 5,775) civilian
  1,250 – 17,229 (avg. 2,951) military
- Turbine: 800+, Civilian 985, military 1,228
- Average multi-engine: civilian 4,148, military 2,951
- 1,500 hours of turbine: civilian 2,170, military 2,097
- Flight Engineer examination: civilian 70 percent, military 80 percent
- College degree: civilian 89 percent, military 99 percent
- Background: civilian 50 percent, military 50 percent
  mixed 32 percent

Some elements of these requirements are worth noting. The requirements presented here exceed the minimum criteria established by the airlines themselves. Some of them have published this information on their website. As pilots move to the more demanding carriers in terms of requirements and aircraft operated, the prevalence of college degrees increase. Darby noted in his presentation that the percentage of pilots with four-year degrees has increased over the past several years and is now more than 90 percent (9). The military as a source of pilots has also declined in recent years and is now approximately 50 percent. This is down from the 80 to 90-percent range in the early 1990s (9). This range has fluctuated somewhat in the past 20 years (9). Finally, not mentioned above is the percentage of minority or women pilots. Darby noted that the make-up of those considered having competitive qualifications is 6 percent women, 2 percent African American, and 3.9 percent Hispanic. Their representation in the industry is clearly less than society as a whole.

CHAPTER 11. REVIEW OF RELEVANT LITERATURE PERTAINING TO ACADEMIC CURRICULUM IN AVIATION

As a means of developing better information regarding the needs of the aviation profession with respect to academic training, relevant literature was examined. The academic field, through several peer-reviewed journals, offers significant insight into how formal education in aviation may be improved or better directed to help meet the needs of airlines and airports.

This information is included in the format of an annotated bibliography so as to be helpful to those considering developing or expanding an aviation program. Those considering developing a four-year program will benefit from this information as it should help shape the new program's development in terms of identifying elements of benefit to both students and their prospective employers. This includes flight internships, airport internships, and specific coursework among others.

The related literature can be categorized into four topic areas. These are airport management/administration, flight operations, recruitment/retention, and aviation education – general. The first two topics cover the major academic emphasis areas that this study covered. The third topic covers the important issue of how to attract students to aviation programs and retain them through graduation. The last topic covers general issues in aviation education that do not fit into the other three categories but that are informative and important in aviation program development.

The information below was taken directly from the articles referenced and serves to provide a brief statement on the research methods and the findings relevant to this analysis. In some cases the abstracts from the articles were directly included either wholly or in part. For others, a more detailed entry was made. The work below summarizing or describing the research in these articles is not the work of this report's authors or researchers. Rather, it is the work of the authors of the individual articles as noted in the bibliographic references that precede the descriptions.

It should be noted that there are some peer-reviewed, non-engineering aviation journals that frequently publish material on a variety of aviation-related topics including educational issues. Some of those journals are mentioned below but the list is by no means exhaustive.

Airport Management/Administration

C. Daniel Prather. Airport Internships: Effectively Structuring a Departmental Rotation Internship. *Collegiate Aviation Review*, Vol. 17, No. 1, 1999, pp. 53-73.

The author, a practicing airport executive with a large airport authority in Florida, presents findings on the expert opinion of airport managers across the country on what they believe to be the most important departments for interns to gain experience. The author designed a survey instrument and sent it to 200 randomly selected airport managers from the 1996-1997 directory of the American Association of Airport Executives (AAAE). A 66 percent response rate was achieved. The goal was to ascertain the most appropriate structure of an airport internship departmental rotation schedule. Each respondent was asked to rate various airport departments on a five-point scale with one five being "extremely important" and one being "extremely unimportant." By combining the "important" and "extremely important" categories, "Finance" and "Planning and Development" tied with both receiving 92 percent of the responses. The other departments receiving a large number of "important" and "extremely important" responses were "Properties and Contracts" (89%), "Operations" (88%), "Information/Public Relations" (83%), "General Aviation" (76%), "Facilities/Maintenance" (72%), "Design and Construction" (69%)", and "Human Resources" (65%). Those receiving the most responses in the "extremely unimportant" and "unimportant" categories were "International Commerce" (34%) and "Aircraft Rescue/Fire Fighting" (27%).

The author found that 63 percent of the responses indicated that an airport internship was either "extremely beneficial" or "beneficial" to the intern. It also found that 59 percent found that airport internships were either "extremely beneficial" or "beneficial" to the airport. The author, based on his findings, recommends an airport internship structure for internships lasting two years, one and one-half years, and one year.

C. Daniel Prather. Post-secondary Aviation Education: Preparing Students to Manage Airports of the 21st Century. *Collegiate Aviation Review*, September 1998, pp. 40-61.

The author, an airport executive as noted above, presents findings on the views of airport managers across the country regarding the most appropriate fields of study, aviation courses, and academic degrees for preparing for a career in airport management. The author randomly surveyed 200 airport managers from the 1996-1997 directory of the American Association of

Airport Executives (AAAE). A 66 percent response rate was achieved. The author found that the top five fields and the percent that rated them as important or extremely important by the airport managers were management (100%), aviation management (89%), public administration (86%), marketing (85%), and finance (84%).

In terms of academic degrees, 50 percent of the respondents have completed a bachelor's degree and 29 percent have completed a master's degree. Sixty-seven percent of the respondents feel that a bachelor's degree is the highest degree preferred by an employer. Twenty-nine percent believe that a master's degree is preferred. As for academic courses, the author found that the most important courses offered in an aviation management curriculum were, in order of importance, as follows: airport administration, airport finance, aviation policy and planning, aviation safety, aviation marketing, aviation law and regulation, aviation communication, air transportation, aviation insurance, and aviation labor relations.

The least important were: international aviation, principles of transportation, and private pilot ground school. The author notes that women are disproportionately under-represented in airport management. He also notes that universities should increase marketing efforts towards aviation students, consider offering a master's degree program in aviation to further educate students about the complexities of the industry, seek accreditation from the Council on Aviation Accreditation, and not to assume that aviation programs alone are educating future airport managers.

Robert W. Kaps and Leland L. Widick. Educational Requirements for a Career in Airport Management: An Industry Perspective. *Journal of Studies in Technical Careers*, Vol. 15, No. 3, 1995, pp. 153-161.

The authors surveyed airport managers at the top 25 airports in the United States regarding the educational preparation of students seeking careers as airport managers. The managers were asked to rate 26 courses as being required, optional, or not necessary. The consensus was that management courses were the most important. Courses in financial management, airport operations, aviation regulations, introduction to management, personnel administration, and macroeconomics were highly regarded. Courses in data interpretation, airline management, aviation maintenance management, an internship component and a pilot's license were ranked low in importance. The authors note that the field of airport management is complex and

dynamic management endeavor and growing more so every day. This is being driven by emerging technological, economic, and political realities.

Lawrence J. Truitt, John A. Haman, and Laus G. Palinkas. Graduate Education in Airport Administration: Preparing Airport Managers for the 21st Century. *The Journal of Aviation/Aerospace Education and Research*, Vol. 2, 1994, pp. 9-16.

The authors surveyed members of the American Association of Airport Executives to identify the knowledge and skills that the next generation of airport administrators will need to effectively run airports. The article discusses how aviation education is adapting to meet the coming challenges. The article focuses on the master of public administration (MPA) degree with a concentration in aviation management and uses it as the basis of discussion. The respondents felt that all of the MPA courses were relevant. Courses in public budgeting and fiscal management ranked the highest followed by public personnel management and the environment of public administration. Of the aviation courses in the curriculum, airport administration ranked the highest followed by aviation safety administration, aviation law and regulation, and aviation policy and planning.

The managers were also asked to recommend courses for the aviation administration concentration. The recommendations were for adding courses including law and regulations (environmental), communication skills and marketing, contract administration, civil engineering, operations, economics, and miscellaneous administrative skills. The airport managers heavily favored courses with practical applications.

James L. Thiesse, David A. NewMyer, and Leland L. Widick. FBO and Airport Internships for University Aviation Students: Benefits for Students, Universities, and the Aviation Industry. *Journal of Studies in Technical Careers*, Vol. 15, No. 4, 1992, pp. 253-264.

In this article, the authors note that internships provide important professional development opportunities and experiences for students. The various tasks that may be assigned to interns are discussed within the framework of four orientations: job shadowing; departmentally-based activities; academically-based activities; and specific tasks. The authors also identify a list of organizations that can provide information on starting internship programs and provide a

framework for considering the general structure and the value of aviation internships. Specifically, this is for airport internships an including those at fixed-base operators (FBOs).

The authors define aviation internships and note the employer's obligations. They also detail the structure and format of internships as well as their benefits and problems. The student, the airport, the university, and the industry all benefit from such a program in a variety of ways that the authors discuss more fully in the article.

Flight Operations

David A. NewMyer, Jose R. Ruiz, and Ryan E. Rogers. University Flight Operations Internships With Major Airlines: Airline Perspectives. *Journal of Air Transportation Worldwide*, Vol. 5, No. 2, 2000, pp. 111-129.

In this study, the authors examine the partnerships between U.S. airlines and aviation-oriented universities that have flight internship programs. Using a literature review and phone surveys, the authors investigated the similarities and differences between the top 12 airlines' internship programs. The authors made the following conclusions. First, these internship programs serve two to 40 interns per semester per airline (roughly 135 to 181 students per semester). Secondly, the 12 airlines work with a total of 103 colleges and universities with some partnerships ranging from one university per airline to 22 universities per airline. Third, two of the 12 airlines pay their flight operations interns. Fourth, a majority of airlines reported offering the benefits other than pay including tours, jump-seat privileges, simulator training, and travel passes. Fifth, 29 locations for flight operations internships were reported by the 12 airlines with six of the airlines offering more than one location. Sixth, six of the 12 airlines offered post-internship travel pass privileges. Finally, five of the 12 airlines offered guaranteed pilot employment interviews to those students that successfully completed the internships. The authors also go on to dispel some of the myths that have surrounded flight internship programs.

Jose R. Ruiz, David A. NewMyer, and D. Scott Worrells. An Evaluation of a Major Airline Flight Internship Program: Participant's Perceptions of Curricular Preparation for, and Components of, the Internship. *Collegiate Aviation Review*, Vol. 17, No. 1, 1999, pp. 74-94.

The authors surveyed 110 former university interns who served in semester-long flight internships at United Airlines. The purpose was to ascertain how well their university

coursework prepared them for the internship programs. Seventy-eight of the respondents indicated that their university curriculum prepared them either well or very well for their internships. Nearly 81 percent of the respondents indicated that the internships had a great or significant impact on them achieving their career goals. Ninety-six percent said they would recommend an internship with United Airlines.

Two types of internships were included in the analysis. The short internship was a two-week program and the long internship was a semester-long program. The value of both programs and the level of academic preparation for these programs were assessed. The evaluation of the coursework was specific to Southern Illinois University, Carbondale. The courses that rated "most helpful" or "very helpful" in preparing students for internships ere airline management, cabin environment and jet transport systems, flight systems management, air transport labor relations, and aviation industry career development.

David A. NewMyer, Jose R. Ruiz, and Scott Worrells. A Pioneering University-Airline Flight Internship Program: A Follow-Up Study of Intern Participants. *The Journal of Aviation/Aerospace Education and Research*, Vol. 8, Winter 1998, pp. 23-33.

This study uses data collected from the same survey mentioned in the article above. While that study focused on academic preparation for internships, this analysis sought to discover if the purposes of the internships had been fulfilled. The survey also gathered information on the characteristics of the internship participants such as their current employment with the goal of discovering how many of them were hired by United Airlines, among other things. The authors describe the United Airlines – Southern Illinois University, Carbondale internship program and discuss the characteristics of its participants. A qualification profile of the average respondent hired by United Airlines is described.

Recruitment/Retention

Mary Ann Turney, James C. Bishop, Merrill R. Karp, Mary Niemczyk, Ruth L. Stitler, and Mavis F. Green. National Survey Results: Retention of Women in Collegiate Aviation. *Journal of Air Transportation*, Vol. 7, No. 1, 2002, pp. 69-92.

The authors present preliminary findings of data collected from 390 college students (195 men/195 women) majoring in aviation programs at nine colleges and universities. The study was

initiated to discover the factors that influence women once they have already selected an aviation career and to better understand what could be done to support them in their endeavors. This was done because the number of women pursuing technical careers and especially careers in aviation remain low. The results showed significant areas of concern among women in flight training. Differences between males and females were found in the responses.

A surprising finding was that women in the early stages of flight training responded differently from women in more experienced stages. This did not occur with men. The results suggest that women in the more experienced stages may have gone through an adaptation process and that they may reflect more male-like attitudes about a wide array of issues including social, confidence, family and career issues.

Mary Ann Turney. Attracting Women To Aviation Careers: What Recent Studies Reveal. *Collegiate Aviation Review*, Vol. 18, 2000, pp. 86-92.

The author of this paper presents a review of literature relevant to the question of why the numbers of women choosing careers in aviation have not increased in the past two decades. She also explores why those who demonstrate an early interest in the aviation eventually look to other careers for satisfaction. The article notes that the percentage of women attracted to aviation remains low despite industry attempts to increase the talent pool by encouraging women to participate.

Brent Bowen, Larry Carstenson, and Frederick Hansen. Recruiting From Within: Action-Oriented Research Solutions to Internal Student Recruitment in Collegiate Aviation Education. *Journal of Air Transportation Worldwide*, Vol. 4, No. 1, 1999, pp. 15-25.

The authors present a case of good practice in student recruitment that can be applied for the overall benefit of collegiate aviation education. The authors establish that student recruitment must be an active and ongoing commitment of the academic unit. The single case scenario presented by the authors provides examples of internal student recruitment strategies that can be applied to any academic program. Related literature is examined and reported to theoretical and applied frameworks. The results convey a system that maximizes student recruitment and concludes with a plan that can be generalized to most collegiate aviation programs.

Jacqueline R. Luedtke and Ioannis Papazafiropoulos. Retention in Collegiate Aviation. *Journal of Air Transportation Worldwide*, Vol. 1, No. 1, 1996, pp. 39-50.

The Aviation Institute at the University of Nebraska at Omaha undertook a research project to study retention issues as they relate to the Institute's academic programs and the field of aviation in general. The author's note that aviation, partially due to the cost associated with training, has unique retention problems. The survey results should prove useful for other aviation programs in the United States as well as for international aviation programs. The authors mention key components of retention programs from other departments and universities and they note that every faculty and staff member needs to be involved in retention efforts for the retention program to be successful.

Aviation Education - General

Dale B. Oderman. Ethics Education in University Aviation Management Programs in the U.S.: Part Two A—The Current Status. *Journal of Air Transportation*, Vol. 8, No. 1, 2003, pp. 15-36.

This article presents the second part of a three part study that examines how four-year universities in the United States with baccalaureate programs in aviation management include ethics instruction in their curricula. Part One justified the need for ethics education and developed hypotheses to evaluate the current status of ethics instruction. Part Two of the study continues with an extensive survey conducted in 2000 of all collegiate aviation management department heads. Part Two A, the first if two reports on the results of the survey, describes the current status of teaching ethics in the nation's aviation management education programs. It was found that ethics is not widely included in collegiate aviation programs at levels expected in light of current industry problems.

Dale B. Oderman. Ethics Education in University Aviation Management Programs in the U.S.: Part One—The Need. *Journal of Air Transportation*, Vol. 7, No. 3, 2002, pp. 3-32.

This study is the first part of a three-part study that examines how four-year universities in the United States with baccalaureate programs in aviation management include ethics instruction in their curricula. Based on a literature review, no research exists to describe the current status of teaching ethics to aviation students. Yet, concurrently, unethical activities reported in the media involving the aviation industry indicates a need for such programs. Part One of this study

justifies the need for ethics education and develops a series of hypotheses to evaluate the current status of ethics instruction, which was investigated and will be reported in Parts Two and Three of this study, respectively (from abstract).

Merrill R. Karp. University Aviation Education: An Integrated Model. *Collegiate Aviation Review*, Vol. 18, No. 1, 2000, pp. 1-11.

University aviation training programs, because of their comprehensive academic environments, offer excellent opportunities to develop and deliver state-of-the-art aviation curricula and become the new primary resource for commercial airline pilots (as opposed to the military). This paper draws upon research conducted in the Aeronautical Management Technology Department at Arizona State University (Karp, 1996) and addresses potential educational enhancements through the implementation of an integrated aviation learning model, the *Aviation Education Reinforcement Option (AERO)*. The AERO model is a learning strategy that incorporates elements of the adult education paradigm, learning style theory, cooperative and collaborative learning techniques, and personal computer-based aviation training devices (PCATDs), to span the long-term retention and application gap that can occur between the classroom and the flight line. This paper suggests that the AERO model, when combined with flight training that emphasizes airline procedures from the very beginning, has the potential to reduce the pilot training time required between the universities' academic classrooms and flight training environments, and the commercial airline cockpit.

Bruce J. Hulley. General Aviation: A Stepping Stone To a World Career in Aviation. *Journal of Air Transportation Worldwide*, Vol. 4, No. 1, 1999, pp. 36-47.

The future of the world's air transportation system is based o the available work force to safely operate this complex mode of transportation. Most airline pilots started their aviation careers in a general aviation aircraft. General aviation includes all aviation except military and commercial aviation and has the most pilots and aircraft. Not all people are suited to be airline pilots. Thos who do not pilot commercial aircraft can still find related employment in the aviation industry. We need to expose our youth to our industry in order to guarantee the availability of an aviation work force of the future. What better way than to offer them the chance to enter an aviation career through a well planned aviation/aerospace, activity related

youth program. The purpose of this paper is to suggest and identify resources of cooperation that can motivate young people to enter future aviation careers through general aviation and organized aviation.

Paul D. Lindseth. Developing a Model of Four-Year Aviation Program Quality: A Grounded Theory Approach. *Collegiate Aviation Review*, September 1998, pp. 11-23.

There has been a rapid increase in the number of four-year aviation programs in the U.S. from 20 programs in 1968 to over 70 programs today (University Aviation Association, 1994). The quality of these programs is difficult to determine since no research, other than accreditation standards, could be found concerning what criteria comprise a high quality four-year aviation program. Furthermore, having aviation professionals prepared through quality academic programs seems essential for the safe operation of the U.S. aviation industry. The purpose of this qualitative study was to identify criteria that support a definition or theory of quality within four-year aviation programs in the U.S. Using Glaser and Strauss' (1967) grounded theory approach, data were collected from U.S. baccalaureate aviation program administrators and directors of training from U.S. major and regional airlines. Eighty-two responses (63% response rate) were used in the analysis. Categories of criteria emerging from the study, such as curriculum, students, and faculty, were used to develop a model of four-year aviation program quality. Results of this study have implications for aviation program administrators and faculty for developing higher quality four-year aviation programs by placing more emphasis on identified criteria of program quality.

Robert W. Kaps and Jose R. Ruiz. Educational Requirements for a Career in Airline Management: An Industry Perspective. *Collegiate Aviation Review*, September 1997, pp. 43-57.

In this study, the presidents at thirty of the top United States airlines were asked to indicate what educational preparation they felt students seeking a career in airline management should possess. They were asked to rate 18 courses offered in the Aviation Management baccalaureate degree curriculum at Southern Illinois University at Carbondale. They were also asked to rank 14 suggested courses from the Council on Aviation Accreditation (CAA) curriculum guide. Following analysis, courses were placed in three categories: Inclusionary, Exclusionary, and Uncertain/Divers.

Findings indicate that airline presidents place the greatest value on courses stressing fiscal requirements, legal aspects, airline operations and operating in a global environment. Conversely, courses including Applications of Technical Information, The National Airspace System, Airport Planning, Airport Management, Professional Development and General Aviation Operations were ranked low in importance.

Michelle Fuller and Lawrence J. Truitt. Aviation Education: Perceptions of Airport Consultant. *Journal of Air Transportation Worldwide*, Vol. 2, No. 1, 1997, pp. 64-80.

The necessity for advanced training in aviation has prompted a few universities to establish graduate programs in aviation. Although several masters aviation programs are now well established, they do not have a common core curriculum. This article reports the findings of a study designed to learn more about the education needs of one segment of the aviation industry – the airport consulting business. Airport consultants were first asked to evaluate the relevance of courses offered in an existing MPA program. They were then asked to evaluate sixteen fields of academic study in terms of importance in preparing entry-level employees for a career in airport consulting.

Summary of Literature

The literature noted above provides useful information on the structure and make-up of academic programs both in aviation management and flight operations. This includes specific examples of coursework in various aviation curriculums as well as indicators or criteria for program quality. Collectively, these articles represent the input of numerous aviation professionals who were asked to assess programs and coursework and offer their expert advice as to how students can best prepare for a career in aviation. They also include information on internship programs for aviation management and flight operations students and discuss the structure of such programs and how they benefit all parties involved.

These articles provide a good foundation for those seeking to develop a new program or expand an existing one. They include the key topics of coursework, internship programs, recruitment and retention issues, program quality issues, and the preparation of students for careers with airports, airlines, fixed-base operators, and consultants. Although it is not an exhaustive list of available research, it is a relevant and pertinent one considering the questions at

issue in this study. The cited literature also provides a basis for the generic curriculum developed earlier in this study. Much of the coursework outlined in the generic curriculum is substantiated through the research results of the articles presented earlier.

This literature also points out the importance and value of additional, non-aviation courses. These additions generally are in the realm of business and public administration. These makes sense as airports are most often public facilities that are being asked to operate more and more like a business everyday. Research in these areas show that the most important non-aviation courses in an aviation management curriculum include financial management, introduction to management, personnel administration, and public relations. This may provide some basis for including a business or public administration core set of courses in the program and/or even housing it administratively in schools of business or public administration. Perhaps the best case for the existence of a four-year degree program in aviation is made by University of North Dakota aviation professor Paul Lindseth. He writes:

> "A rapid expansion of America's air transportation industry from 182 million passenger miles flown in 1982 to over 400 million passenger miles flown in 1991 is a main factor for the increased number of aviation programs along with the decreasing number of ex-military pilots since the 1970s. The significant increase in passenger miles flown requires a greater number of aviation personnel along with more sophisticated technology and equipment to operate in the same amount of airspace. As a result, aviation professionals must be more knowledgeable, better prepared, and more capable of making critical decisions to continue to ensure the safety of passengers, flight crew members, and the general public. Because pilots, aviation and airport managers, administrators, and air traffic controllers are in command of hundreds to thousands of lives daily, these professionals need superior preservice programs. Having aviation professionals prepared through quality academic programs is essential for the safe operation of today's and tomorrow's air transportation industry" (Lindseth, 1998).

Recent years have only seen additional growth in air transportation as societies and economies have become more global in nature. The debate of the academic legitimacy of aviation programs is essentially over. The questions that now remain are how is it going to be provided (administratively/organizationally/structurally) and who will provide it (public/private universities/colleges). It is likely they will continue to be a combination of two-year and four-year schools as well as some participation from the private sector. Essentially, the need for such a program and its benefits to the industry is well established. For states and regions with

economies reliant upon aviation and aerospace jobs, this need and its benefits are even more compelling.

Once established, aviation programs, like many other academic programs, are faced with issues concerning attracting and retaining students. As pointed out earlier, aviation program face unique problems not the least of which is cost. Learning to fly is an expensive proposition. The authors noted above point out methods and strategies for attracting and retaining students. Bowen, Carstenson, and Hansen (1999) mention recruiting techniques from a survey they conducted. They include reputation of educational institution, word of mouth, personal promotional lectures, and the use of print/electronic media (advertising). Retention strategies are mentioned in research by Luedtke and Papazafiropoulos (1996). These include community outreach programs that link the university and local community, individualized academic advising, the use of a Peer Leader program, and obtaining as much financial assistance as possible for the students.

The aforementioned research also addresses the issue of attracting more women to aviation. The keys to success in this area often involve understanding the differences in learning, communication, and leadership styles between men and women and making appropriate adjustments. Visits to aviation programs in Oklahoma revealed that money continues to be an impediment to attracting and retaining students. This is primarily a problem with flight students as flight-training costs continue to increase. Any effort toward reducing or minimizing flight-training costs could go along way toward attracting and retaining flight students.

CHAPTER 12. CONCLUSION

The development and implementation of an aviation management and commercial pilot program from its initial inception is a significant undertaking. Even the expansion of an existing program would present major challenges considering the lack of or limited nature of the programs that do exist in the state. Existing programs at community colleges and those few at four-year universities would require major expansion in terms of faculty, courses, and or facilities that would undoubtedly trigger the substantive proposal requirement outlined by the HECB. With that said, accomplishing this task is not an impossibility. It will, however, require substantial effort and commitment from many people on many levels to see it through to fruition even if it occurs in incremental stages over a period of years.

Unlike most other academic programs, the first mention of aviation curriculums at the senior college level often generates a discussion concerning the legitimacy of "aviation" as an academic program. Discussions revolve around whether such aviation training should be at the senior colleges or at vocational/technology education institutions. While this may have been a legitimate concern at some point in the past, this debate is now more or less moot. This work has shown that major universities all over the country have such programs. These include state flagship universities, major research universities, and large private universities.

These institutions have realized the growing need and complexities associated with the evolving aviation industry and the demand for highly trained professionals in all aspects of the industry. They have responded to the demand for such a skilled workforce with the aforementioned aviation programs to meet such demand. According to a 1997 study by aviation industry and education professionals, the college ranks are likely to become an increasingly important path for commercial pilots as military opportunities diminish (5). In addition, the report also states that approximately 300 collegiate institutions offer some type of aviation program (non-engineering). University Aviation Association information states that there are 80 programs that offer bachelor's degrees while others range from simply offering a few classes to those offering master's degrees.

The United States Department of Education includes aviation programs in their *Classification of Instructional Programs* (CIP) (3). This document provides a taxonomic scheme for tracking useful statistics concerning academic programs across the nation. Several air transportation-related programs are included in the CIP under the two-digit series code of 49 for

Transportation and Materials Moving. The two-digit codes are the most general of grouping of related programs. The four-digit series codes are intermediate groupings of programs that have comparable content and objectives while the six-digit series codes represent specific instructional programs. Appendix D presents this information in detail.

This document also summarizes efforts to identify those universities in Texas that are interested in housing a comprehensive aviation program. Researchers contacted nine universities with eight responding. The current economic and budgetary problems facing universities, the state, and the nation certainly make developing a comprehensive aviation program a difficult task. There were two universities who expressed their interest in such a program while the others indicated that they were not interested.

UNT sent a response indicating that they have been and still are interested in having a comprehensive aviation program at their institution. They stated that money would be an issue, but feel like it is a worthy program with a recognized need. TSU, which already has an airway science curriculum, responded but does not appear to be in a position to further developing their program. The response came from an assistant professor in their program and not from the provost who was contacted by mail. They do not currently have a flight program, but indicated that they are attempting to establish a program.

Tarleton State University believes that there is no need for another aviation program in Texas. They feel that they are meeting the needs of the state and would not be in support of public money being spent on another aviation program in Texas. Neither are they interested in adding courses to their existing curriculum. Since they are a senior-level college, they are not able to offer a full spectrum of courses (i.e., lower division). Tarleton serves a niche market and would have difficulty attracting new freshman students because of limited course offerings, structure and perhaps even location. New freshman students may want the full college experience and not want to settle for a community college.

A few remarks are in order pertaining to the potential location of a comprehensive aviation program. The approach one takes in establishing a new degree program is not always straightforward. Researchers found aviation programs at a variety of schools across the country. Some were at large, public research universities and others were at small colleges. Some of the more successful programs share common elements. They are typically at four-year universities where they have access to the resources of other colleges and academic disciplines. This includes

business, engineering, and technology programs that can contribute to the value of aviation programs. This allows for a broader and deeper curriculum with more options for students. It also allows for faculty and student collaboration across the disciplines, which typically enhance the educational experience.

If they are in or near urban areas, it makes recruiting and retention of students easier. Researchers learned from some of the site visits that smaller, rural locations face constant issues regarding a lack of social opportunities for students. Perhaps more important is the increased opportunities for internships, part-time jobs, and work co-ops as well as partnerships with industry and government that can be critical to the success of academic programs like those in aviation. The opportunities and resources are simply better on balance.

This report also sought out to provide better a better understanding of some key areas that would eventually prove helpful to those universities considering a comprehensive aviation program. These key areas include flight program costs, aircraft and flight training device costs, faculty salary costs, and pilot hiring data. While these programs are expensive to develop and operate, they are generally operated using flight fees paid by the students in the program. There are many examples of programs that operate in this method and are successful. Students can expect to pay between $30,000 and $40,000 for their flight ratings, new aircraft cost nearly $200,000 and the average faculty member can expect to be paid in the $60,000 range. As the economy recovers, there seems to some optimism that pilot hiring will recover as well. Currently, many airlines are not hiring pilots and thousands remain on furlough. Growth in the fractional ownership market and the regional airline sector has been positives for pilots in an industry that has faced some difficult times in recent years.

The report also includes a review from the current academic literature that addresses curriculum issues and the value of various internship programs among other topics. This was included to provide a theoretical foundation for aviation programs that can be used later by those charged with establishing a new program or expanding an existing one. The topics covered are integral to aviation programs and they offer significant research findings and insight on the development of curriculum and programs for aviation management and professional pilot options as well as the internships that should accompany these programs, and how to recruit and retain students. Much of the literature substantiates the earlier work in this report including the generic curriculum.

This report contains a significant amount of information gathered over a period of a year and a half. It includes information from site visits of university aviation programs, data from academic journals and government sources, and the results of discussions and correspondence with aviation professionals, senior airline pilots, academics, university administrators, and students. It provides a volume of useful information on aviation programs, how they are structured, issues they face, and the elements and obstacles involved in establishing a program in Texas. It includes an analysis of certain aviation industry trends and an outlook for the future. It provides information on those universities in the state that offer aviation programs, the extent of those programs, and other universities that may or may not be interested.

Ultimately, the individual university that pursues the idea will determine the structure and function of a comprehensive aviation program. Its administrative location and identity, its curriculum, and its shared programs and opportunities will be determined by the existing administration as to how to best utilize existing resources. Several of the program heads who were interviewed during this project recommended that once a university is identified, a consultant be brought in to help establish the program within the parameters of the existing university's structure. This is a good idea especially if the consultant is from a similar university in size and structure.

A new aviation program is a tremendous undertaking. Support from the highest levels at the university, and perhaps beyond, are critical to the early and future success of the program. Without it, the program may never be afforded the resources necessary to successfully operate. This support should be evident in the form of a long-term commitment before the process ever begins. It is that crucial.

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APPENDIX A

COURSE DESCRIPTIONS FROM SELECTED UNIVERSITIES

SOUTHEASTERN OKLAHOMA STATE UNIVERSITY

Aviation Courses (AVIA)

1004 Primary Ground Instruction. Sixty-five (65) hours classroom instruction. Preparation for FAA Private Pilot written examination.

1041 Private Flying. Minimum of Forty (40) hours flight instruction time. 20 hours dual, 20 hours solo. Preparation for FAA Private Pilot flight test.

2064 General Aviation. Minimum of Fifteen (15) hours flight instruction time.40 hours classroom instruction. (For aviation minors) (Prerequisites: AVIA 1004 and 1041)

2083 Advanced Ground Instruction I. Sixty (60) hours classroom instruction. Preparation for FAA commercial pilot written examination. (Prerequisite: AVIA 1004)

3003 Aviation Meteorology. A study of the atmosphere and factors affecting weather systems. Also includes pilot weather services, including weather reports, weather forecasts, and weather maps.

3023 Air Traffic Control. An extensive overview of the Air Traffic Control system within which both pilots and aviation managers will operate including the terminology of the system. (Prerequisite: AVIA 3284)

3103 Research of Corporate Flight Department. The student will develop insights into the workings of the corporate flight department and how it interfaces with the rest of the corporation. Extensive on-site research and correspondence.

3113 Aviation Legal Problems. To acquaint students pursuing aviation careers with the complex legal and regulatory responsibilities to be confronted, analyzed and resolved in a rapidly changing environment

3123 Advanced Ground Instruction II. Sixty (60) hours classroom instruction. Preparation for FAA commercial pilot written examination. (Prerequisite: AVIA 1004)

3133 Aviation Administration. This course exposes the career-oriented student to administrative and regulatory requirements and skills necessary to function in industry as mid-level managers. Case studies will be reviewed and analyzed.

3143 Aviation History A study of early aviation pioneers and their achievements and the rapid advancements in aviation technology up to present day achievements.

3164 Commercial Flying. Minimum of one hundred twenty-five (125) hours flight instruction time. Preparation for FAA Commercial Pilot flight test. (Prerequisite: AVIA 1041)

3203 Flight Instructor Ground Instruction. Sixty (60) hours classroom instruction. Preparation for FAA Flight Instructor written examination. (Prerequisite: AVIA 1041 and 3284)

3213 Corporate Internship. Designed to expose the student with workings of the corporate flight department and permit hands-on experience with flight planning, ground transportation, scheduling, catering, dispatching and other duties and responsibilities confronting the corporate pilot or mechanic. Time will be spent on site with various flight departments throughout the country.

3223 Advanced Turbine Aircraft. Puts the student into the cockpit, either simulated or actual, placing added workload and decision-making situations in the path of success. Cockpit Resource Management concepts will be emphasized.

3234 Advanced Aircraft Systems. This course is designed to familiarize the Aviation student with operating systems peculiar to advanced, highly complex aircraft.

3241 Flight Instructor Flying. A minimum of 25 hours of dual flight instruction. Preparation for FAA Flight Instructor flight test. (Prerequisite: AVIA 3203)

3284 Instrument Ground Instruction. Seventy-five (75) hours classroom instruction. Preparation for FAA Instrument Rating written examination. (Prerequisite: AVIA 1004 and 1041)

3321 Instrument Flying. Minimum of Forty (40) hours instruction time of which at least 20 hours must be in the airplane. Preparation for FAA Instrument Rating flight test. (Prerequisite: AVIA 3284)

3334 Advanced Aerodynamics. This course is designed to prepare the student to understand and apply aerodynamics principles as they relate to advanced high performance aircraft. (Prerequisite: MATH 1513 and 1613)

3362 Instrument Flight Instructor Ground Instruction. Thirty (30) hours classroom instruction. Preparation for FAA Instrument Flight Instructor written examination. (Prerequisite: AVIA 3203 and Instrument Rating)

3401 Instrument Flight Instructor Flying. A minimum of 20 hours dual flight instruction. Preparation for FAA Instrument Flight Instructor flight test. (Prerequisite: AVIA 3241 and Instrument Rating)

4413 National and International Operations. Prepares students to conduct complex national and international trip planning (Must be taken in residence, Prerequisite: BIM 1553)

4444 Second Officer-Flight Engineer Written Test Certificate I. Sixty (60) hours classroom instruction. Preparation for FAA Flight Engineer Basic written examination.

4485 Second Officer-Flight Engineer Written Test Certificate II. One hundred seventy-five (175) hours classroom instruction. Preparation for FAA Flight Engineer Turbojet written examination.

4524 Second Officer Flight Certificate. Ten (10) hours of Boeing 727 logable F.E. simulator time plus other considerations.

4562 Multi-Engine Ground Instruction. Thirty (30) hours classroom instruction. Preparation for Multiengine written examination.

4600 Multi-Engine Flying. A minimum of 15 or 30 hours flight instruction time depending upon major-minor option selected. Preparation for multiengine flight test.

4613 Aviation Management Internship. A supervised professional level work experience to expose the student to management practices in the aviation industry.

4621 Multi-Engine Flight Instructor Ground Instruction. Twenty (20) hours flight instruction time. Preparation for Multiengine Flight Instructor flight test.

4631 Multi-Engine Flight Instructor Flying. A minimum of 20 hours flight instruction time. Preparation for Multiengine Flight Instructor flight test.

4643 Physiology. A study of the physical and mental effects of flight as related to aircrew personnel performance and passenger comfort/behavior.

4703 Airline Transport Pilot Ground Instruction. Seventy-five (75) hours classroom instruction. Preparation for FAA Airline Transport Pilot written examination. (Prerequisite: departmental approval

4663 Contemporary Topics in Aviation. A capstone course for graduating seniors where current topics of importance to the aerospace industry are discussed. (Prerequisite: Senior status and departmental approval)

4801 Airline Transport Pilot Flying. A minimum of 25 hours dual instruction. Preparation for FAA Airline Transport Pilot flight test. (Prerequisite: AVIA 4703)

4970 Special Studies. Individualized project selected in consultation with professor.

4980 Seminar. Small group study of topic announced in the Schedule of Classes.

Airframe and Powerplant (AP)

(NOTE: A&P courses are listed for advance standing credit only.
These courses are NOT currently offered at SOSU.)

1002 Introduction to A&P Tools & Equipment. General purpose tool usage, basics of precision measurement; aircraft hardware and basic aircraft structures.

1032 Principles of A&P. Aircraft maintenance methods, federal aviation regulations and aircraft records.

1062 Aircraft Technology and Servicing. Nomenclature of aircraft, servicing, towing, and mooring of aircraft.

1091 Sheet Metal & Metal Fabrication. Aircraft welding, basic fabrication of steel structures. Airframe repair principles and selection of sheet metal fasteners and structural materials.

2112 Powerplant Electrical Fundamentals. Aircraft basic electrical systems, batteries, motors, generators and starters.

2121 Airframe Servicing & Inspection. Aircraft structures, wood and plastic construction and repair, finishing techniques using dopes, lacquers and epoxy materials.

2152 Airframe & Powerplant Servicing & Inspection. Preventative maintenance, 100 hour and annual inspection procedures.

2182 Aircraft Technology. Aircraft control systems, aerodynamics, and aircraft drawing interpretation.

3182 Aircraft Hydraulic Systems. Basic hydraulic principles, servicing, inspection and maintenance of hydraulic and pneumatic systems.

3212 Aircraft Electrical Systems. Aircraft lighting systems, alternating current systems and power generation and distribution.

3241 Powerplant Systems. Aircraft lubrication systems, theory construction and maintenance of propellers, rotors, induction and exhaust systems.

3272 Physics of Reciprocating Powerplants. Theory, construction and maintenance of aircraft reciprocating engines.

3302 Physics of Gas Turbine Powerplants. Inspection and maintenance of gas turbine engines and accessories.

3332 Fluid Mechanics & Fuel Scheduling. Fuel injection systems, float and pressure carburetor operation and construction.

3362 Application of Electrical and Electronic Principles. High and low tension ignition systems, magneto, spark plugs, igniters, generator and starter overhaul and testing.

3393 Maintenance Supervisor. A study of FAA repair stations; PMA; STC, including aircraft, engine and supplies purchasing. (Must be taken in residence, Prerequisite: Airframe and Powerplant Certificate or departmental approval)

3422 Special Slide Rule. Weight and balance theory and application, proper run-up procedures and ground handling techniques.

4453 Inspection Authorization. Requirements for the inspection authorization, aircraft maintenance systems and inspection procedures. (Must be taken in residence, Prerequisite: Airframe and Powerplant Certificate or departmental approval)

4514 Technical Lab Problems. Aircraft shop management, airport relations, employee training, self employment, aircraft sales and financing. (Must be taken in residence, Prerequisite: departmental approval)

4980 Seminar. Topic as announced in Schedule of Classes.

Graduate Course Descriptions (AVIA)

5423 Applications in Crew Resource Management. This course will focus on problems and solutions in decision-making and communication unique to aerospace operations. This course will examine methods to improve effective crew management utilizing the common concepts of Crew Resource Management (CRM) as developed by major air carriers and explore the theoretical basis of such training. Topics such as supervision of crewmembers, counseling, accountability and role management will be studied. Each student will assist in the development of a CRM program.

5323 Airport Operations. This course addresses operational requirements, responsibilities, and management approaches relevant to major US and international commercial service airports. Both FAA and ICAO standards and methods will be studied in detail for topics such as airport licensing, air side operations, land side operations, operational safety, coordination of maintenance and construction, aviation security, and disaster preparedness.

5313 Aviation Finance. A lecture, discussion and hands-on introduction to economic concepts involved in aviation economic decision analysis. Student application will include performing a Benefits-Cost- Analysis, which will develop techniques for defining and measuring relevant economic units for comparison. This course will introduce students to real world cost modeling business applications using Microsoft Excel. Each student team member will also gain practical hands-on experience in financial decision making as a member of the board for a simulated regional airline. Student teams will compete during the semester modifying regional airlines financial obligations and evaluating the results through interpolation of quarterly reports.

5203 Legal and Ethical Issues in Aerospace. This course addresses legal questions in the field of aviation and ethical factors involved therein. Current issues will be used as the medium for study of the legal and moral concepts that influence developments in both national and international air law. U.S. government and ICAO publication, aviation case reports, air law journals and international aviation treaties will be used as legal support materials. Legal and ethical considerations directly challenging the aviation professional will be addressed through case studies.

5103 Aerospace Safety Program Development. This course is designed to provide the essential elements critical to the development, identification, and implementation of an aerospace safety program. Critical measures are discussed and emphasized as integral elements of a comprehensive safety program with focus on identification and prevention of unique safety problems in aerospace. Interaction between national and state government, corporate, and local regulations will be examined in detail supplemented with pertinent case studies.

5153 Aircraft Accident Investigation. This course is designed to examine the critical analysis of selected aircraft accidents and an evaluation of causal factors. Particular emphasis is placed in the study of human factors connected with flight and crew activities in aerospace operations. Interactions and cooperative agreements between international, national and state government, corporate, and local jurisdictions will be examined in detail supplemented with pertinent case studies. Field investigation techniques, laboratory techniques for accident reconstruction, analysis of cockpit voice recorders, flight data recorders, and air traffic control radar and voice tapes will be examined.

5223 Aerospace Hazard Control and Analysis. This course examines the modern aerospace work environment from a safety and health point of view. Hazard control of the various substances used in, on and around the airport property, as well as the substances used and carried on aircraft will be reviewed with respect to the proper handling, disposal and emergency procedures. A comprehensive review and understanding of EPA and OSHA policies and procedures is a fundamental tenet of this course.

5213 Aerospace Economics and Fiscal Control. The major areas of emphasis of this course are the role of government, union and management relations, airline integration, centralized scheduling, flight and crew operations center structure, and crew management. The course will also examine the integration of the all areas of fiscal impact to include advertising, customer relations, maintenance coordination, compute code share, calculate air seat mile and the impact on the profit/loss.

5303 Management and Administration of Aerospace Contracts. The focus of this course is the comprehensive analysis of the procurement process and the various contractual relationships in the aerospace industry. This course also provides a detailed review of the laws and right governing the contractual process from design through product delivery and material maturity.

5500 Directed Readings in Aerospace. This course provides an opportunity to augment or develop specialized areas in the aerospace curriculum as determined by the instructor. Students may elect to perform a special, directed analysis and or independent study in an area of particular interest. A detailed proposal of the project must be developed and presented to the instructor for approval.

5510 Graduate Internship in Aerospace. The graduate internship in aerospace course is an academic and professional activity that is coordinated by the university between aerospace related organizations and the student. An internship in aerospace provides the student with an opportunity to extend their academic endeavors through the application of theories and philosophies studied in the classroom to specific professional activities.

5520 Seminar in Aerospace Trends. The seminar in aerospace trends is designed to provide individual and group research projects into contemporary issues confronting aerospace administrators. The dynamics of this course require the students present their findings to a group of their peers in a formal academic environment.

5520 Seminar in Aerospace Trends. The seminar in aerospace trends is designed to provide individual and group research projects into contemporary issues confronting aerospace administrators. The dynamics of this course require the students present their findings to a group of their peers in a formal academic environment.

UNIVERSITY OF OKLAHOMA

Aviation Courses (AVIA)

1113 Introduction to Aviation. Prepares student to take the FAA private pilot written examination. Covers FAR's, meteorology, aerodynamics, flight physiology, performance charts, radio navigation techniques.

1222 Primary Flying. Prerequisite: 1113. Includes in-flight instruction with effort directed toward obtaining FAA certification as a private pilot. Third class medical must be obtained prior to solo.

2231 Advanced Flying. Prerequisite: 1222 or private pilot certificate.

2341 Secondary Flying. Prerequisite: 2231. Consists of cross country experience under direct supervision of an instructor pilot. Part of the FAA Part 141 commercial certification course.

3111 Advanced Flight Maneuvers. Prerequisite: 1222 or FAA private pilot certificate. Increase the student's knowledge and understanding of advanced flight maneuvers. Accelerated stalls, spins, inverted flight, and recovery from unusual altitudes. Advanced aerodynamics will be discussed and demonstrated.

3113 Commercial Aviation. Prerequisite: 1113 or private pilot certificate. To define the scope and narrow field of study, insofar as possible, to the knowledge requisite to the commercial pilot certificate.

3133 Fundamentals of Instrument Flight. Federal aviation regulations as pertain to instrument flight rules, (IFR) weather and forecast products, interpretation of enroute low altitude charts and terminal instrument approach procedure depictions, instrument flight procedures and techniques.

3572 Instrument Flying. Prerequisite: 3133 and private pilots certificate. Individual flight simulator instruction in the technique of flying solely by reference to instruments. Ground instruction in radio navigation, meteorology, instrument approach procedures, air traffic control procedures and federal aviation regulations.

3581 Multi-engine Flying. Prerequisite: 4552 or commercial pilot certificate. A study of the design, construction and flight characteristics of multiengine aircraft. In-flight instruction in pilotage and operation of multiengine airplanes. Designed to qualify the student for certification as a multiengine pilot.

4113 CFI Seminar. Prerequisite: 3133, 3113. Increase student knowledge of theories of learning, flight instructor authority, and responsibility and classroom and flight techniques. Emphasis on principals of instruction, student motivation and maneuver analysis.

4313 Turbine Transition. Prerequisite: 3581 and 4552. Introduce the student to the procedures of flying a turbine aircraft and the concepts of crew resource management. Emphasis is placed on the basic terminology and procedures and emergency operations.

4423 Crew Resource Management. Prerequisite: 3581 and 4552. To teach the student the principals and procedures of a two or more person cockpit. Includes: briefings, call-outs, and emergency procedures.

4552 Commercial Flying. Prerequisite: 3113. The final stage of the FAA Part 141 commercial pilot certification course. Designed to polish pilot skills in commercial aircraft maneuvers.

4602 Flight Instructor-Airplane. Prerequisite: commercial pilot certificate and instrument rating. Flight instruction in preparation for FAA flight instructor certificate.

4613 Instrument Flight Instructor. Prerequisite: commercial pilots certificate and flight instructor-airplane certificate. Consists of lecture and flight instruction in the specialized teaching techniques and procedures required of an instrument flight instructor. At the end of the course, the student will meet the requirements for certification by the FAA as an instrument flight instructor.

4622 Multiengine Flight Instructor. Prerequisite: commercial pilots certificate and flight instructor-airplane certificate. Instruction in the specialized teaching techniques and procedures required for a multiengine flight instructor. At the end of the course, the student will meet the requirements to take the flight test for certification by the FAA as a multiengine flight instructor.

4713 Senior Capstone. Prerequisite: senior standing and permission of instructor; completion of all other major upper-division courses or concurrent enrollment. This project course builds on the accumulated knowledge from all courses to date. Lectures will cover problem identification, analysis, and generation of alternatives, cost/benefit studies, interviews and presentations. Student teams will analyze and make recommendations on an actual problem for an aviation related organization, such as the FAA.

G4983 Airline Management. Prerequisite: junior of graduate standing. Study of the managerial aspects of the airline industry to include economic and organizational characteristics, marketing, operational scheduling, fleet planning, and labor relations. Students participate in management simulations as senior executives of regional domestic carrier.

4990 Special Studies in Aviation. 1 to 4 hours. Prerequisite: departmental permission. Will encompass various aviation-related topics including many specialty flight programs; such as, aerobatic instruction, multiengine training, pilot refresher training, etc.

OKLAHOMA STATE UNIVERSITY

Aviation Education (AVED)

1113 Theory of Flight. A ground school course covering Federal Aviation Regulations, theory of flight, power plant operation, service of aircraft, principles of navigation and meteorology. Fulfills the ground school training needed for a Private Pilot Certificate.

1222 Primary Flight Laboratory. Lab 4. Meets the flight requirements for the FAA Private Pilot Certificate. Flight instruction conducted under FAR Part 141. Special fee required. Graded on a pass-fail basis.

1403 Advanced Theory of Flight. Prerequisites: 1113 and passed FAA Private Pilot Examination. Advanced navigation, aircraft performance and meteorology, and introduction to crew resource management.

1503 History of Manned Space Flight. Significant historical concepts and events leading to the current status of space exploration.

2113 History of Aviation. History of aviation from its early developments to the present. Historic events and the role of government as they relate to the evolution of the regulatory infrastructure of the aviation industry.

2122 Commercial Flight Laboratory I. Lab 4. Prerequisite: 1222. First of three flight laboratories required for FAA commercial flight certificate with instrument rating. Flight instruction conducted under FAR Part 141. Special fee required.

2132 Commercial Flight Laboratory II. Lab 4. Prerequisite: 2122. Dual instrument flight instruction to meet requirements for FAA instrument rating. Flight instruction conducted under FAR Part 141. Special fee required.

2142 Commercial Flight Laboratory III. Lab 4. Prerequisite: 2132. Final flight lab to meet requirements for the FAA commercial pilot certificate. Flight instruction conducted under FAR Part 141. Special fee required.

2152 Instrument Flight. Lab 4. Dual flight training in preparation for the instrument flight examination. Unusual attitudes, emergencies, instrument approaches, and IFR cross-country flight. Special fee required.

2203 Impact of Aviation and Space Exploration on Society. Survey of significant events and ideas and their economic and social impact on society.

2213 Theory of Instrument Flight. Prerequisite: 1403. Instrument flight rules, the air traffic system and procedures, the elements of forecasting weather trends. Preparation for FAA instrument computer-based knowledge exam.

2313 Theory of Commercial Flight. Prerequisite: 2213. Advanced aircraft systems, aerodynamics, federal aviation regulations, airports and airspace, navigation, and performance. Preparation for FAA Commercial Pilot Written Examination. Special fee required.

2633 Air Traffic Control and the National Airspace System. Prerequisite: 1113. In-depth knowledge in the subject of air traffic control and the national airspace system facilities, equipment and associated development. Enroute and terminal control areas, computerization and automation, flight service systems, ground-to-air systems and integrated telecommunications networks.

3231 Theory of Multi-engine Flight. Prerequisite: Private Pilot Certificate. Aeronautical theory and information required for operating the multi-engine airplane safely, efficiently and within its specified limitations. Emphasis on aerodynamics and multi-engine emergencies.

3243 Human Factors in Aviation. Prerequisite: PSYC 1113. The study of people interacting with the aviation environment. Individual and group performance, equipment design, physical environment, and procedure development.

3333 Advanced Aircraft Systems. Prerequisite: 2313. Study of complex aircraft systems. Electronic flight instruments, inertial navigation, and aircraft monitoring systems.

3341 Multi-engine Flight Laboratory. Lab 2. Prerequisites: Private Pilot Certificate and FAA Third-class Medical Certificate. Dual flight instruction to meet requirements for the FAA multi-engine rating. Flight instruction conducted under FAR Part 141. Special fee required.

3441 Aerobatic Flight. Lab 2. A minimum of ten hours dual flight training. Basic, intermediate and advanced aerobatic flight maneuvers including sequencing and dimensional box spacing. Special fee required.

3443* Aviation Law. Prerequisite: LSB 3213. Insight pertinent to federal governing bodies in addition to local and international laws forming the present structure of aviation law. Practices and pitfalls in aviation activities and a basic legal research capability.

3513 Aviation Management. Prerequisite: 50 credit hours. Managing the major elements of the aviation industry including aircraft manufacturing and air transportation system.

3523 Airport Planning and Management. Prerequisite: 50 credit hours. Overview of the major functions of airport management including master planning. Study of the socio-economic effects of airports on the communities they serve.

3533 Aircraft Turbine Engine Operation. Principles of physics and gas laws pertaining to turbine powered aircraft operation. Turbine powerplant systems theory with emphasis on safe and efficient operation of turbine powered aircraft.

3553* General Aviation Management. Prerequisite: 50 credit hours. Functions of management in general aviation and airport operations including information systems, maintenance, regulatory impact, physical facilities, flight operations, political forces and administration.

3563 Aviation Marketing. Prerequisite: 50 credit hours. Marketing aviation products for the major elements of the aviation industry.

3573 Aviation Finance. Prerequisite: 50 credit hours. Financing the major elements of the aviation industry including general aviation, aircraft manufacturing and airports.

3663* Air Transportation: The Industry. Prerequisite: 50 credit hours. Broad understanding of the air transportation industry and an in-depth knowledge of the organizational structures, managerial functions and operational aspects of today's major, national, and regional air carriers. Historical perspectives, regulators and associations, economic characteristics, labor relations and marketing of modern air carriers.

4100* Specialized Studies in Aviation. 1-3 credits, maximum 6. Prerequisite: 55 credit hours. Independent studies, seminars, and training within selected areas of aviation.

4113* Aviation Safety. Prerequisite: 55 credit hours. Overview of flight safety including studies in human factors, weather, aircraft crashworthiness, accident investigation, and aviation safety programs. Students will be introduced to elements of aviation safety in ground and flight operations.

4133 Principles of Flight Instruction. Prerequisites: 2142, 2313. Development of flight training lesson plans and syllabi. Application of learning theory and teaching fundamentals to flight maneuvers and performance evaluation. Preparation for the FAA Fundamentals of Instructing and Flight Instructor-Airplane Written Examinations.

4200* Internship in Aviation. 1-12 credits, maximum 12. Prerequisite: 55 credit hours. Individually supervised internship in aviation career areas. Directed field experience related to the participant's area of concentration.

4213* Current Trends and Issues in Aviation. Prerequisite: 3663. Analysis of current issues facing management in various segments of the aviation industry. Specific areas include issues affecting the airline industry and general aviation. Application of previously learned concepts to case studies of practical problems to develop deeper understanding of the subject.

4231 Flight Instructor: Airplane Flight Laboratory. Lab 2. Prerequisites: 2142, 4133. Dual flight instruction to meet the requirements for the FAA flight instructor: airplane certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4303* Aviation Weather. Prerequisite: GEOG 3033. Familiarization with weather products needed to enhance flight safety.

4331 Flight Instructor: Instrument Flight Laboratory. Lab 2. Prerequisite: 4231. Dual flight instruction to meet the requirements of adding an instrument flight instructor rating to the flight instructor certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4333* Advanced Aircraft Performance. Prerequisite: 50 hours. A study of advanced aircraft performance including appropriate physical laws, atmospheric properties and power plant technology.

4643* Aviation Navigation Global Positioning Systems. Prerequisite: 50 credit hours. Overview of the theory and operation of the GPS in the private and public sector.

4653 (I)International Aviation Issues. Prerequisite: 50 hours. The fundamental knowledge, comprehension and the abilities to apply, analyze, synthesize and evaluate international aviation issues.

4703* Crew Resource Management. Prerequisites: 2142, 3243. Decision making and communication to improve effective crew management. Ten hours in a dual flight control multi-engine simulator. Special fee required.

4771 Flight Instructor: Multi-engine Flight Lab-oratory. Lab 2. Prerequisite: 4231. Dual flight instruction to meet the requirement for adding a multi-engine flight instructor rating to the flight instructor certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4943* Basic Aircraft Accident Investigation. Prerequisite: 50 credit hours. A study of statutes, regulations and regulatory agency requirements that influence aircraft accident investigation.

4953* Corporate Aviation Management. Prerequisites: 2142 and 3341. Study of management principles and practices of corporate aviation. Equipment acquisition, legal requirements, government regulations, aircraft maintenance management, and investment decision-making.

4973* Air Transport Law. Study of the legal system as it relates to air transport law and governance of the air transportation industry.

4990 Pilot Proficiency Flight. 1-2 credits, maximum 4. Lab 32. Required for students entering the aviation education program who possess all FAA certificates/ratings required for the aviation sciences degree.

5000* Master's Report or Thesis. 1-3 credits, maximum 3. Master's degree enrollment for a total of two credit hours if writing a report or three hours if writing a thesis.

5020* Seminar in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual research problems in aerospace education.

5052* Guided Reading and Research. Prerequisite: consent of instructor. Guidance in reading and research required for completing the report for the M.S. in aviation and space science program.

5103* Aviation Career Development. Aviation career development in private and public aviation organizations.

5113* Aviation Safety Program Development. Prerequisite: 4113. A detailed examination of risk management and accident prevention in the aviation industry. Organization and operation of safety programs including OSHA requirements, performance measurements, cost analysis, and systems safety analysis.

5200* Graduate Internship in Aviation and Space. 1-6 credits, maximum 6. Directed field experiences in aerospace education for master's students.

5203* Aeromedical Factors. Prerequisite: 3243. The study of aeromedical factors that influence pilot performance. The study of life support equipment designed to increase aviation safety.

5303* Aviation and Space Quality Issues. A study of the practice and research involved in implementing aviation and space quality issues.

5702* Simulation in Aviation. Prerequisite: 3341. Preparation for the practical skills required for a career as a professional pilot. Skill areas comparable to those required for the FAA Airline Transport Pilot rating.

5711* Airline Transport Pilot. Prerequisite: 3341. Designed for the professional pilot. Completion of the course assists in preparation for the FAA Airline Transport Pilot written examination.

5720* Current Issues in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Current issues in aerospace education.

5813* Earth Observation Systems. Study of earth orbiting systems that collect data on the earth's water, land and atmosphere.

5823* Space Science: Sun, Inner Planets and Asteroid Belt. A study of the sun, inner planets and asteroid belt.

5843* Space Science: The Outer Planets and Probes. Evolution of the outer planets, space probe exploration, orbital mechanics and missions.

5850* Directed Readings in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed studies in aerospace education.

5910* Practicum in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed observation and supervised clinical experiences in aerospace education.

6000* Doctoral Thesis. 1-15 credits, maximum 15. Required of all candidates for the Ed.D. in applied educational studies. Credit awarded upon completion of the thesis.

6203* Aviation Physiology. Prerequisite: 5203 or equivalent. The study of the complexities of pilot performance as it relates to human physiology, human factors and aviation safety.

6303* Aviation and Space Safety Data Analysis. Practical application and research of aviation and space safety databases.

6313* Administration of Aviation Institutions. A study of the organization and administration of public and private aviation institutions. Study of the impact of economic and governmental system on these institutions.

6413* Development of Air and Space Flight. Specific air and space missions with emphasis on contributions to humankind.

6423* Certification of Airplanes. A study of the practices and research involved in the certification of airplanes.

6443* Certification of Rotorcraft. A study of the practices and research involved in the certification of rotorcraft.

6613* Aviation Executive Development. A study of the styles of aviation executives in private and public aviation organizations.

6774* Applied Aviation and Space Research. Prerequisites: consent of instructor and approval of student's advisory committee. Action research topics in aviation and space identified by the aerospace industry with emphasis upon publications in aviation and space refereed journals and trade publications.

6880* Doctoral Internship in Aviation and Space. 1-6 credits, maximum 6. Directed field experiences in aerospace education for doctoral students.

6943* Aviation Regulatory Law. A study of the practical application and research of the FAA regulatory process and associated case law.

6963* Advanced Aircraft Accident Investigation. Prerequisite: 4943. Application and practice of the different statutes, regulations, and regulatory agency requirements that influence aircraft accident investigations.

* Indicates the course is approved for graduate credit.

LOUISIANA TECH UNIVERSITY

Course Descriptions for Flight Operations and Aviation Management
(some of the courses listed under Flight operations are also listed under the Aviation Management section)

FLIGHT OPERATIONS
Professional Aviation (PAV)

101: Private Pilot Ground I. 0-3-3: An introduction to basic aerodynamics, aircraft systems, instrumentation, performance, and aviation weather. Initial preparation for FAA Private Pilot Examinations.

102: Private Pilot Ground II. 0-3-3: An introduction to FAA regulations and procedures, communications, navigation, aviation physiology, and aviation safety. Final preparation for the FAA Private Pilot Written Examination.

110: Private Pilot Flight I. 4-0-1: Provides the student with approximately 11 hours of simulator/dual/solo flight instruction. Designed to meet flight requirements toward Private Pilot certificate.

111: Private Pilot Flight II. 4-0-1: Concurrent with 101 and 102. Provides student with approximately 24 hours of dual/solo flight instruction. Designed to complete flight training requirements for FAA Private Pilot Certification.

200: Aircraft Powerplants Systems. 0-3-3: Theory of piston engines. A study of internal combustion process in the radial, opposed, and V-typed engines, including engine driven accessories.

205: Aircraft Electrical Systems. 0-3-3: Fundamentals of the aircraft electrical systems.

208: Introduction to Computers. 1-2-2: Introduction to computers to acquire computer literacy. Study of hardware, software, systems, and application in aviation.

223: Fixed-Base Operations. 0-3-3: Detailed study of the functions and responsibilities of the typical Fixed Base Operator.

239: Advanced Aviation Weather. 0-3-3: A study of the atmosphere and weather causes, aviation weather reporting systems, weather safety, and interpretation of weather reports, charts and forecasts. meet weather knowledge requirements for FAA Commercial, Instrument, and Certified Instructor rating.

240: Instrument Pilot Ground I. 0-3-3: Attitude instrument flying, airplane instrumentation, advanced radio and radar navigation.

241: Instrument Pilot Ground II. 0-2-2: Advanced flight planning, communications, navigation, aviation safety, and instrument departure, en route, and approach procedures. Final Preparation for Instrument Rating.

242: Instrument Pilot Flight I. 3-0-1: Provides the student with approximately 15 hours of instrument flight instruction necessary to meet the requirements for the FAA Instrument Rating.

243: Instrument Pilot Flight II. 3-0-1: Provides the student with approximately 60 hours of dual instrument flight instruction necessary to meet the requirements for the FAA Instrument Rating.

303: Aerodynamics. 0-3-3: A study of advanced aircraft design, aerodynamics, and performance.

305: Jet Propulsion Systems. 0-3-3: Theory of jet propulsion and measurement of thrust. Includes turbojet, turbofan, and turboprop engines.

315: Airport Planning and Management. 0-3-3:Provides the student with introductory exposure to the field and scope of airport planning and management.

316: Human Factors in Aviation. 0-3-3: Human Factors in Aviation. 0-3-3. For recognition of the comprehensive role of human factors in enhancing aviation safety.

320: Corporate Aviation. 0-3-3: Value/Benefit analysis of the corporate aviation decision. Topics include aircraft selection, flight department administration and operations, aircraft maintenance, FAA regulatory requirements, and future considerations.

322: Aviation Law. 0-2-2: A practical study of aviation law development and application. Case studies. Required for Airway Science Curriculum.

331: Air Carrier Systems. 0-3-3: Applied study of large aircraft systems. Emphasis on regional air carrier aircraft.

332: Air Carrier Operations. 0-3-3: Air carrier operations. Study of required pilot operations.

340: Commercial Pilot Ground I. 0-3-3 : Aerodynamics, performance, instrumentation, stability and control, and aircraft limitations.

341: Commercial Pilot Ground II. 0-2-2: Advanced navigation, emergencies and unusual situations, introduction to multi-engine aircraft, and aviation safety. Final preparation for FAA Commercial Pilot examination.

342: Commercial Pilot Flight I. 6-0-1: Provides students with approximately 21 hours of flight instruction. Designed to meet the flight requirements for the FAA Commercial Pilot Certificate.

343: Commercial Pilot Flight II. 6-0-1: Provides students with approximately 23.5 hours of flight instruction. Designed to meet the flight requirements for the FAA Commercial Pilot Certificate.

344: Commercial Pilot Flight III. 6-0-1: Provides students with approximately 20.5 hours of flight instruction. Designed to meet the flight requirements for the FAA Commercial Pilot Certificate.

400: Multi-Engine Ground. 0-2-2: Provides students with the theory of multi-engine instrument flight. Focuses on emergency procedures and performance factors and weather-related flight.

405: Instrument Flight Instructor. 3-2-3: Provides students with fundamentals necessary to analyze and instruct instrument-reference flight maneuvers and procedures. Prepares students for FAA Instrument Flight Instructor written examination.

407: National Airspace System. 0-3-3 : A survey course designed to instruct the student on the National Airspace Systems to include Air Traffic Control issues and procedures.

410: Multi-Engine Pilot Flight. 3-0-1: Preq PA 400. Provides students with flight instruction necessary to meet requirements for FAA Multi-engine rating.

411: Instructor Pilot Flight. 3-0-1: Provides students with flight instruction necessary to meet the requirements for an FAA Instructor certificate and ratings.

414: Flight Instructor Ground. 0-3-3: Fundamentals of flight instruction and analyses visual reference flight maneuvers. Preparation for FAA instructor written examination.

415: Air Transport Pilot Flight. 3-0-1: Provides the student with flight instruction necessary to meet the requirements for FAA Airline Transport certificates and ratings. Special fee.

419: Supervised Practice Flight/Ground Instruction. 3-0-1: Directed observation, participation and critique related to actual flight instructions.

440: Airline Economics and Management. 0-3-3: An advanced study of airline operation, fleet acquisition, management techniques, economic considerations, public benefits.

490: The Government Role in Aviation. 0-3-3: Past, current, and future governmental control. A study of Congressional action, the NAS, the FAA, ICAO, and state/local aviation laws.

491: Aviation Safety. 0-3-3: Historical development of aviation safety, accident/incident analysis and reporting, introduction to accident investigation, human factors, accident prevention, and development of aviation safety programs. Course taught by distant learning.

495: Aviation Professionalism. 0-3-3: Study of aerospace industry and career opportunities. Emphasis on business climate and job acquisition procedures in the field. Overview of business management and labor practices.

496: Internship in Aviation. 3-12: Supervised work in government or industry to gain experience in aviation fields.

498: Independent Study. 0-3-3: Directed study of air transportation as part of a foreign and domestic, multi-model transportation system.

414: Applied Aviation Theory: Fundamentals of flight instruction and analyses visual reference flight maneuvers. Preparation for FAA instructor written examination.

415: Applied Flight/Airline Transport Certificate: Provides the student with flight instruction necessary to meet the requirements for FAA Airline Transport certificates and ratings.

419: Directed Flight Instruction Experience: Directed observation, participation and critique related to actual flight instructions.

440: Airline Economics and Management: An advanced study of airline operation, fleet acquisition, management techniques, economic considerations, public benefits.

490: The Government Role in Aviation: Past, current, and future governmental control. A study of Congressional action, the NAS, the FAA, ICAO, and state/local aviation laws.

491: Aviation Safety: Historical development of aviation safety, accident/incident analysis and reporting, introduction to accident investigation, human factors, accident prevention, and development of aviation safety programs.

495: Aviation Professionalism: Study of aerospace industry and career opportunities. Emphasis on business climate and job acquisition procedures in the field. Overview of business management and labor practices.

496: Internship in Aviation: Supervised work in government or industry to gain experience in aviation fields.

498: Independent Study: Directed study of air transportation as part of a foreign and domestic, multi-model transportation system.

AVIATION MANAGEMENT COURSES
Professional Aviation (PAV)

101: Private Pilot Ground I: An introduction to basic aerodynamics, aircraft systems, instrumentation, performance, and aviation weather. Initial preparation for FAA Private Pilot Examinations.

102: Private Pilot Ground II: An introduction to FAA regulations and procedures, communications, navigation, aviation physiology, and aviation safety. Final preparation for the FAA Private Pilot Written Examination.

110: Private Pilot Flight I: Provides students with approximately 25 hours of simulator, dual and solo flight instruction. Designed to meet flight requirements toward Private Pilot certificate.

111: Private Pilot Flight II: Concurrent with 101 and 102. Provides student with approximately 25 hours of dual/solo flight instruction. Designed to complete flight training requirements for FAA Private Pilot Certification.

208: Introduction to Computers: Introduction to computers to acquire computer literacy. Study of hardware, software, systems, and application in aviation.

223: Fixed-Base Operations: Detailed study of the functions and responsibilities of the typical Fixed Base Operator.

303: Aerodynamics: A study of advanced aircraft design, aerodynamics, and performance.

315: Airport Planning and Management: Provides the student with introductory exposure to the field and scope of airport planning and management.

320: Aerospace Science: Study of the science of aviation. Includes powerplants, vehicle design, navigation systems, space flight, economic considerations, public benefits, and current business trends/industry status.

322: Aviation Law: A practical study of aviation law development and application. Case studies. Required for Airway Science Curriculum.

407: Professional Aviation Theory: Provides the student with the problem, solutions, and application of theory of operations in the ATC system.

440: Airline Economics and Management: An advanced study of airline operation, fleet acquisition, management techniques, economic considerations, public benefits.

490: The Government Role in Aviation: Historic, current and future governmental control. A study of congressional action, the NAS, the FAA, ICAO, and state and local aviation laws.

491: Aviation Safety: Historical development of aviation safety, accident/incident analysis and reporting, introduction to accident investigation, human factors, accident prevention, and development of aviation safety programs.

495: Aviation Professionalism: Study of aerospace industry and career opportunities. Emphasis on business climate and job acquisition procedures in the field. Overview of business management and labor practices.

496: Internship in Aviation: Supervised work in government or industry to gain experience in aviation fields.

498: Independent Study: Directed study of air transportation as part of a foreign and domestic, multi-model transportation system.

APPENDIX B

COLLEGES WITH AVIATION PROGRAMS

Colleges with Aviation Programs (From Woman Pilot)

The Following List is from the Woman Pilot website (http://www.WomanPilot.com/wp%20pages/career%20pages/colleges.htm).

The information is in the following format:

University/College
State
Phone
Web address
Degree Programs (A: Associate, B: Bachelor's, B+ graduate programs)

Areas of Concentration/Specialty:
AE - Aerospace Engineer
F - Flight
AM – Aviation Management
M - Maintenance
A - Avionics
S - Scholarships
Special Programs (if any)

Aims Community College
CO
970.339.8008
www.aims.edu
A
F
S

Alabama Aviation - Technical College
AL
www.sbiwgukk.cin.aatc.edu

Andrews University
MI
616.471.1455
www.andrews.edu
AB
F

Arizona State University
AZ
602.965.7302
www.asu.edu
B+
F
M

Arkansas State University
AR
870.512.7800
AA
F
AM
M
A
S
Flight Dispatcher NIFA Flt Team

Auburn University
AL
334.844.6848
www.eng.auburn.edu
B+
AE
F
AM
A
S
War Eagle Flying Team & ATC & SIM LAB

Averett College
VA
800.VERETT
www.averett.edu
AB

Baker College of Muskegon
MI
616.777.5200
www.baker.edu
AB
F
AM
S
Hands on - first day flying

Baylor University
TX
254.710.3563
www.baylor.edu
B
F
S

Big Bend Community College
WA
509.762.6256
www.bbcc.ctc.edu/aviation
A
F

Bowling Green State University
OH
419.372.2129
www.bgsu.edu
B
F
AM
M
S
Precision Flying Team - Alpha Eta Rho

Bridgewater State College
MA
508.697.1779
www.bridgew.edu
B
F
AM
S
Aviation Club

Broward Community College
FL
954.761.7464
www.broward.edu
A
F
AM
M

California State University
CA
805.756.1111
www.calpoly.edu

Central Missouri State University
MO
660.543.8011
www.cmsu.edu
B+
F
AM
A

Central Texas College
TX
800.792.3348
www.ctcd.cctx.us
A
F
AM
M
A
S
Precision Flying Team

Central Washington University
WA
509.963.3691
www.cwu.edu
B
F
AM

Cochise College
AZ
800.966.7943
www.cochise.cc.az.us
F
M
A
S

College of Aeronautics
NY
718.429.6600
www.aero.edu
B
F

College of West Virginia
WV
304.893.5531
www.wva.edu
A
F

Columbus State Community College
www.cscc.edu
A
M
Maintenance/power plant

Colorado Northwestern Community College
CO
970.675.2261
www.cncc.ccco.us
A

Community College of Beaver County
PA
724.775.8581
www.ccbc.ccpa.us
A
F

Cornell University
607.254.4643
www.cornell.edu
Mechanical & Aerospace Engineering

Daniel Webster College
NH
800.325.6876
www.dwc.edu
B
AE
F
AM
S
ATC management & flying team

Delaware State University
DE
www.dsc.edu

Delta State University
MS
www.deltast.edu
B+
F

Dowling College
NY
516.244.1383
www.dowling.edu
B+
F
AM

Eastern Kentucky University
KY
606.622.1014
www.eku.edu
B
F
AM
S
Flying Team - Alpha Eta Rho

Embry Riddle Aeronautical University
FL
800.862.2416
www.embryriddle.edu
B+
AE
F
AM
M
A
S
Precision flying team

Embry Riddle Aero University - Distance Learning
FL
800.359.3728
www.embryriddle.edu
AB+
AM
Independent study programs

Embry Riddle Aeronautical University
AZ
800.888.3728
www.embryriddle.edu
B+
AE
F
S

Florida Community College
FL
904.633.8289
www.fccj.ccfl.us
A
F

Florida Institute of Technology
FL
www.fit.edu
B
F
AM

Fox Valley Technical College
920.735.5645
www.foxvalley.tec.wi.us
A
F

Gateway Technical College
WI
www.gateway.tec.wi.us/
B
F

Georgia State University
GA
404.651.2000
www.gsu.edu
B

Guilford Technology Community College
NC
336-665-9425
E-mail: fryee@gtcc.cc.nc.us
A.A.S
F
M
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Hampton University
757.727.5328
B
F

Henderson State University
AR
870.230.5012
www.hsu.edu
B
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AM
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Alpha Eta Rue - NIFA - stud inst - Mike w/email

Indian Hills Community College
IA
www.ihcc.ccia.us
A
F

Indiana State University
IN
www.indstate.edu
B
F

Kansas State University
KS
785.826.2640
www.sal.ksu.edu
AB
F
AM
M
S

Kent State University
OH
330.672.3131
www.kent.edu
B+
F

Lane Community College
OR
541.744.4195
www.lanecc.edu
A
F
M
A

Le Tourneau University
TX
903.233.3620
www.letu.edu

Lehigh Carbon Community College
PA
610.264.7085
www.lccc.edu
A
F
AM
M
S

Lenoir Community College
NC
252.522.1735
www.lenoir.cc.nc.us
A
F
AM
S
Lancer Flying Club

Lewis University
IL
815.838.0500
www.lewisu.edu
B/A
F
AM
M
A
S
Flight Dispatcher NIFA

Louisiana Tech University
LA
504.380.2436
www.aviation.latech.edu
B
F

Lynn University
FL
561.994.0770
www.lynn.edu
B
F

Mankato State University
MN
507.389.5430
www.mankato.msus.edu
B
F
Aviation club

Massachusetts Institute of Technology
MA
617-253-1000
www.mit.edu
B+
AE
AM
S
Air Force ROTC, Soaring Assoc.

Mercer County Community College
NJ
609.586.4800
www.mecc.edu
A
F

Metropolitan State College-Denver
CO
303.556.2983
www.mscd.edu/~aviation
B
F
AM
M
A
S
Precision Flying Team

Miami-Dade Community College
FL
305.237.5555
www.mdcc.edu
A
F

Middle Tennessee State University
TN
615.898.2788
www.mtsu.edu/~aerodept/
B+
F
AM
M
A
S

Northeast Louisiana University
LA
318.342.1780
www.nlu.edu
B
F
AM
S
Associate - Flight Attendant studies

Northern Michigan University
MI
800.856.5822
www.nmu.edu
A

Northwestern State University
LA
800.256.5822
www.nsula.edu
ATP

Oakland Community College
MI
www.occ.cc.mi.us
A
F

Ohio University
OH
740.597-2626
www.ent.ohiou.edu/avt
AB
F
AM
S
United Airlines program

Ohio State University
OH
614.292.6446
www.ohio-state.edu
B
F
AM

Oklahoma State University
OK
800.233.5019
www.okstate.edu
B
F
AM

Orange Coast College
CA
www.occ.cccdedu

Parks College - St Louis University
IL
314.977.8207
www.slu.edu
AB+
AE
F
AM
M
A
S

Purdue University
IN
219.989.2400
www.calumet.purdue.edu
B+
F
AM
M

Rocky Mountain College
MT
800.877.6259
www.rocky.edu
B
F
AM
S

Salt Lake Community College
UT
801.957.4448
www.slcc.edu

San Jacinto College
TX
281.478.2789
www.sjcd.cctx.us
A
F
AM
M
Continental Express Airline Affiliation

San Juan College
TX
800.232.6327
www.flightcareers.com
A
F
S
aff: Mesa Airlines

San Jose State University
408.924.1000
www.sjsu.edu
B

Southeastern Oklahoma State University
OK
580-745-2000
www.sosu.edu/aerospace
B+
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AM
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Nifa Team AHP-WIA

Southern Illinois University
IL
618.536.4405
www.siu.edu
B+
F
High School Career Day

St. Cloud State University
MN
8000.369.4260
www.stcloudstate.edu
B
F

Tennessee State University
TN
B
F

Texas State Tech College
TX
www.texastech.edu
A
F

Tulsa Junior College
OK
A
F

United States Air Force Academy
CO
www.usafa.com

University of Alaska
AK
B
F

University Central of Texas
TX
254.526.8262
B
F

University of Dubuque
IA
800.722.5583
www.dbq.edu
B
F

University of Illinois
IL
217.244.8671
www.uiuc.edu or www.aviation.uiuc.edu
B
AE
F
S
Precision Flying Team - Alpha Eta Rho

University of Kansas
KS
785-864-4267
www.ukans.edu
B+
AE
S

University of Maryland - Eastern Shores
MD
410-651-6365
www.umes.edu/engavi
B
F
AM
S

University of Nebraska
NE
800-3FLYUNO
www.unomaha.edu
B+
F
AM
S

University of North Alabama
AL
256.765.4271
www.una.edu

University of North Dakota
ND
701.777.4757
www.und.edu
B
F
AM
M

University of Oklahoma
OK
800.522.0772
B
F

Utah State University
UT
435.797.1096
www.usu.edu
B
F

Utah Valley State College
UT
334.983.3521
www.uvsc.edu
A
F

Wallace Community College
AI
800.624.3468
www.wallace.edu
A
AE
F
AM
M
A
S
Precision Flying Team

Western Michigan University
MI
619.964.6375
www.wmich.edu
B
F
AM
M
S
Precision Flying Team

Western Oklahoma State College
OK
405.744.6352
www3.okstate.edu
A
F

Wichita State University
KS
B

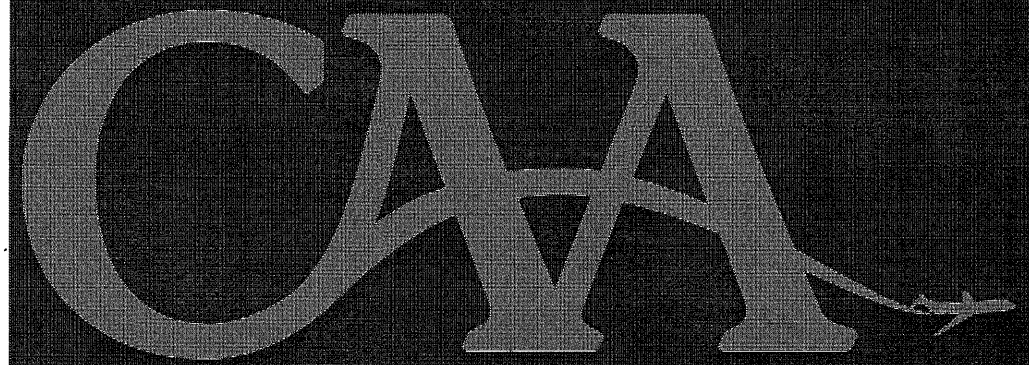
Wilmington College
DE
www.wilmcoll.edu

APPENDIX C

THE COUNCIL ON AVIATION ACCREDITATION

The Council on Aviation Accreditation

Industry and Education Working Together to Advance Aviation!

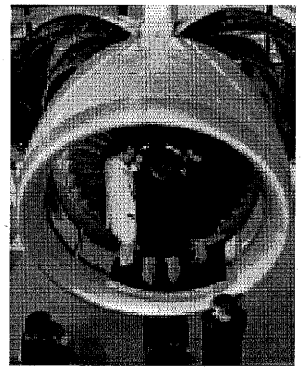


Guide for School Counselors and Students

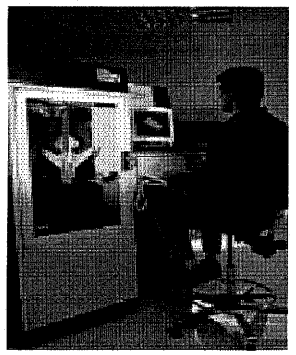
CAA

The New Aviation Career Path

Has a student ever asked you what he/she needs to do to work in the civilian aviation industry? Were you able to provide an answer? In the past, many career counselors, lacking alternative resources, have recommended military duty. This is an indirect solution at best, and poses potential obstacles. Students may find that it is easy to enlist in the armed forces but difficult to get into a aerospace program. The fact is that the direct career path to a successful civilian aviation job is through collegiate aviation programs.



Aviation is a $600 billion industry that accounts for ten percent of the gross national product. Aerospace organizations are looking for new ways to encourage interest in aviation and communicate their job prerequisites to the public. Trends in military downsizing and predicted shortages of aerospace professionals are forcing organizations to consider new sources of job candidates. Because the best aviation positions usually require some background and experience, employers who need pilots, aviation maintenance technicians, airport managers, air traffic controllers, and other aerospace professionals must communicate their needs and help establish some standardization for aviation education programs.



In a 1997 Congressional report titled *Taking Flight: Education and Training for Aviation Careers*, the National Academy of Sciences determined that collegiate aviation programs should be able to supply a sufficient number of job applicants for the future. It stated that those graduates will be adequately qualified, provided that the **Council on Aviation Accreditation (CAA)** continues to grow and set the standards for these programs.

What Is the Council on Aviation Accreditation?

The **Council on Aviation Accreditation** is a nonprofit 501(c)(3) organization that meets twice a year and sets standards for all aerospace programs taught in colleges and schools around the United States. Designed by aerospace educators and the FAA, it judges the quality of aviation education courses. Programs that meet **CAA** standards are accredited for a five-year period.

Members of the **CAA** are educators, customers, employees, regulators, manufacturers, research firms, and advocates. Ultimately, they are the people who teach and hire aerospace industry professionals.

Become an Expert in Aviation Career Counseling

What does this mean to you as a career counselor? First, encourage your students with aerospace interests to apply to colleges with **CAA**-accredited aviation programs. They will be getting an excellent college education as well as a nationally recognized aviation curricula. **CAA** programs have a direct link with all corners of the aerospace community and frequently offer benefits, such as internships.

Second, consider becoming an sustaining member of the **CAA**. You will have the opportunity to work with representatives from business, advocacy groups, government, and education. You will be able to find out, firsthand, what kind of knowledge and experience your students need for both college and employment. You also will be able to track the constant changes in the industry.

The Pulse of the Industry

Through the **CAA**, leaders from every facet of the aviation industry come together to discuss the elements of today's successful aerospace program. Teams of experts evaluate college and university aerospace programs to make sure that they adhere to rigorous standards and reflect changes in today's technology. This information provides schools with the knowledge they need to continually build their curricula.

This community partnership forms a conduit working to promote interest in the aviation profession, attract the brightest and most capable students, educate them by applying the highest standards, and route them to successful aerospace careers. In educational disciplines like engineering, many companies will not hire people who do not have degrees from accredited programs. It is a matter of time before this will be the case in the aerospace industry. Last year, there were more than 26,000 students in aerospace programs in this country alone.

David North, Editor-In-Chief of *Aviation Week and Space Technology,* says, "All aerospace companies and airlines should take a much more active role in molding their potential pool of job applicants... Activism is far better than hoping the person walking through the door has the skills and attitude you are seeking.

What Is Accreditation?

Accreditation is a status that educational programs earn, much like an individual earns a certificate or license. Accreditation is a system for recognizing educational institutions and affiliated professional programs that achieve and maintain a level of performance and quality, which entitles them to the confidence of the educational community and the public they serve.

In the United States, this recognition is provided through non-governmental, voluntary institutions, or professional associations, which establish criteria for accreditation, arrange site visits, conduct evaluations, and publicly acknowledge programs that meet the criteria. Although the **CAA** is incorporated as an independent, specialized, accrediting association, this organization is the out-

growth of a collaborative effort between the FAA and the University Aviation Association.

Accreditation stimulates aviation program excellence and self-improvement through uniform educational quality standards. It increases credibility and integrity of aerospace programs throughout the aerospace community.

The Benefits of CAA Membership

- ☐ ***Participate in the improvement of America's aviation education infrastructure***
- ☐ ***Network with representatives from every aspect of the aviation industry and develop important new contacts***
- ☐ ***Through CAA contacts, provide and collect valuable feedback***
- ☐ ***Build your resume and enhance your marketability***
- ☐ ***Gain greater industry insight and develop an expertise in aviation career planning***
- ☐ ***Offer your students a clear path to their career goals***
- ☐ ***Justify future resources for your career counseling programs***
- ☐ ***Improve opportunities for scholarships***
- ☐ ***Build parental confidence***

A CAA Success Story

Christian Smith exemplifies the benefits of an accredited aviation education. Christian attended a **CAA** accredited university. As part of his curriculum, he worked for one semester as an intern for United Airlines for college credit.

Graduating from college, Christian took a job doing some corporate flying in a KingAir. A year later, he was hired by United and became a B-737 first officer. Two years later, he upgraded to the A-320 and two years after that, completed training to fly the B-777. He has even appeared on the cover of *Air Line Pilot* magazine.

Christian's success is due to his hard work and diligence, but one cannot overlook the opportunities he gained from attending an accredited college. In selecting Christian for both an internship and, ultimately, employment, United Airlines knew that he came from a challenging, technologically-current school. United could draw this conclusion because Christian graduated from a CAA accredited program. In addition, representatives from both United and the school work together to help set the standards all **CAA** accredited programs are required to meet.

At a recent **CAA** meeting, J.D. Whitlatch, former vice president of Standards and Training for United Airlines, discussed company/educator linkages and flight internships. In the first ten years of the program, United selected more than 800 interns, 200 of whom were hired as flight officers. In addition to the comprehensive internship experience, United has offered opportunities for faculty, and some have obtained type ratings. Whitlatch noted that in order for an institution to participate in the internship program, the organization must have at least one program accredited by **CAA**.

The future employees of the airlines, FAA, DOT, aircraft manufacturers, NTSB, NASA, airport authorities, and the military are all in **CAA** programs today. There will be more and more success stories like Christian's because industry and education are working together to ensure that tomorrow's aviation professionals have the knowledge and skills they need. The mechanism for this success is the **CAA**.

CAA Membership Categories

You can be a member of this dynamic organization. The four categories of **CAA** membership are:

· Corporate Members are nationally recognized aviation corporations, industry organizations, governmental organizations, or aviation education organizations. (Annual Dues: $1,800)

· Trade Association Members include any recognized trade association which is not a governmental entity or employee/labor union or association and which represents or renders service to the aviation industry and which has a special expertise in aviation. (Annual Dues: $500)

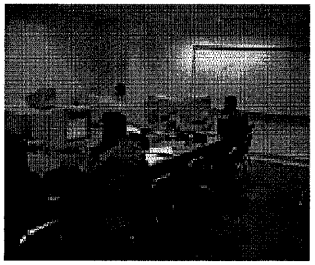
· Educator Members include any regionally or nationally accredited college or university having an aviation program or offering courses in aviation at the associate or baccalaureate level. (Annual Dues: $600)

· Sustaining Members include any organization, corporation, foundation, institution, practitioner, or individual having an interest in aviation and aviation education that desires to contribute knowledge or support to the CAA, but does not qualify as a Corporate or Trade Association Member. There are two classifications of Sustaining Members: Individual (**Annual Dues: $40**) and Organization* (Annual Dues: $350).

Corporate, Educator and Trade Association members are voting members; Sustaining members are non-voting members.

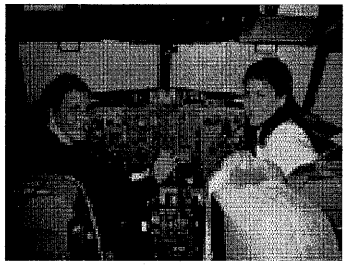
*Organizations or institutions not eligible for accreditation

Here Is What the Aviation Industry Says About the CAA



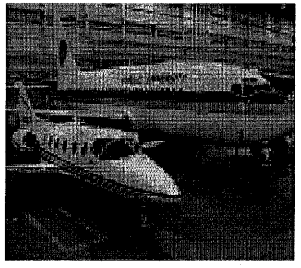
*"**CAA** endorsements give us an important, credible, and useful qualitative means of evaluating a candidate's educational experience. As demand for talented aviation professionals increases, we in the industry will become more and more dependent on **CAA**'s role in maintaining and improving the educational process."*

Robert Buley, Northwest Airlines Captain



"The **CAA** helps strengthen collegiate aviation in two ways. The accreditation process itself gives administrators and faculty in collegiate aviation programs the opportunity to reflect on what we do and how we do it and thereby ensure we continuously improve. It also serves to firmly connect our schools and curriculum with the industry's needs so our students will get the best preparation for success. The **CAA** serves everyone's needs: the colleges, the students, and industry."

Herbert Armstrong, Assistant Dean, Dowling College



"In the next 10-12 years, the scheduled U.S. airlines expect to carry more than 1 billion passengers a year. To meet this demand, the airline industry will need a well prepared and highly motivated work force. We will look to the accredited colleges, universities, and other aviation training institutions to provide these individuals."

Captain Al Prest, Vice President, Operations, Air Transport Association of America

"Pratt & Whitney hires many of its aviation professionals from **CAA**-approved schools . . . The **CAA**, in cooperation with industry, guides the design of its approved schools' curriculum so that it matches company needs and thereby contributes directly to higher productivity and profitability."

Richard Wellman, Pratt & Whitney

"What I see among the members of the **CAA** is an incredible amount of collegiate and corporate dedication to ensuring the quality of accredited programs . . . This process gives college administrators, employers, students, and parents the assurance that programs accredited by the **CAA** have been scrutinized by experts in the field and have met or exceeded high standards of performance."

Carmen Goodman, **CAA** Public-At-Large Trustee

"There are few causes more worthy than to educate young men and women to eventually assume our august responsibilities in this extremely exacting, ever growing air transportation industry."

Jack McNamara, former **CAA** President

"I can easily say that completing a **CAA** Accreditation Self Study enhances the entire academic process and serves to further motivate our students. It gives the college or university an opportunity to greatly improve services and focus on the improvement of teaching and learning systems."

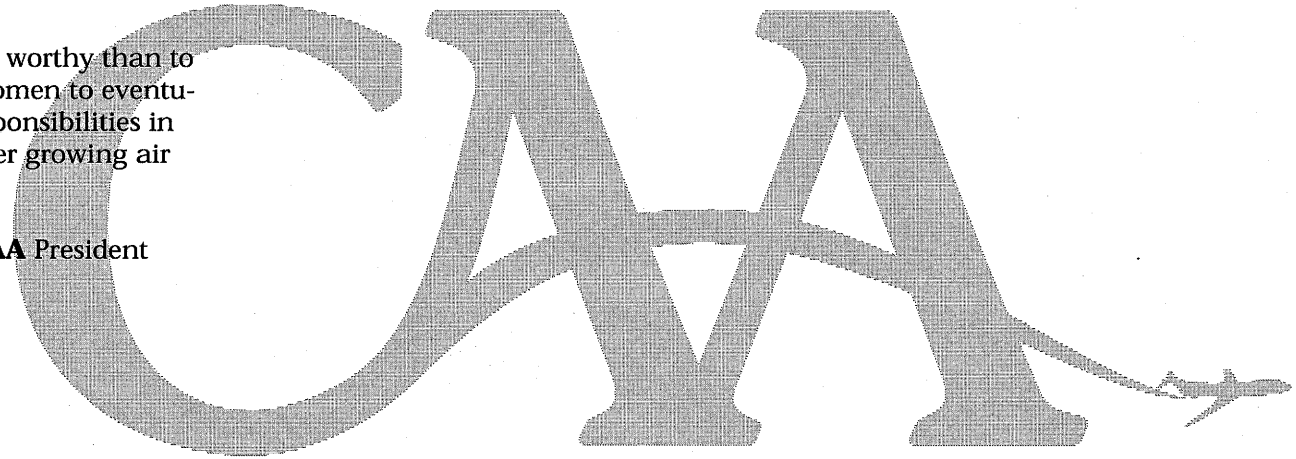
Bob Finkelstein, North Shore Community College

Become A Member!

Get involved in your community—the aviation community! Become a member of the **CAA** and be a part of tomorrow's aerospace legacy! To find out more about the **CAA** and what you can do, contact us at:

Council on Aviation Accreditation
3410 Skyway Drive
Auburn, AL 36830

Phone: (334) 844-2431
Fax Machine: (334) 844-2432
Email: caa@auburn.edu
Web site: http://**caa**accreditation.org



APPENDIX D

CLASSIFICATION OF INSTRUCTIONAL PROGRAMS (CIP) CODES FOR AVIATION PROGRAMS

49. TRANSPORTATION AND MATERIALS MOVING. Instructional programs that prepare individuals to apply technical knowledge and skills to perform tasks and services that facilitate the movement of people or materials.

49.01 Air Transportation. Instructional content for this group of programs is defined in codes 49.0101 – 49.0199.

49.0101 Aeronautics/Aviation/Aerospace Science and Technology, General. A program that focuses on the general study of aviation and the aviation industry, including in-flight and ground support operations. Includes instruction in the technical, business, and general aspects of air transportation systems.

49.0102 Airline/Commercial/Professional Pilot and Flight Crew. A program that prepares individuals to apply technical knowledge and skills to the flying and/or navigation of commercial passenger and cargo, agricultural, public service, corporate and rescue fixed wing aircraft. Includes instruction in principles of aircraft design and performance; aircraft flight systems and controls; flight crew operations and procedures; radio communications; navigation procedures and systems; airways safety and traffic regulations; and governmental rules and regulations pertaining to piloting aircraft. Programs may qualify individuals to sit for the FAA commercial and airline aircrew examinations.

49.0104 Aviation/Airway Management and Operations. A program that prepares individuals to apply technical knowledge and skills to the management of aviation industry operations and services. Includes instruction in airport operations, ground traffic direction, ground support and flightline operations, passenger and cargo operations, flight safety and security operations, aviation industry regulation, and related business aspects of managing aviation enterprises.

49.0105 Air Traffic Controller. A program that prepares individuals to apply technical knowledge and skills to air-traffic management and control, usually with additional training at the FAA Flight Control Center in a cooperative education program. Includes instruction in flight control; the use of radar and electronic scanning devices; plotting of flights; radio communication; interpretation of weather conditions affecting flights; flight instrumentation used by pilots; and maintenance of flight-control center or control-tower log books.

49.0106 Airline Flight Attendant. A program that prepares individuals to apply technical knowledge and skills to the performance of a variety of personal services conducive to the safety and comfort of airline passengers during flight, including verifying tickets, explaining the use of safety equipment, providing passenger services, and responding to in-flight emergencies.

(49.0107) Aircraft Pilot (Private). (Moved, Report under code 36.0119 in chapter V.)

49.0108 Flight Instructor. (NEW) A program that prepares individuals to apply technical knowledge and skills to the training pilot or navigators to fly and/or navigate commercial passenger and cargo, agricultural, public service, corporate and rescue aircraft, fixed or rotary wing. Includes instruction in principles of aircraft design and performance; aircraft flight systems and controls; flight crew operations and procedures; radio communications and navigation procedures and systems; airways safety and traffic regulations; and governmental rules and regulations pertaining to piloting aircraft. Programs may qualify individuals to administer the
FAA commercial air crew examinations.

49.0199 Air Transportation, Other. Any instructional program in aviation and air transportation services not listed above.

49.02 Ground Transportation. Instructional content for this group of programs is defined in codes 49.0202 – 49.0299.

49.0202 Construction/Heavy Equipment/Earthmoving Equipment Operation. A program that prepares individuals to apply technical knowledge and skills to operate and maintain a variety of heavy equipment, such as a crawler tractors, motor graders and scrapers, shovels, rigging devices, hoists, and jacks. Includes instruction in digging, ditching, sloping, stripping, grading, and backfiling, clearing and excavating.

----- **Agricultural Power Machinery Operator.** (Report under 01.0204)

49.0205 Truck and Bus Driver/Commercial Vehicle Operation. A program that prepares individuals to apply technical knowledge and skills to drive trucks and buses, delivery vehicles, for-hire vehicles and other commercial vehicles. Includes instruction in operating gas, diesel, or
electrically-powered vehicles; loading and unloading cargo or passengers; reporting delays or accidents on the road; verifying load against shipping papers; arranging transportation for personnel; and keeping records of receipts and fares.

49.0206 Mobil Crane Operation/Operator. (NEW) A program that prepares individuals to hoist and swing loads via complex rotating machinery that is driver operated. Includes instruction in crane operational characteristics, load and capacity chart usage, emergency control skills, safety, specific types of mobile cranes and loading devices, applicable codes and standards, and applications to particular types of jobs and loads.

49.0299 Ground Transportation, Other. Any instructional program in vehicle and equipment operation not listed above.

49.03 Marine Transportation. Instructional content for this group of programs is defined in codes 49.0303 – 49.0399.

49.0303 Commercial Fishing. A program that prepares individuals to apply technical knowledge and skills to function as commercial fishermen, fishing operations supervisors or in related fishing industry operations. Includes instruction in fishing vessel operation; fishing equipment operation and maintenance; equipment repair; catch identification, sorting, and storage; safety procedures; record keeping; and applicable legal regulations.

49.0304 Diver, Professional and Instructor. A program that prepares individuals to apply technical knowledge and skills to function as professional deep-water or scuba divers, diving instructors, or diving support personnel. Includes instruction in the use of diving equipment and related specialized gear; diving safety procedures; operation and maintenance of underwater life-support systems; underwater communication systems; decompression systems; underwater salvage; exploration, rescue, and photography; and installation and fitting of underwater mechanical systems and their maintenance, repair or demolition.

(49.0306) Marine Maintenance and Ship Repairer. (Moved, Report under 47.0616)

49.0309 Marine Science/Merchant Marine Officer. A program that prepares individuals to serve as captains, executive officers, engineers and ranking mates on commercially licensed inland, coastal and ocean-going vessels. Includes instruction in maritime traditions and law; maritime policy; economics and management of commercial marine operations; basic naval architecture and engineering; shipboard power systems engineering; crew supervision; and administrative procedures.

49.0399 Marine Transportation, Other. Any instructional program in water transportation not listed above.

49.99 Transportation and Materials Moving, Other. Instructional content is defined in code
49.9999.

49.9999 Transportation and Materials Moving, Other. Any instructional program in transportation and materials moving not listed above.

APPENDIX E

TEXAS SOUTHERN UNIVERSITY AVIATION PROGRAM COURSES AND CURRICULUM

GENERAL INFORMATION
Department of Transportation Studies
BACHELOR OF SCIENCE DEGREE
AIRWAY SCIENCE
Undergraduate Study in Airway Science Management
&
Airway Computer Science

Airway Science Program at Texas Southern University
"Achieving Excellence Across the Airways"

The Bachelor of Science degree in Airway Science in the Department of Transportation Studies offers opportunities for excellent employment and professional advancement to undergraduate students seeking a bright future. The phenomenal growth of the U.S. airline system since 1978, has witnessed 247 million airline passengers grow to over half a billion each year. Projections are for the number of airline travelers to reach one billion by the year 2010. To meet current and future demands, commercial aviation requires well-educated, highly qualified people to step into an increasingly technological world.

The School of Technology at Texas Southern University is one of a few institutions of higher education approved by, and in partnership with the Federal Aviation Administration (FAA), to prepare the technically trained people needed for aviation careers. Through the Airway Science program at Texas Southern University, students prepare for such diverse career fields in aviation as air traffic control, information systems management, flight operations, airline and airport management.

VISION

The Airway Science Program was established with a vision of educating a cadre of highly competent technocrats and managers to operate the National Airspace System throughout the 21st Century and beyond. This vision encompasses a broad-based education in the empirical sciences and aviation, which would render Airway Science graduates highly functional and effective in professional aviation within the United States and on the world stage. Airway Science graduates would thus remain on the leading edge of innovative advancements in aviation throughout this century and the next.

MISSION

The mission of the Airway Science Program is threefold: (1) to prepare students, for a variety of administrative and managerial positions in Aviation; (2) to prepare students to function effectively in a number of diverse computer-related positions in aviation, and (3) to provide students with the academic background and preparation for pursuing graduate studies in the field of aviation or affiliated areas. In the fulfillment of this mission, students selecting the Airway Science Management track of study are prepared for several career specialization options in; Air Traffic Control, Air Carrier Management, Airport Management and General Aviation Operations Management. To the same end, students choosing the Airway Computer Science track of study are prepared to operate, design software for, troubleshoot, and program computers used in aviation.

PROGRAM DESIGN

The Airway Science curriculum is designed to place special emphasis on operational and technical management in aviation. Students who elect to major in Airway Science Management focus primarily on academic concepts and operational practices involved in aviation management. The primary objective of the Airway Computer Science curriculum is academic preparation in the areas of computer operation, programming, design, and problem solving, within aviation. Both Airway Science curricula are designed to place additional emphasis on mathematics and the empirical sciences as mental tools to furnish students with a firm foundation in professional disciplines with technical implications.

This degree program provides students with the opportunity to specialize in one of two areas of concentration in Airway Science, namely: Airway Science Management and Airway Computer Science. The academic requirements of both Airway Science curricula are structured in six different course components namely; general education requirements and aesthetics, mathematics, physical science, management, technical (aviation) and aviation electives.

The Airway Science program focuses on four educational objectives:

1) To provide students with a sound foundation in aviation, applied and conceptual mathematics, computer sciences, empirical sciences, management, and social sciences, adequate for entry level management positions in professional aviation.

2) To prepare students specifically for a variety of administrative and managerial positions in aviation and other aviation related professional disciplines.

3) To prepare students to effectively function in diverse areas of computer operation, design, maintenance, problem solving and programming within the field of aviation.

4) To furnish students with an academic background that is adequate for pursuing graduate studies in aviation or other affiliated areas of graduate work

COURSE DESCRIPTIONS FOR AIRWAY SCIENCE DEGREE

AWS 101 INTRODUCTION TO AVIATION
Introduction to the operational parts of an airplane, meteorology, aircraft navigation systems, radio procedures, cockpit instrumentation, flight physiology, and FAA regulations governing flight activity of a private pilot. Preparation for the FAA private pilot written examination. Three hours of lecture per week. (3) Cr.

AWS 102 AVIATION HISTORY
Historical survey of manned flight; developments in aircraft design; the present air transportation system; evolutionary trends in air transportation, origin of the major air carriers; and overview of the historical role of African Americans in aviation. Three hours of lecture per week. (3) Cr.

AWS 113 INTRODUCTION TO FLIGHT
Aircraft engine performance charts, weight and balance computations, cross-country flight, flight control procedures, and radio communication. Supervised dual- and solo-flight simulation provided to students. Two hours of lecture and two hours of laboratory per week. Prerequisite: AWS 101. (3) Cr.

AWS 120 TRANSPORTATION SURVEY
Transportation modes and their interrelationships: the significance and evolution of social and environmental impacts of transportation systems: urban transportation problems. Three hours of lecture per week. (3) Cr.

AWS 201 FLIGHT METEOROLOGY
Survey of atmospheric and weather-related phenomena and their impact on flight operations, including the interface of airmen and flight service stations. Three hours of lecture per week. Prerequisite: AWS 101. Corequisite: AWS 201L. (3) Cr.

AWS 201L FLIGHT METEOROLOGY LABORATORY
Introduction to the methods and techniques of weather forecasting and reporting in flight meteorology. Two hours of laboratory per week. Corequisite: AWS 201. (1) Cr.

AWS 371 AIR CARRIER MANAGEMENT
Historical development of U.S. trunk carrier operations and regulatory interfaces with the federal government, International Civil Aviation Organization (ICAO) and the International Air Transport Association(IATA). Three hours of lecture per week. Prerequisites: AWS 102 and AWS 113. (3) Cr.

AWS 404 FLIGHT SAFETY
Analysis of factors and procedures relating to aviation safety, techniques for accident prevention; development of safety and emergency response programs; procedures used in accident investigations; and human factors. Three hours of lecture per week. Prerequisites: AWS 101 and AWS 113. (3) Cr.

AWS 406 THE NATIONAL AIRSPACE SYSTEM
Overview of the National Airspace System (NAS) and the Capital Improvement Program (CIP) plans; including problems such as airspace allocation, airspace usage, automation, system innovation, facilities and equipment replacement, and safety. Three hours of lecture per week. Prerequisites; AWS 321 (3) Cr.

AWS 407 AVIATION SERVICES OPERATIONS
Study of the organization, management, and overall operating procedures of a field base operation, concession and airport tenant contracts, including the study of regulations governing fueling operations and the economics of fuel distribution at airports. Three hours of lecture per week. Prerequisites; AWS 371. (3) Cr.

AWS 495 FIELD WORK PRACTICUM IN AIRWAY SCIENCE
Directed study involving field placement that provides students with on-the-job exposure to present operational and managerial practices in professional aviation. Prerequisites: Senior standing, AWS 321, AWS 371, and AWS 381 (6) Cr.

Texas Southern University

"Building Leaders of Tomorrow"

Return the information below and receive all the necessary materials to become part of this exciting program. Mail to:

Texas Southern University
Airway Science Program
3100 Cleburne Avenue
Houston, Texas 77004

YES! I AM INTERESTED IN A CARRIER IN TRANSPORTATION

Please send me: ( ) An Application ( ) Scholarship information ( ) Financial aid information

Name:_____

Address:_____Phone:_____

City_____State:_____Zip:_____

High School or College:_____

SAT/ACT Code#_____Scores: SAT (Verbal)/(Math)_____

ACT Composite_____ Class Rank: _____GPA:_____

Extracurricular interests:_____

Year to enter college_____

Have you applied for admission to Texas Southern University? YES/NO_____Date:_____

REQUIREMENTS FOR ADMISSION

Applicants into the Airway Science Program must meet the university's admission requirements. These requirements include successful completion of an accredited American high school or comparable foreign institution. Applicants must have also taken the American College Test (ACT) or the Scholastic Aptitude Test (SAT). New students are required to take the University placement test battery and successfully complete the Texas Academic Skills Program (TASP) test before being able to properly select Airway Science as their academic major.

Transfer students from colleges or universities of recognized standing can obtain admission by presenting official transcripts of all previous college work, and a complete university application. Completed application forms should be mailed to the Director of Admissions, Texas Southern University, 3100 Cleburne Avenue-Bell Hall, Houston, Texas 77004-9987.

Admission of International Students

Applicants from international students are evaluated in the same manner as those of students from the United States. However, international students whose education and training have been in a language other than English must satisfactorily pass the Test of English as a Foreign Language (TOEFL). This requirement is designed to determine whether students are proficient enough in English to undertake their studies in Airway Science successfully. International students who need additional information on immigration related issues should contact the office of Dr. Iris Perkins, Texas Southern University, 3100 Cleburne Avenue, Houston, Texas 77004. U.S.A.

Application forms for admission may be obtained from:
Office of Admissions, Texas Southern University
3100 Cleburne Avenue, Houston, Texas 77004
For more information regarding admissions: 713-313-7070

TEXAS SOUTHERN UNIVERSITY
COLLEGE OF SCIENCE AND TECHNOLOGY
Curriculum for Majors in Airway Science Management
Undergraduate Degree Plan

FRESHMAN YEAR

	FIRST SEMESTER			GR		SECOND SEMESTER			GR
AWS	-101	INTRO TO AVIATION	3		CS	-117	INTRO TO COMP SCI. II	3	
AWS	-101L	INTRO TO AVIA. LAB	1		HED	-233	HIST & PRINC OF HEALTH	2	
MATH	-133	COLLEGE ALGEBRA	3		MATH	-134	TRIGONOMETRY	3	
ENG	-131*	FRESH ENG. I	3		ENG	-132	FRESH ENG. II	3	
CS	-116	INTRO COMP SCI I	3		SC 135 *or* 136		BUS & PROF COMM.	3	
ITEC	-111	ORIENTATION	1		AWS	***	ELECTIVE***	3	
BADM	-101	INTRO TO BUSINESS	3						
TOTAL			17					17	

SOPHOMORE YEAR

	THIRD SEMESTER				FORTH SEMESTER			
ENG	-230**	WORLD LIT I	3		MUS	-239	FINE ARTS IN DAILY LIV.	3	
HIST	-231	SOC & POL TO 18773	3		MATH	-241	CALCULUS I	4	
POLS	-231	AMER POL SYS I	3		HIST	-232	SOC & POL FROM 1877	3	
CS	-216	ADV. APPL. I	3		POLS	-232	AMER POL SYS II	3	
AWS	***	ELECTIVE***	3		AWS	***	ELECTIVE***	4	
PSY	-131/L	GENERAL PSYCH	3						
TOTAL			18					17	

JUNIOR YEAR

	FIFTH SEMESTER				SIXTH SEMESTER				
PHY	-235	GEN PHYS I	3		PHY	-236	GEN PHYS II	3	
PHY	-215	GEN PHYS LAB	1		PHY	-216	GEN PHYS LAB	1	
AWS	-321/L	AIR TRAFFIC CONTROL	4		AWS	-371	AIRPORT MGMT	3	
AWS	-351	AVIATION LAW	3		AWS	-381	AIR CARRIER MGMT	3	
MGMT	-300	PRINCIPLES OF MGMT.	3		MGT	-301	PERS MANPWR DEV	3	
FR	-131	INTRO TO FRENCH I *or*			FR	-132	INTRO TO FRENCH II *or*		
SPAN	-131	INTRO TO SPANISH I	3		SPAN	-132	INTRO TO SPANISH II	3	
TOTAL			17					16	

SENIOR YEAR

	SEVENTH SEMESTER				EIGHTH SEMESTER				
AWS	-404	FLIGHT SAFETY	3		AWS	-407	AVIATION SERVICE OP.	3	
AWS	-406	NAT'L AIRSPACE SYS	3		AWS	-495	FILEDWORK PRACT.	3	
MGMT	-400	SMALL BUS MGMT	3		MGMT	-402	INTERN. MAN.	3	
PSY	-332	VOCA'L & INDUST PSY	3		ITEC	-412	SENIOR SEMINAR	1	
EET	-322	STATISTICS TECH *or*			ITEC	-331	TECH WRITING	3	
MATH	-231	ELEM. STATISTICS	3		AWS	***	ELECTIVE***	3	
MATH	-231	ELEM. STATISTICS	3						
TOTAL			15					16	

TOTAL PROGRAM HOURS: 130

STUDENT NAME_____ ID#_____ DATE_____

ADDRESS_____

APPROVED

Julie — HEAD, TRANSPORTATION STUDIES — DATE 1/31/2002

Daniel C. Wu — DEAN, COLLEGE OF SCIENCE & TECHNOLOGY — DATE 2/4/02

* Pending acceptable score on English and Mathematics examination

** One 200 level English course may be substituted by one of the following: Speech Communication 236 or Theater Cinema 140

*** AWS Electives: AWS 102, AWS 120, AWS 313, AWS 113/L, AWS 201/L (13 HRS REQ.)

Spring 2002

TEXAS SOUTHERN UNIVERSITY
COLLEGE OF SCIENCE AND TECHNOLOGY
Curriculum for Majors in Airway Computer Science
Undergraduate Degree Plan

FRESHMAN YEAR

	FIRST SEMESTER			GR		SECOND SEMESTER				GR
AWS	-101	INTRO TO AVIATION	3		CS	-117	INTRO COMP. SCI II	3		
AWS	-101L	INTRO TO AVIA. LAB	1		HED	-233	HIST & PRINC. HEALTH	2		
MATH	-133	COLLEGE ALGEBRA	3		ENG	-132	FRESH ENGLISH II	3		
ENG	-131*	FRESH ENGLISH I	3		MATH	-134	TRIGONOMETRY	3		
CS	-116	INTRO COMP SCI. I	3		AWS	***	ELECTIVE***	3		
ITEC	-111	ORIENTATION	1		SC 135 or 136		BUS & PROF COMM.	3		
BADM	-101	INTRO TO BUSINESS	3							
TOTAL			17		TOTAL			17		

SOPHOMORE YEAR

	THIRD SEMESTER				FORTH SEMESTER				
ENG	-230**	WORLD LIT I	3		HIST	-231	SOC & POL TO 18773	3	
AWS	-113	INTRO TO FLIGHT	3		CS	-124	FUND MACH COMP	3	
AWS	-113/L	INTRO TO FLIGHT LAB	1		CS	-216	ADV. APPLICATIONS I.	3	
CS	-120	INTRO TO UNIX	3		PHYS	-235	GEN PHYS I	3	
MATH	-241	CALCULUS	4		PHYS	-215	GEN PHYS LAB	1	
AWS	***	ELECTIVE***	3		PSY	-131/L	GENERAL PSY	3	
TOTAL			17		TOTAL			16	

JUNIOR YEAR

	FIFTH SEMESTER				SIXTH SEMESTER				
AWS	-321/L	AIR TRAFFIC CONTROL	4		PHYS	-236	GENPHYS II	1	
AWS	-351	AVIATION LAW	3		PHYS	-216	GEN PHYS LAB	3	
POLS	-231	POL. SCIENCE I	3		MUS	-239	FINE ARTS IN DAILY LV.	3	
HIST	-232	SOC & POL 1877	3		CS	-243	COMP ORGAN	3	
AWS	***	ELECTIVE***	4		POLS	-232	POL. SCIENCE II	3	
					CS	-241	STRUC. PROG. IN C	3	
TOTAL			17		TOTAL			16	

SENIOR YEAR

	SEVENTH SEMESTER				EIGHTH SEMESTER				
AWS	-404	FLIGHTSAFETY	3		AWS	-371	AIRPORT MAN.	3	
CS	-343	MICROPROC & SYS	3		ITEC	-412	SENIOR SEMINAR	1	
FR	-131	INTRO TO FRENCH I or			ITEC	-331	TECH WRITING	3	
SP	-131	INTRO TO SPANISH	3		FR	-132	INTRO TO FRENCH II or		
MGT	-300	BUS ORG'L & MGMT	3		SP	-132	INTRO TO SPANISH	3	
EET	-322	STATISTICS TECH or			AWS	-495	FIELDWORK PRACT.	3	
		ELEM. STATISTICS	3		AWS	***	ELECTIVE	3	
AWS	-406	NAT A/S SYSTEM	3						
TOTAL			18		TOTAL			16	

TOTAL PROGRAM HOURS: 134

STUDENT NAME_____ ID#_____ DATE_____

ADDRESS_____

APPROVED

HEAD, TRANSPORTATION STUDIES — DATE 1/31/2002

DEAN, COLLEGE OF SCIENCE & TECHNOLOGY — DATE 2/4/02

* Pending acceptable score on English and Mathematics examination

** One 200 level English course may be substituted by one of the following:
Speech Communication 135, 136, 236 or Theater Cinema 140

*** AWS Elective Options: AWS 102, AWS 120, AWS 313, AWS 407 (REQ. 13 HRS)

Spring 2002

APPENDIX F
TARLETON STATE UNIVERSITY AVIATION PROGRAM CURRICULUM AND ARTICULATION AGREEMENTS

BA/BS/AVM/MGSA 8/5/02

TARLETON STATE UNIVERSITY-CENTRAL TEXAS
ADVISEMENT PLAN 2002-2003 CATALOG

BACHELOR OF SCIENCE
AVIATION SCIENCE Aviation Management

Student Name:_____ SSN:_____ Date:_____
Address:_____ Zip:_____
Telephone: (hm)_____ (wk)_____

CORE REQUIREMENTS			Sem		
6 hours of English	Date	School	Hours	Grade	Points
ENGL 1113 (1301) Intro to College Composition					
ENGL 1123 (1302) College Composition & Research					
3 hours of Communications From:					
COMS 1013 (SPCH 1311) Fundamentals of Speech					
COMS 1023 (SPCH 1315) Public Speaking					
COMS 3013 Business & Professional Speech					
3 hours of Math					
MATH 1073 (1314) College Algebra or above					
8 hours of Natural Science (2 classes w/labs)					
CHEM, BIOL, GEOL, PHYS					
CHEM, BIOL, GEOL, PHYS					
3 hours of Visual and Performing Arts * From:					
ART, FA, MUSC, THEA					
3 hours of Humanities					
Literature course in English					
18 hours of Social and Behavioral Sciences					
HIST 2013 (1301) U. S. History through 1877					
HIST 2023 (1302) U. S. History Since Reconstruction					
POLS 2013 (GOVT 2302 or 2305) American National Gov't					
POLS 2023 (GOVT 2301 or 2306) Texas Government					
6 Hrs from the Following:**					
A EC 1053 (AGRI 2317) Introduction to Agricultural Econ					
ARCH 2013 (1311) Archeology					
ECO 1013 Introduction to Economics					
ECO 2013 (ECON 2301) Principles of Economics: Macro					
GEOG 1103 World Regional Geography					
GEOG 1203 Introduction to Human Geography					
GEOG 2013 The Geography of Texas					
HIST 1013 (2311 or 2321) World History to 1700					
HIST 1023 (2312 or 2322) World History Since 1700					
PHIL 2013 (2303) Introduction to Logic					
PHIL 1013 (1301) Introduction to Philosophy					
PSY 1013 (2301) General Psychology					
SOC 1013 Cultural Anthropology					
SOC 2013 (1301) Introduction to Sociology					
SOC/SWK 3033 Sociolgy of American Multiculture					
3 hours of Wellness					
HLTH 1013 Wellness for Life					
ActivITY P. E. (3 hrs)					
ROTC					
ANSC 1501 Rodeo Techniques					
MUSC 1002 (marching band)					

* Must be historical, appreciative, or theoretical in nature; it may not be applied or performance; may not be from major field of study

** Must be from different disciplines and may not be selected from major field of study

BA/BS/AVM/MGSA 8/5/02

LOWER LEVEL COURSE REQUIREMENTS

	Date	School	Sem Hours	Grade	Points
ACC 2033 Introduction to Financial Accounting					
ACC 2043 Introduction to Managerial Accounting					
AIRP 1305 Aircraft Science					
AIRP 1417 Private Pilot Ground School					
ECO 2013 Principles of Economics-Macro					
ECO 2023 Principles of Economics-Micro					
PHYS 1054 General Physics II* (See advisor for possible substitution)					

All three and four thousand level courses must be completed at Tarleton State University or other upper level institution.

*meets core lab science requirement

UPPER LEVEL COURSE REQUIREMENTS

ASCI 3033 Air Traffic Control					
ASCI 3043 Airport Management					
ASCI 4013 Aviation Law					
ASCI 4083 Aviation Safety					
CIS 3003 Computer Technology and Impact					
CIS 3083 Management of Telecommunications					
ECO 3023 Intermediate Microeconomics					
FIN 3013 Principles of Financial Management					
G B 3113 Business Statistics					
G B 3123 Business Correspondence					
G B 4323 Business Law I					
G B 4333 Business Law II					
MGMT 3013 Principles of Management					
MGMT 3023 Personnel/Human Resources Management					
MGMT 3503 Organization Behavior and Administration					
MGMT 4063 Employee and Labor Relations					
MGMT 4073 Business Ethics					
MGMT 4213 Productions and Operations Management					
6 Hours Advanced Electives*					

*Business or CIS recommended

NOTE: This is a tentative guide to be used for advisement of students. It is not considered an official degree plan by Tarleton State University and it is subject to review and change by the Texas Higher Education Coordinating Board.

Academic Program Articulation Agreement Proposal Format
for
Tarleton State University / Community College Articulation Agreements

The university's rules/regulations regarding autonomous student transfers from community colleges are described in the university Catalog. Articulation Agreements describe the university's agreement with one or more specific community colleges for specifically defined purposes. Typically, these purposes define the terms for transfer of credit from the specified community college to the university for pre-advised cohorts of students intending to pursue a specific baccalaureate degree at T.S.U. *Accordingly, students who transfer to T.S.U. under such agreements and subsequently change their degree objective must satisfy the university's generic rules/regulations for transfer of credit as outlined in the Catalog.* In all cases, individual transfer or transfer via *Articulation Agreement*, all baccalaureate graduates of Tarleton State University must have completed:

- a minimum of 128 semester credit hours
- a minimum of 36 upper level hours
- a minimum of 32 semester credit hours in residence at TSU, of which 24 hours must be advanced, including 12 advanced hours in the major
- 47 hours of core curriculum as required by Tarleton State University.

****

Section I. Parties to the Agreement

TSU Academic Department: Management, Marketing, and Administrative Systems

Specific TSU Degree/Major: BS Aviation Science/Professional Pilot

Community College: Central Texas College

Academic Department: _____

Section II. Rationale/Purpose of the Agreement (Narrative Briefly Explaining Mutual Interests and Benefits of a Formal Agreement)

The Bachelor of Science in Aviation Science degree offered by Tarleton State University is the only public-assisted aviation program in Texas. TSU offers the Aviation Management and the Professional Pilot majors with this degree. Studies for the Professional Pilot major concentrate on aircraft flight operations and prepare students with qualifications as professional pilots with a science/technology orientation. Advanced aeronautical ratings complemented by business administration, management, and communication skills for professional pilots in the civil and military aviation industries are the focus of the curriculum. CTC offers the freshman and sophomore aviation courses and TSU offers the junior and senior level aviation courses. This agreement formalizes TSU's commitment to accept from CTC the University core requirements and lower-level aviation courses needed for the BS in Aviation Science degree in an effort to provide a seamless transition from CTC to TSU.

Section III. Compliance with University's Baccalaureate Degree Requirements

All signatories to this agreement attest that students matriculating at TSU under terms of this agreement who complete the requirements for the stipulated degree/major will also satisfy the four university requirements of all graduates enumerated on page one of this form. All signatories also attest that no community college credits will apply to the stipulated degree/major that were not previously reviewed/approved by both the relevant TSU academic department head and dean.

Section IV. Special Terms or Conditions (Narrative description of any terms or conditions uniquely applicable to this agreement that both parties believe should be made explicit.)

Students transferring into the BS in Aviation Science major at Tarleton State University will have completed all the specified lower-level aviation courses including all ground school and flight instruction courses from Central Texas College.

Section V. Attachments (Explanatory materials such as degree plans, course listings, instructor vitae, secondary agreements, etc.)

	Title	Description
A.	*Advising Form*	*Form listing required courses with CTC course numbers*
B.		
C.		

Section VI. Periodic Review, Length, and Termination Specifications of this Agreement

This agreement shall be effective as of the date indicated in the following section and

shall remain in effect until either or both parties provide the other party written notification of intent to terminate no less than ninety (90) days in advance of a stipulated date.

Section VII. Signatories: We do hereby agree and attest to the terms outlined herein and attached h to be effective on this date: Month:_____ Day:___ Year:____

For: **Tarleton State University**:

Academic Department Head (Date) 6-4-02

Dean (Date) 6-4-02

Provost/VPAA (Date) 6-5-02

Executive Director (Date) 6/10/02
(when applicable)

President (Date) 6/10/02

For: **(Partner Institution)**

Academic Department Head (Date) 06-10-2002

Dean or Vice President (Date) 6/2002

Vice President / Dean (Date) 06/06/2002

President (Date) 6/6/02

****

Tarleton State University - Central Texas College
Academic Program Articulation Agreement

TSU Dept: Management, Marketing, and Administrative Systems

Degree/Major BS Aviation Science/Professional Pilot

Community/Junior College Dept: (if applicable)_____

Core Component	Semester Taken	Course Number	Grade	Tarleton Course Number With TCCNS Equivalency Number
Communication Component 9 hours		CTC		ENGL 1113 (ENGL 1301)
		CTC		ENGL 1123 (ENGL 1302)
		CTC/TSU		COMS 1013 (SPCH 1311), COMS 1023 (SPCH 1315), COMS 3013
Mathematics Component (3 hours)		CTC		MATH 1073 (MATH 1314) or above
Natural Science Component (2 x 4 hour courses w/lab)		CTC		CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
		CTC		CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
Visual and Performing Arts 3 hours		CTC		ART - ART 1313 (1301), 2313 (1303), 2323(1304) FINE ARTS - FA 1013 (HUMA 1315), MUSIC – Music Appreciation (1301), MUSC 2133 (1300) THEATER – THEA 1053 (DRAM 1310) THEA 2073 (DRAM 2361), THEA 2363 (DRAM 2362) The course selected must be historical, descriptive, or theoretical in nature; it may not be a course in performance. These core curriculum requirements may not be selected from the student's major field of study.
Humanities 3 hours		CTC		Literature course in English.
Social and Behavioral Sciences 18 hours		CTC		HIST 2013 (HIST 1301)
		CTC		HIST 2023 (HIST 1302)
		CTC		POLS 2213 (GOVT 2302 or GOVT 2305)
		CTC		POLS 2223 (GOVT 2301 or GOVT 2306)
		CTC		6 hours from the following: MUST BE FROM DIFFERENT DISCIPLINES AND MAY NOT BE SELECTED FROM MAJOR FIELD OF STUDY. SOC 1013, SOC 2073 (1301) PSY 1013 (2301), PHIL 1013 (1301), PHIL 2013 (2303), ECO 1013, ECO 2013 (ECON 2301), A EC 1053 (AGRI 2317), GEOG 1103 (GEOG 1301), GEOG 1203, GEOG 2013, H ST 1013 (HIST 2311 or 2321), HIST 1023 (HIST 2312 or 2322), ARCH 2013 (1311)
		CTC		
Wellness 3 hours		CTC		HEALTH 1013 Activity P.E. (3 hours), ROTC, ANSC 1502, or MUSC 1032 (marching band)

Lower-level Course Requirements	Hours	Course	Date Completed	Grade	Course	Date Completed	Grade
AIRP 1315 Private Flight	3	CTC					
AIRP 1255 Flight-Intermediate	2	CTC					
AIRP 1305 Aircraft Science	3	CTC					
AIRP 1307 Aviation Meteorology	3	CTC					
AIRP 1341 Advanced Air Navigation	3	CTC					
AIRP 1343 Aerodynamics	3	CTC					
AIRP 1417 Private Pilot Ground School	4	CTC					
AIRP 1451 Instrument Ground School	4	CTC					
AIRP 2250 Flight-Instrument	2	CTC					
AIRP 2337 Commercial Ground School	3	CTC					
AIRP 2239 Flight-Commercial	2	CTC					
AIRP 2355 Propulsion Systems	3	CTC					
AIRP 2331 Airline Management	3	CTC					
CIS 1033 Elementary Computer Applications	3	CTC					

Upper-level Course Requirements	Hours	Course	Date Completed	Grade	Course	Date Completed	Grade
ASCI 3013 Air Carrier Operations	3	TSU					
ASCI 3023 Techniques of Instruction	3	TSU					
ASCI 3033 Air Traffic Control	3	TSU					
ASCI 3043 Airport Management	3	TSU					

ASCI 4013 Aviation Law	3	TSU					
ASCI 4023 Flight Engineer	3	TSU					
ASCI 4083 Aviation Safety	3	TSU					
CIS 3083 Management of Telecommunications	3	TSU					
GB 3113 Business Statistics	3	TSU					
GB 3123 Business Correspondence	3	TSU					
MGMT 4073 Business Ethics	3	TSU					
9 hours Advanced Electives	9	TSU					

Comments:

To the student:

This Academic Program Articulation Agreement covers course work completed at or approved by Central Texas College and Tarleton State University toward the Bachelor of Science in Aviation Science while this agreement is in force*. Conditions for continuation at each school and for transfer to Tarleton are covered by usual school policies. Tarleton graduation requirements, general and specific to the Bachelor of Science degree in Aviation Science, apply except to the extent that they are explicitly altered by this agreement. Tarleton graduation requirements include gpa minimums, minimum resident hours, time limit on finishing degree plan requirements, etc.

Should you decide to graduate at Tarleton with a degree other than Bachelor of Science in Aviation Science then this Academic Program Articulation Agreement is void. In such a case, transfer work will be evaluated as for other students and determination of possible transfer credit will not be governed by this agreement. Your signature below indicates your understanding and agreement to these conditions. The agreement also requires the signature of an academic advisor at CTC and an academic advisor from TSU. The TSU academic advisor will forward a signed copy to the Tarleton Registrar's Office for review and approval. This agreement becomes official for you as a student when the TSU Registrar returns an approved copy to you.

I understand that the Academic Articulation Agreement applies to course work completed at or approved by CTC and TSU toward the Bachelor of Science degree in Aviation Science and is subject to the restrictions stated above.

_____ _____
signature date

_____
SS # or student id number

Address: _____

_____

Academic Advisors

CTC_____ _____
signature date

TSU_____ _____
signature date

Reviewed and approved by Tarleton State University Registrar:

_____ _____
signature date

Changes require review and approval by the TSU Registrar before becoming effective.

* Should either school decide to terminate this equivalency agreement, advisors will work to keep graduation requirements as close to this agreement as is practical.

Tarleton State University - Texas State Technical College
Academic Program Articulation Agreement

TSU Dept: Management, Marketing, and Administrative Systems

Degree/Major BS Aviation Science/Professional Pilot

Community/Junior College Dept: (if applicable)_____

Communication Component 9 hours				ENGL 1113 (ENGL 1301)
				ENGL 1123 (ENGL 1302)
				COMS 1013 (SPCH 1311), COMS 1023 (SPCH 1315), COMS 3013*
Mathematics Component (3 hours)				MATH 1073 (MATH 1314) or above
Natural Science Component (2 x 4 hour courses w/lab)				CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
				CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
Visual and Performing Arts 3 hours				**ART** – ART 1313 (1301), 2313 (1303), 2323(1304) **FINE ARTS** - F A 1013 (HUMA 1315), **MUSIC** – Music Appreciation (1301), MUSC 2133 (1300) **THEATER** – THEA 1053 (DRAM 1310), THEA 2073 (DRAM 2361), THEA 2083 (DRAM 2362) The course selected must be historical, appreciative, or theoretical in nature; it may not be applied or performance. These core curriculum requirements may not be selected from the student's major field of study.
Humanities 3 hours				Literature course in English.
Social and Behavioral Sciences 18 hours				HIST 2013 (HIST 1301)
				HIST 2023 (HIST 1302)
				POLS 2013 (GOVT 2302 or GOVT 2305)
				POLS 2023 (GOVT 2301 or GOVT 2306)
				6 hours from the following: **MUST BE FROM DIFFERENT DISCIPLINES AND MAY NOT BE SELECTED FROM MAJOR FIELD OF STUDY.** SOC 1013, SOC 2013 (1301), PSY 1013 (2301), PHIL 1013 (1301), PHIL 2013 (2303), ECO 1013, ECO 2013 (ECON 2301), A EC 1053 (AGRI 2317), GEOG 1013 (GEOG 1301), GEOG 1023, GEOG 1033, HIST 1013 (HIST 2311 or 2321), HIST 1023 (HIST 2312 or 2322), ARCH 2013 (1311)
Wellness 3 hours				HEALTH 1013 Activity P.E. (3 hours), ROTC, ANSC 1502, or MUSC 1002 (marching band)

AIRP 1200 Air Navigation 1	2	TSTC					
AIRP 1201 Air Navigation 2	2	TSTC					
AIRP 1215 Private Flight	2	TSTC					
AIRP 1255 Flight-Intermediate	2	TSTC					
AIRP 1317 Private Pilot Ground School	3	TSTC					
AIRP 1206 Aviation Meteorology 1	2	TSTC					
AIRP 1207 Aviation Meteorology 2	2	TSTC					
AIRP 1343 Aerodynamics	3	TSTC					
AIRP 1270 Instrument Ground School 1	2	TSTC					
AIRP 1271 Instrument Ground School 2	2	TSTC					
AIRP 2250 Instrument Flight	2	TSTC					
AIRP 2337 Commercial Ground School	3	TSTC					
AIRP 2239 Flight-Commercial	2	TSTC					
AIRP 2355 Propulsion Systems	3	TSTC					
AIRP 2236 Certified Flight Instructor	2	TSTC					
ITSC 1309 Integrated Software Applications 1	3	TSTC					

* All three and four thousand level courses must be completed at Tarleton State University.
**

ASCI 3013 Air Carrier Operations	3	TSU					
ASCI 3023 Techniques of Instruction	3	TSU					
ASCI 3033 Air Traffic Control	3	TSU					
ASCI Airport Management	3	TSU					
ASCI 4013 Aviation Law	3	TSU					
ASCI 4023 Flight Engineer	3	TSU					
ASCI 4083 Aviation Safety	3	TSU					
CIS 3083 Management of Telecommunications	3	TSU					
GB 3113 Business Statistics	3	TSU					
GB 3123 Business Correspondence	3	TSU					
MGMT 4073 Business Ethics	3	TSU					
9 hours Advanced Electives:							
	3	TSU					
	3	TSU					
	3	TSU					

Comments:

Tarleton State University - San Jacinto College
Academic Program Articulation Agreement

TSU Dept: Management, Marketing, & Administrative Systems

Degree/Major BS Aviation Science/Professional Pilot

Community/Junior College Dept: (if applicable)

Communication Component 9 hours		SJC		ENGL 1113 (ENGL 1301)
		SJC		ENGL 1123 (ENGL 1302)
		SJC/TSU		COMS 1013 (SPCH 1311), COMS 1023 (SPCH 1315), COMS 3013*
Mathematics Component (3 hours)		SJC		MATH 1073 (MATH 1314) or above
Natural Science Component (2 x 4 hour courses w/lab)		SJC		CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
		SJC		CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
Visual and Performing Arts 3 hours		SJC		**ART** – ART 1313 (1301), 2313 (1303), 2323(1304) **FINE ARTS** - F A 1013 (HUMA 1315), **MUSIC** – Music Appreciation (1301), MUSC 2133 (1300) **THEATER** – THEA 1053 (DRAM 1310), THEA 2073 (DRAM 2361), THEA 2083 (DRAM 2362) The course selected must be historical, appreciative, or theoretical in nature; it may not be applied or performance. These core curriculum requirements may not be selected from the student's major field of study.
Humanities 3 hours				Literature course in English.
Social and Behavioral Sciences 18 hours		SJC		HIST 2013 (HIST 1301)
		SJC		HIST 2023 (HIST 1302)
		SJC		POLS 2013 (GOVT 2302 or GOVT 2305)
		SJC		POLS 2023 (GOVT 2301 or GOVT 2306)
		SJC		6 hours from the following: **MUST BE FROM DIFFERENT DISCIPLINES AND MAY NOT BE SELECTED FROM MAJOR FIELD OF STUDY.** SOC 1013, SOC 2013 (1301), PSY 1013 (2301), PHIL 1013 (1301), PHIL 2013 (2303), ECO 1013, ECO 2013 (ECON 2301), A EC 1053 (AGRI 2317), GEOG 1013 (GEOG 1301), GEOG 1023, GEOG 1033, HIST 1013 (HIST 2311 or 2321), HIST 1023 (HIST 2312 or 2322), ARCH 2013 (1311)
Wellness 3 hours		SJC		HEALTH 1013
		SJC		Activity P.E. (3 hours), ROTC, ANSC 1502, or MUSC 1002 (marching band)
		SJC		

AIRP 1301Air Navigation	3	SJC						
AIRP 1307 Aviation Meteorology	3	SJC						
AIRP 1311 Flight Theory	2	SJC						
AIRP 1215 Private Flight	3	SJC						
AIRP 1347 Human Factors	3	SJC						
AIRP 1341 Advanced Air Navigation	3	SJC						
AIRP 1451 Instrument Ground School	4	SJC						
AIRP 2250 Instrument Flight	2	SJC						
AIRP 2337 Commercial Ground School	3	SJC						
AIRP 2355 Propulsion Systems	3	SJC						
AIRP 2331 Advanced Meteorology	3	SJC						
AIRP 1255 Intermediate Flight	2	SJC						
AIRP 2239 Commercial Flight	2	SJC						
AIRP 1343 Aerodynamics	3	SJC						
AVIM 2331 Airline Management	3	SJC						

- All three and four thousand level courses must be completed at Tarleton State University.

ASCI 3013 Air Carrier Operations	3	TSU					
ASCI 3023 Techniques of Instruction	3	TSU					
ASCI 3033 Air Traffic Control	3	TSU					
ASCI 3043 Airport Management	3	TSU					
ASCI 4013 Aviation Law	3	TSU					
ASCI 4023 Flight Engineer	3	TSU					
ASCI 4083 Aviation Safety	3	TSU					
CIS 3083 Management of Telecommunications	3	TSU					
GB 3113 Business Statistics	3	TSU					
GB 3123 Business Correspondence	3	TSU					
MGMT 4073 Business Ethics	3	TSU					
9 Hours Advanced Electives:							
	3	TSU					
	3	TSU					
	3	TSU					

Comments:

Tarleton State University - Southwest Texas Junior College
Academic Program Articulation Agreement

TSU Dept: Engineering Technology

Degree/Major: BS Aviation Science/Professional Pilot

Community/Junior College Dept: (if applicable)_____

Communication Component 9 hours		SWTJC		ENGL 1113 (ENGL 1301)
		SWTJC		ENGL 1123 (ENGL 1302)
		SWTJC/TSU		COMS 1013 (SPCH 1311), COMS 1023 (SPCH 1315), COMS 3013*
Mathematics Component (3 hours)		SWTJC		MATH 1073 (MATH 1314) or above
Natural Science Component (2 x 4 hour courses w/lab)		SWTJC		CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
		SWTJC		CHEMISTRY, BIOLOGY, GEOLOGY, & PHYSICS
Visual and Performing Arts 3 hours		SWTJC		**ART** – ART 1313 (1301), 2313 (1303), 2323(1304) **FINE ARTS** - F A 1013 (HUMA 1315), **MUSIC** – Music Appreciation (1301), MUSC 2133 (1300) **THEATER** – THEA 1053 (DRAM 1310), THEA 2073 (DRAM 2361), THEA 2083 (DRAM 2362) The course selected must be historical, appreciative, or theoretical in nature; it may not be applied or performance. These core curriculum requirements may not be selected from the student's major field of study.
Humanities 3 hours		SWTJC		Literature course in English.
Social and Behavioral Sciences 18 hours		SWTJC		HIST 2013 (HIST 1301)
		SWTJC		HIST 2023 (HIST 1302)
		SWTJC		POLS 2013 (GOVT 2302 or GOVT 2305)
		SWTJC		POLS 2023 (GOVT 2301 or GOVT 2306)
				6 hours from the following: **MUST BE FROM DIFFERENT DISCIPLINES AND MAY NOT BE SELECTED FROM MAJOR FIELD OF STUDY.** SOC 1013, SOC 2013 (1301), PSY 1013 (2301), PHIL 1013 (1301), PHIL 2013 (2303), ECO 1013, ECO 2013 (ECON 2301), A EC 1053 (AGRI 2317), GEOG 1013 (GEOG 1301), GEOG 1023, GEOG 1033, HIST 1013 (HIST 2311 or 2321), HIST 1023 (HIST 2312 or 2322), ARCH 2013 (1311)
		SWTJC		
		SWTJC		
Wellness 3 hours				HEALTH 1013 Activity P.E. (3 hours), ROTC, ANSC 1502, or MUSC 1002 (marching band)
		SWTJC		

AIRP 1315 Private Flight	3	SWTJC					
AIRP 1355 Intermediate Flight	3	SWTJC					
AIRP 1313 Introduction to Aviation	3	SWTJC					
AIRP 1307 Aviation Meteorology	3	SWTJC					
AIRP 1345 Aviation Safety	3	SWTJC					
AIRP 1343 Aerodynamics	3	SWTJC					
AIRP 1317 Private Pilot Ground School	3	SWTJC					
AIRP 1351 Instrument Ground School	3	SWTJC					
AIRP 2350 Instrument Flight	3	SWTJC					
AIRP 2337 Commercial Ground School	3	SWTJC					
AIRP 2239 Commercial Flight	3	SWTJC					
AIRP 2355 Propulsion Systems	3	SWTJC					
AIRP 1347 Human Factors in Aviation	3	SWTJC					
ITSC 1301 Introduction to Computers	3	SWTJC					

* All three and four thousand level courses must be completed at Tarleton State University.
**

AIRP 3013 Air Carrier Operations	3	TSU					
AIRP 3023 Techniques of Instruction	3	TSU					
AIRP 3033 Air Traffic Control	3	TSU					
AIRP 3043 Airport Management	3	TSU					

AIRP 4013 Aviation Law	3	TSU					
AIRP 4023 Advanced Systems	3	TSU					
AIRP 4083 Aviation Safety	3	TSU					
CIS 3083 Management of Telecommunications	3	TSU					
G B 3113 Business Statistics	3	TSU					
G B 3123 Business Correspondence	3	TSU					
MGMT 4073 Business Ethics	3	TSU					
9 Hours Advanced Electives:							
	3	TSU					
	3	TSU					
	3	TSU					

Comments:

APPENDIX G
TEXT OF LETTERS SENT TO TEXAS UNIVERSITIES AND THEIR RESPONSES

Text of Initial Letter

May 21, 2003

<University>

Dear <Provost>:

For the past year, the Texas Transportation Institute has been reviewing academic degree programs in aviation that include both an aviation management and a professional pilot option. This review is being conducted under a contract with the Aviation Division of the Texas Department of Transportation who was directed by the Texas state legislature to conduct such a review. While some universities in the state currently offer aviation programs of varying depth, no public university in the state of Texas offers a comprehensive four-year degree program in aviation.

This letter seeks to solicit any interest by the administration and/or related faculty at <university> in expanding any current programs or in developing a new program in aviation that would offer a four-year degree in aviation with aviation management and professional pilot options. As background information, I have included a copy of our work efforts to date which may help you better understand aviation programs and their unique challenges and rewards. A letter articulating your level of interest in such a program would be most helpful.

There is no doubt that the existing economic climate, both in terms of state educational funding specifically and the state and national economies in general, is not currently conducive to the development of new academic programs or even the expansion of existing ones. Neither is the timing good considering the problems airlines face both here in this country and abroad. Nevertheless, considerable time is required to develop, expand, approve, fund, and implement a new academic program, especially a potentially capital intensive one such as aviation. However, the future state of the economy and the aviation industry is likely to improve and professional pilots and other aviation professionals will once again be in demand. Our interest here, however, is to assess your university's level of interest for such a program and identify those universities that are best suited for such a program or envision such a program as fitting into their mission and long-term vision. Currently, Texas is home to several major airports, three major U.S air carriers, and numerous defense contractors, all of whom are likely employers for graduates of an aviation program.

Today, these types of aviation programs are found at some of our nation's most respected public universities. These include Purdue University, The Ohio State University, Arizona State University, the University of Oklahoma, and the University of North Dakota. More than 100 colleges and universities in the U.S. offer aviation programs at the baccalaureate level. Oklahoma, for example, has three such programs and they attract most of their students from Texas.

I would greatly appreciate hearing from you or discussing this letter in more detail with you or members of your staff. I understand that costs are often a prohibitive factor in deciding whether or not to implement new programs. In this case, I am interested in knowing if the university is interested in the idea, or if not I would appreciate knowing the reasons it is not interested, especially if that reason is cost.
If you have any questions, need any additional information, or wish to discuss this letter in more detail with me, please feel free to call me at (979) 845-5200 or e-mail me at jborowiec@tamu.edu.

Sincerely,

Jeffrey D. Borowiec, Ph.D.

Text of Follow-up Letter

June 26, 2003

<University>

Dear <Provost>:

Last month, I wrote you regarding a study we are conducting for the Aviation Division of the Texas Department of Transportation examining the issues associated with establishing a comprehensive, four-year degree program in aviation at the university level offering both aviation management and professional pilot options. As included in the letter and documented in the report that I sent you, these programs are found at some of the best public universities in the country.

The letter indicated that we are interested in knowing whether or not your institution is interested in developing such a program or expanding an existing program to offer such an aviation curriculum. We are interested in knowing your level of interest despite the financial constraints that may exist.

Should you have any questions or need any additional information, please feel free to call me at (979) 845-5200 or e-mail me at jborowiec@tamu.edu. I would greatly appreciate hearing from you by July 15, 2003.

Sincerely,

Jeffrey D. Borowiec, Ph.D.
Associate Research Scientist

Borowiec, Jeff

From: Bell, David P [DBell@Central.UH.EDU]
Sent: Monday, June 30, 2003 4:54 PM
To: 'jborowiec@tamu.edu'
Cc: Charlson, Elaine M
Subject: aviation program

Dear Dr. Borowiec:

I am writing on behalf of Dr. Edward P. Sheridan, Senior Vice Chancellor for Academic Affairs at the University of Houston System. We raised the question you asked of us at our monthly meeting of the Provosts of all four campuses of the University of Houston System - University of Houston, UH-Clear Lake, UH-Downtown, and UH-Victoria.

It was felt by all four provosts that a program in aviation would not be a viable pursuit, in terms of both the mission of the four institutions as well as the cost factor that would be involved.

We thank you for your inquiry and wish you the best.

Sincerely,

David P. Bell
Assistant Vice Chancellor for Academic Affairs

TEXAS A&M UNIVERSITY
Office of the Executive Vice President
and Provost

July 3, 2003

Dr. Jeffrey D. Borowiec
Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

Dear Dr. Borowiec:

Thank you for your letter dated May 21, 2003. I have consulted with Dr. Kem Bennett, Vice Chancellor and Dean of the Dwight Look College of Engineering. At this time, it does not seem reasonable for Texas A&M University to consider a new four-year degree program in aviation management and/or professional pilot programs. There are many reasons for this opinion, but specifically, such a technology program does not seem appropriate for a research institution. As stated in your letter, many very good aviation programs already exist in the nation, such as Embry-Riddle. In Texas, the Texas State Technical College offers an attractive aviation program.

Thank you for your interest in Texas A&M University. If more information is needed, please feel free to contact me.

Sincerely,

David B. Prior
Executive Vice President
and Provost

DBP:*njm*

Street address: 9th Floor, Rudder Tower • *Mailing address:* 1248 TAMU • College Station, Texas 77843-1248 • (979) 845-4016; FAX (979) 845-6994

Vice President for
Academic Affairs

SWT

July 3, 2003

Dr. Jeffrey D. Borowiec
Associate Research Scientist
Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, Texas 77843-3135

Dear Dr. Borowiec:

Thank you for your recent letter regarding this study that you are conducting for the Aviation Division of the Texas Department of Transportation. The work that the Texas Transportation Institute has already completed in reviewing existing programs and developing a generic curriculum is impressive. I have forwarded the information that you sent to Dr. Jaime Chahin, Dean of our College of Applied Arts, and asked him to complete a preliminary review of this material.

Unfortunately, our university is in the early stages of a strategic planning process that will take all of the fall semester and much of the early spring semester to complete. During this planning process, we will be identifying and agreeing upon new program directions for the next several years. For this reason, I cannot provide much information about our level of interest at this time. I can assure you that we will include the information that you sent in our review of program possibilities to be considered. One resource that our community has that could support this kind of program is a municipal airport with multiple large runways, the former Gary Air Force Base.

I regret that I cannot provide a more detailed response at this time, but I can assure you that we will carefully consider the information that you have provided.

Sincerely,

Robert D. Gratz

Robert D. Gratz
Vice President for Academic Affairs

xc: President Trauth
Dean Chahin

Southwest Texas State University
601 University Drive San Marcos, Texas 78666-4615
Telephone: 512-245-2205 Fax: 512-245-8346
SWT is a member of the Texas State University System.

Borowiec, Jeff

From: John Idoux [Idoux@tarleton.edu]
Sent: Tuesday, July 08, 2003 12:09 PM
To: jborowiec@tamu.edu

Dr. Borowiec,

Dr. Steve Vitucci, our Academic Dean here at Tarleton - Central Texas, has passed on to me a copy of your recent correspondence relating to your study on aviation studies.

I would be pleased to talk with you concerning your study and to try and address some of the questions you have asked. I am in this week if it will be convenient for you to call.

Sincerely,

John Idoux

****
John P. Idoux, Executive Director and CEO
Tarleton State University - Central Texas
1901 South Clear Creek Road
Killeen, Texas 76549
Phone: 254-519-5720
FAX: 254-519-5450
idoux@tarleton.edu
www.tarleton.edu/centraltexas
****

Borowiec, Jeff

From: Dittmer, Peter M [Dittmer_PM@tsu.edu]
Sent: Wednesday, July 09, 2003 6:28 PM
To: 'jborowiec@tamu.edu'
Subject: RE: Comprehensive Aviation Curriculum

Dear Dr. Borowiec,

I hope that your summer is going well. If you recall Prof. Piezon and myself met with you and discussed at great lenghth the possibilities of such a program. At this particular time, we would not like to commit to such an iniative, but will seriously look at the possibilities of such a program existing at Texas Southern University.

Currently, I am out of town working a Fellowship on the West Coast. I will be back in the Houston area in early August. I would be happy to discuss possibilities at this time.

I look forward to hearing from you.

Sincerely,

Peter M. Dittmer
Assistant Professor
Airway Science Program
Texas Southern University

Borowiec, Jeff

From: Parker, Eileen [eileen.parker@mwsu.edu]
Sent: Monday, July 14, 2003 3:57 PM
To: 'jborowiec@tamu.edu'
Subject: aviation program

Dr. Borowiec:

We are in receipt of your letter of June 26. At this time, we are not interested in offering aviation curriculum.

Thank you for your correspondence.

Friederike Wiedemann
Vice President for Academic Affairs
Midwestern State University
3410 Taft Blvd.
Wichita Falls, TX 76308
(940) 397-4226

Eileen Parker
Assistant to the Vice President
for Academic Affairs
Midwestern State University
(940) 397-4226
(940) 397-4042 FAX
eileen.parker@mwsu.edu

UNIVERSITY of NORTH TEXAS

Office of the Provost and Vice President for Academic Affairs

July 21, 2003

Dr. Jeffrey D. Borowiec
Texas Transportation Institute
The Texas A&M System
3135 TAMU
College Station TX 77843-3135

Dear Dr. Borowiec:

Thank you for your most recent letters of June 15 and 26 inquiring whether the University of North Texas (UNT) is interested in developing a program in aviation management with a professional pilot option.

UNT has had a long interest in such a program. The Dallas/Fort Worth/Denton metroplex is clearly one of the major locations for the aviation industry in the nation. The DFW region contains the headquarters of two major airlines (American and Southwest), three major airports (DFW, Love Field, and Alliance), and legions of aerospace firms that support the industry. This region and the state of Texas could benefit from a comprehensive program at a major public university. As the largest university in the metroplex, the University of North Texas would be the logical institution to locate such a program.

However, like most public institutions in Texas, UNT is severely constrained by the current economic conditions and the restricted state budget. Regrettably, we have no surplus funds that would permit us to begin such a program without state funding. Further, we are in the midst of starting up a College of Engineering that will restrict all available funds for the immediate future.

Thus, our clear response to your letter is that, yes, we are interested but cannot move forward with a proposal until adequate funds can be found to support such a program. In addition, UNT would like to remain a part of any state planning effort. (Dr. Peter Lane from our History faculty has been involved in our early aviation study and will help coordinate further planning between the university and the state.)

We appreciate your leadership efforts during these austere times. Hopefully, future economic conditions will permit funding for this important initiative in support of the aviation industry.

Sincerely,

David B. Kesterson

David Kesterson
Provost and Vice President for Academic Affairs

cc: Dr. Norval Pohl, President
Dr. Peter Lane, Department of History

The leading university of the Dallas-Fort Worth region
P.O. Box 311190 ♦ Denton, Texas 76203-1190 ♦ (940) 565-2550
Fax (940) 565-4438 ♦ TTY (800) RELAY TX ♦ www.unt.edu/vpaa

EXECUTIVE VICE PRESIDENT AND PROVOST
THE UNIVERSITY OF TEXAS AT AUSTIN

1 University Station G1000 · Austin, Texas 78712-0538 · (512) 471-4363 · FAX (512) 471-0577

July 31, 2003

Dr. Jeffrey Borowiec
Texas Transportation Institute
Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

Dear Dr. Borowiec,

In response to your letters dated June 26 and May 21 regarding the establishment of a four-year degree program in aviation management and professional pilot options at The University of Texas, I have consulted with the Dean of Engineering and Chairman of Aerospace Engineering and we concur that the University does not wish to consider the programs at this time.

With best wishes,

Sheldon Ekland-Olson
Executive Vice President and Provost

SEO:mrc

cc: Dean Ben Streetman
Dr. David Dolling

APPENDIX H
AVIATION AT THE UNIVERSITY OF NORTH TEXAS
A REPORT AUTHORED BY DR. PETER HALL
SPECIAL ASSISTANT TO THE CHANCELLOR
OCTOBER 15, 1998

Aviation at the University of North Texas

A Report Authored by Peter B. Lane, Special Assistant to the Chancellor,
Oct 15, 1998 (Revised)

Table of Contents

I. Introduction

The Dallas/Fort Worth metroplex in Texas is one of the leading aviation centers in the world. The region and the state abound with industries and institutions that focus on some aspect of aviation. A recent directory published by the North Texas Commission estimated that the economic impact of the Dallas/Fort Worth Airport alone was over 10 billion dollars annually.

As part of its mission to interact with and support programs related to the major sectors of the economy, the University of North Texas is investigating the feasibility of establishing an Aviation program as part of its academic offerings. In the summer of 1998, Chancellor Alfred F. Hurley assigned Dr. Peter B. Lane to conduct a study on the subject answering the following questions:

Is there a need for an Aviation Science program at a public university in the region?
How should such a program be structured?
How should the University proceed?.

This report provides preliminary answers to those questions and makes some recommendations for further actions

The study consisted of a series of interviews with a cross section of individuals interested in aviation both within and external to the University. (see Atch. 1). The author consulted a previous study that addressed the future of aviation education at UNT. Thus, this report is a consolidation of ideas and suggestions

from many individuals plus the thoughts of the author who is solely responsible for its content.

Most observers would agree that the aviation industry is the engine that drives the economy in the Dallas/Fort Worth region and, perhaps, throughout the state of Texas. The most recent North Texas: World Center of Aviation Business directory lists over 2250 businesses in the area involved with aviation. Some estimates indicate that over 200,000 jobs in this region are directly related to aviation. Dallas/Fort Worth is home to one of the world's largest airports, a new logistical airport, two of its major airlines, and numerous plants manufacturing some of the finest fighters and helicopters in the world.

In support of this vast complex are literally thousands of small businesses that are related to aviation ranging from a catering service at DFW Airport to a small manufacturing sub contractor forging brake pucks for the F-16. Of special note is the rapid increase in international cargo operations at both DFW and Alliance Airports.

Throughout Texas, aviation becomes aerospace when one considers the tremendous complex in the Houston area centered around the Johnson Space Center. Given the large size, diversity, and importance of the aviation industry in Texas, there is clear justification for academic programs in support.

II. Other Programs

There are many academic programs related to the aviation industry throughout the southwest. The state of Oklahoma, in particular, has taken an assertive position in support of aviation. Strong programs at the University of Oklahoma, Oklahoma State University, and Southeast Oklahoma State University attest to the state commitment.

In Texas, programs at the community college level stand out. Both the Dallas and Tarrant County community college districts support programs in piloting, maintenance, and dispatch specialties. Programs at Texas Southern and Baylor cover aspects of careers in aviation. The nation's leading private institution in this field, Embry-Riddle, has begun a program in Fort Worth at both the undergraduate and graduate level. UT Austin, UT Arlington, and Texas A&M have well respected programs in aeronautical engineering and of course, the University of Houston, has specific programs geared to the space efforts at the Johnson Space Center. No large public university has established a full program that offers bachelor's degree across the spectrum of the aviation in

III. Special Factors

Some special factors must be considered prior to establishing a program at UNT

A. Is there a need for some type of an Aviation program at UNT?

Any new academic program must be justified by an external requirement for expertise in the area. A thorough survey must be conducted to confirm any subjective assertion. It is often remarked that our young people are searching for meaningful careers in this complex world. Since this region contains a full array of institutions, agencies, and businesses connected to the aviation industry, why not convince a potential student to specialize in some aspect of the industry. Any degree program must be flexible enough to permit a student to major or minor in an aviation program or do an aviation concentration in conjunction with a traditional discipline. Numerous students have informally expressed their interest in such a program at UNT. Such a program could be an important tiebreaker in the selection of a college or university to attend.

B. Should an Aviation Science program be at the undergraduate or graduate level or both ?

The initial program at UNT should be offered at the undergraduate level. Depending upon market demand and the success of the initial program, a graduate offering could be considered as apart of a Phase II program at some later date which might also include a research dimension.

C. How should such a program be organized within the University?

This will be one of the most challenging elements to the program. The options are many. Possibilities range from a separate department reporting directly to the Provost or Associate Provost or to a department within Business, Arts and Sciences, or Education.

IV. The Proposal

A. UNT should establish a full program in Aviation (Science or Education) offering a Bachelor of Science in Aviation (Science or Education)in one of four tracks:

1. Pilot Track- Most experts predict a world-wide shortage of pilots in the years ahead. With the phase down of the military source and the growth in the industry, college programs are expected to help fill the gap. Individuals would enroll into a basic flying training program contracted to a reputable firm at Denton, Alliance, and/or Addison airports. Students would pay for their instruction at no cost to the University. The course would include ground school taught at UNT and flight instruction with the student receiving some reasonable amount of college credit for the effort. Reputable institutions such as Ohio State, Purdue, and Oklahoma State Universities have all worked out appropriate means of awarding academic credit. Current programs provide a Commercial Instructor rating certified by the FAA with the student accruing over 200 flight hours at a cost of over $20,000

2. Maintenance and Manufacturing Track- Students would concentrate on courses directed at the repair of aircraft engines, airframes, and supporting systems. The American Airlines facility at Alliance Airport or the Lockheed Martin plant in Forth Worth would be a possible future source of employment for graduates. This track would include courses offered primarily in Arts and Sciences or in Business Administration.

3. Management and Logistics Track- The air cargo field is growing very rapidly. Students would concentrate on courses to prepare them for careers with the Federal Aviation Administration, Airport Management, or intermodal aspects of the transportation industry. Courses in this track would be taught primarily in the College of Business Administration.

4. Other –Students would take a general aviation curriculum to provide a sound background in key elements of the industry. For example, individuals aspiring to a career as a flight attendant would take this general track with courses in human psychology, language fluency, and multi cultural areas in addition to the aviation core.

B. Curriculum

1. Students who enroll would take the standard core curriculum required of all students at UNT.
2. Students would then take an Aviation Science core coordinated through a Department of Aviation Science and taught in departments across the campus. Courses might include:
    a. Aviation History (History)
    b. The Principles of Flight (Physics)
    c. Meteorology (Physics)
    d. US Aviation Policy (Political Science)
    e. The Business of Aviation (College of Business Administration)
    f. Aviation Safety (Emergency Management or College of Business Administration)

3. The student would then take a series of courses in the selected track along with a few electives fulfilling the requirements for graduation. Surprisingly, a significant percentage of related courses are already taught at UNT. See Atch. 2 for the menu of courses taught at Ohio State University as an example.

V. Recommendations

A. After personal and staff review of this report, the Chancellor would authorize continued study of the feasibility of the project. Some internal areas deserving additional study would include:
    1. Contracting process for an external flying training program.
        a. Process for selection
        b. Liability issues
        c. Safety considerations
        d. Cost and benefits for the University conducting the program or contracting it out

2. Relations with the community college programs in the area.
   a. Any program at UNT should utilize the resources in the area to the maximum extent possible and cooperate to the fullest with existing programs.
   b. This would insure cost efficiencies and minimize any political opposition to the concept of a program at UNT.
   c. Articulation agreements with area community colleges and institutions of higher education, both public and private, would have to be negotiated.

3. Visitations
   a. Select a few of the best Aviation programs in the US. Send a University representative to visit those institutions to examine funding, curriculum, facilities et. al. The University of North Dakota, Oklahoma State University, Embry-Riddle, and Ohio State University are examples of colleges or universities to be visited.
   b. Modify the UNT proposal based upon ideas accrued from the visits.

4. State relations
   a. Open up channels of communications with key state officials who supervise aviation and higher education. The Aerospace Commission and the Department of Aviation have both pledged their support.
   b. Work with the Coordinating Board to determine the process for winning approval for a program and its funding.

5. Prepare a preliminary budget for an initial program

   a. The study phase
   b. Funding required for Year One through Year Five

6. Develop a required course inventory for an Aviation program. Determine those courses across the University that with minor modification might meet the requirements.

7. Explore how such a program would best be located within the University for maximum efficiency and cost effectiveness

8. Establish an Advisory Board of officials from across the industry to review the report and provide counsel regarding whether there is a genuine need for such a program at a public university in the Metroplex. These leaders will hire our graduates so they should help shape the curriculum.

9. Explore the opportunities for external funding from the federal, state, or private sources

10. In late spring, 1999, invite a leading aviation educator to visit UNT to review the final proposal, examine facilities, and analyze the environment for a program at UNT. The process for securing the Texas Academy of Mathematics and Science might serve as an excellent model for an Aviation program.

11. Conduct a detailed survey among the high school and community college students in the area to explore the interest in a major that concentrates on aviation education.

12. Join appropriate associations and organizations that coordinate and promote aviation education in the US. For example, establish a chapter of Alpha Eta Rho, the collegiate coed fraternity that brings together students having an interest in the field of aviation. Join professional associations that promote aviation education.

Summary

Texas should support a major program at a public university that trains its citizens and supports the aviation industry. UNT is the logical place for such a program given the strength of the sector in the DFW area, the location of the professional development program for Airport Managers Certification at our Professional Development Institute, a strong AFROTC program, and a long history of support for the aviation industry.

Attachment One

Interviews

Knox Bishop-Director-Museum of Aviation-Love Field, Dallas

Sam Stuart-Owner and Operator-Addison Airport,

Gene Wright-Department of English, UNT

Rebecca McFaul, Mountain View Community College, Dallas

Oklahoma State Univ-Dept. of Aviation Science

Debbie Meyer, Federal Aviation Administration, Fort Worth

Gary Marsden, Director , Aviation Department, TCJC

Gary Odum-Director of Aviation Science, Auburn University

Richard White-College of Business Administration-Management Dept., UNT

Lew Taylor-College of Business Administration-Management Dept., UNT

Lou Ponthieu-College of Business Administration-Management Dept., UNT

Bill Grubbs-Department of Engineering Technology, UNT

Dan Hagan-Community Relations, American Airlines

Rose Perez, Human Resources, American Airlines

Terry Garland-Denton TX Airport Board

Gary Heartsill-Instructor, Embry-Riddle

Bill Edwards-Retired Director of the Aviation program at Southeastern Oklahoma State University, Durant Okla.

Jay Young, Texas Aerospace Commission, Austin TX

Dan Fulton, Texas Department of Transportation, Division of Aviation, Austin TX

Curtis R. Gibson, Department of Aviation , Central Texas College, Killeen TX

Jay Miller, Director, American Airlines Museum, Fort Worth

Sandy Turner, Public Programs Coordinator, Professional Development Institute, UNT

David Mize, Development Director, College of Arts and Sciences, UNT

Ed McLaughlin, Vice President, Programs, North Texas Commission

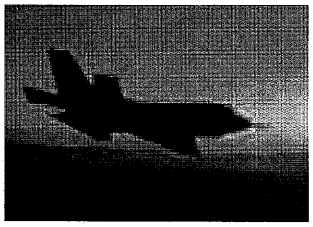
Jerry Wircenski, Technology and Cognition, College of Education, University of North Texas

APPENDIX I
NORTH TEXAS: WORLD CENTER OF AVIATION
(SOURCE: NORTH TEXAS COMMISSION)

NORTH TEXAS: WORLD CENTER OF AVIATION®

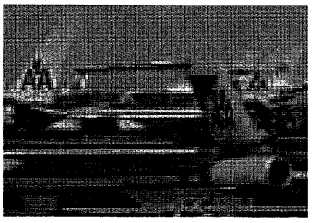
The Dallas/Fort Worth Metroplex, or North Texas, has one of the largest concentrations of aviation-related businesses in the world. This is due in large part to the region's central location in the United States and North America as well as the impact of its primary economic engine – Dallas/Fort Worth International Airport. Due to DFW's tremendous array of daily flights and destinations, coupled with its central location, many corporations have come to realize that they can trim business costs while improving productivity when operating out of North Texas. Listed below are just some of the reasons that North Texas is "The World Center of Aviation®."

LEADING THE ECONOMY

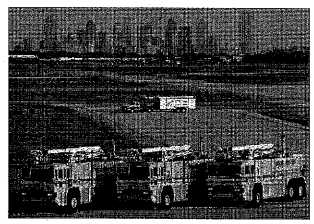


- The leading aviation businesses and airports in the D/FW Metroplex contribute more than 23 ***billion*** dollars each year to the economy.
- There are more than 1,300 aviation-related businesses in North Texas – more than any other area of its size in the world.
- There are more than 181,000 documented aviation-related jobs in the North Texas Region.
- The aviation industry pays more than 5 ***billion*** dollars in salaries in North Texas each year.

THE D/FW METROPLEX IS TAKING OFF



- Dallas/Fort Worth International Airport is the third busiest airport in the world in terms of daily operations and the sixth busiest in numbers of passengers.
- DFW Airport has seven all-instrument runways, three control towers, 130 non-stop domestic and 30 non-stop international destinations and 2,300 flights daily.
- Nearly 900,000 U.S. tons of cargo pass through DFW International Airport annually.
- North Texas is home to AllianceTexas, a 15,000-acre master-planned international business, aviation and industrial trade development in Fort Worth. The centerpiece is Alliance Airport, the nation's first major industrial airport. This unique arrangement, incorporating air, rail and highways within a freeport-enterprise-foreign trade zone is not available on this scale anywhere else in the world.

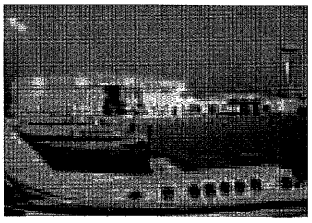


- The Metroplex's third largest airport is Love Field, the flight operations center and headquarters for Southwest Airlines, which is conveniently located just minutes from downtown Dallas.
- Supporting DFW International Airport, Alliance and Love Field are 12 reliever airports spread throughout the D/FW Metroplex.

YOU'RE IN GOOD COMPANY

- American Airlines, headquartered here, operates a hub at DFW International Airport as does Delta Air Lines.
- Federal Express has a Southwest Regional Sort Hub at Alliance Airport in Fort Worth and United Parcel Service has a Regional Hub at Dallas/Fort Worth International Airport.

- Large and small aircraft manufacturers flourish in the D/FW Metroplex including Lockheed Martin, Bell Helicopter Textron, Gulfstream Aerospace, Boeing, Northrup Grumman, Rockwell Collins, Hughes, American Eurocopter, Bell Augusta and Honeywell Flight Systems.
- In 2001, Lockheed Martin Aeronautics was awarded an $18.9 ***billion*** contract from the U.S. and British armed forces for the F-35 Joint Strike Fighter. Many believe that the eight-year developmental phase will result in the largest military contract in history – an order for the production of more than 3,000 F-35s which may well top $200 ***billion.***



- Aviall, Inc., the largest distributor of aircraft parts in the United States, has its headquarters near Dallas/Fort Worth International Airport.

FIND OUT MORE

For more information about the Dallas/Fort Worth Metroplex and its high quality of life and low cost of living, contact the North Texas Commission at 972.621.0400, fax 972.929.0916, or visit our website at www.ntc-dfw.org. You may also write to the North Texas Commission at P.O. Box 610246, DFW Airport, Texas 75261-0246.

NORTH TEXAS COMMISSION
BUILDING THE REGION OF CHOICE

9/02

APPENDIX J
MODEL SPECIFICATIONS FOR
FRASCA MODEL 142P – PREFERRED CONFIGURATION
(SOURCE: FRASCA INTERNATIONAL, URBANA, ILLINOIS)

FRASCA INTERNATIONAL, INC.
906 East Airport Road, Urbana, Illinois 61802-7407, U.S.A. - (217) 344-9200 - FAX: (217) 344-9207
world wide web: http://www.frasca.com e-mail: marketing@frasca.com

Frasca Model 142P – Preferred Configuration

Effective Date: 31 July 2000

INCLUDES THE FOLLOWING EQUIPMENT:

I. Model 142 Twin Engine Flight Training Device Includes as standard equipment: single seat fuselage with controls and instruments for flight, engine, and systems; **Graphical Instructor Station** (GISt) with computer, monitor, printer, desk, Map Module, Approach Module, Snapshot Module, and Station Editor Module; IFR Avionics Package with RNAV (Simulated Bendix/King Silver Crown Series); Jeppesen U.S. navigation data base; worldwide navigation capabilities using real-world frequencies; dual EGT gauge; three needle altimeter; toe brakes; electric elevator trim; adjustable seat, cockpit light, hour meter; operator manuals and checklists; digital design with built-in diagnostic program; modular construction for ease of maintenance.	PRD1014	$90,650
II. Cockpit Equipment and Configuration		
• Wide Cockpit which includes seats for both pilot and copilot.	OPT1027	$8,500
• Multi-to-Single Engine Conversion Kit which includes replacement throttle quadrant and metal plates to cover unused switches and instruments on the fuel panel.	OPT1029	$8,300
• Trim Console which provides manual controls for elevator trim, aileron trim, and rudder trim.	OPT1033	$1,750
III. Flight and Navigation Instruments		
• Dual Fuel Flow Indicator	OPT1038	$ 2,400
• Glideslope on NAV 2 Receiver	OPT1040	$ 950
• Bendix/King KI 525A HSI	OPT1042	$ 5,800
• Dual Needle RMI	OPT1047	$ 4,135
IV. Miscellaneous Items		
• OAT gauge, aerobatic attitude indicator, digital clock with timer, modem for remote diagnostic access, and freeze switch in cockpit.		$2,000
V. Graphical Instructor Station (GISt)		
• **GISt Enhancement Package** Includes: Record/Replay Module, Lesson Plan Module, NIFA Scoring Module, Parameter Plotting Module and Jeppesen Data Translator	OPT 1019	$7,500
VI. Visual System		
• FVS200T Textured Color Visual System, which includes a direct-view color, monitor, IG computer, and data base features.	OPT1166	$35,000
Total List Price		**$166,985**
Preferred Package Discount		**($26,985)**
Total Discounted Price, FOB Urbana, IL		**$140,000**

Discounted price valid only in Continental U.S.; prices subject to change without notice; any applicable taxes not included.

APPENDIX K
FACULTY SALARY DATA
(TEXAS HIGHER EDUCATION COORDINATING BOARD)

Public Universities
Average Budgeted Salaries by Rank
FY2003 (Fall 2002 Doubled)

	Professor						Associate Professor					
	No. Faculty	No. FTE Faculty	Average Salaries	Median	Highest Salaries	Lowest Salaries	No. Faculty	No. FTE Faculty	Average Salaries	Median	Highest Salaries	Lowest Salaries
The University of Texas at Arlington	195	192.34	$80,475	$77,286	$149,000	$49,960	166	161.57	$60,165	$56,650	$97,200	$36,462
The University of Texas at Austin	921	858.23	103,157	93,704	297,364	36,552	397	380.29	65,913	62,000	156,000	36,910
The University of Texas at Dallas	118	105.00	97,516	92,702	219,250	56,050	83	73.54	72,634	65,000	137,814	47,000
The University of Texas at El Paso	129	121.48	75,139	73,606	104,400	50,352	148	142.28	57,690	54,766	87,906	30,838
The University of Texas-Pan American	85	83.91	70,807	69,380	109,216	44,828	113	111.62	59,877	57,142	109,016	30,063
The University of Texas at Brownsville	30	20.77	59,984	59,178	73,252	53,854	56	44.95	54,584	52,995	84,058	44,110
The University of Texas of the Permian Basin	16	11.25	69,375	70,512	87,972	51,800	27	26.00	53,121	49,468	74,676	43,628
The University of Texas at San Antonio	123	108.23	85,104	83,000	144,450	49,226	152	141.47	66,385	61,216	130,000	41,350
The University of Texas at Tyler	43	42.50	68,343	66,238	90,380	52,322	47	46.00	53,598	50,282	87,562	37,998
Texas A&M University	807	678.80	93,572	90,978	199,124	33,308	375	324.47	65,872	62,550	149,796	37,800
Texas A&M University at Galveston	17	13.82	72,476	68,447	94,831	49,014	12	11.28	53,898	53,010	71,162	40,238
Prairie View A&M University	50	43.65	71,134	66,292	129,203	55,224	72	65.73	56,464	54,164	77,928	42,738
Tarleton State University	59	53.50	63,733	61,712	86,219	51,922	61	58.75	51,281	50,286	66,886	43,000
Texas A&M University-Commerce	71	70.25	68,136	67,368	101,250	31,150	50	49.75	52,150	50,848	69,922	42,752
Texas A&M University-Corpus Christi	74	63.01	64,564	61,734	94,003	50,800	72	64.81	56,376	53,250	90,232	42,000
Texas A&M University-Kingsville	100	91.60	62,340	61,336	88,432	49,996	65	59.79	51,718	49,302	74,998	42,994
Texas A&M International University	18	17.00	77,388	75,000	96,530	57,188	45	44.25	55,739	53,122	80,682	44,530
Texas A&M University-Texarkana	19	18.25	66,630	67,022	75,092	56,494	15	11.63	55,274	55,000	65,962	43,512
West Texas A&M University	52	49.10	64,394	63,436	96,704	49,882	40	40.00	52,732	50,282	70,952	42,754
University of Houston	362	346.26	98,941	92,050	260,000	27,000	315	310.00	65,358	61,980	133,000	31,810
University of Houston-Clear Lake	49	47.75	77,691	77,316	109,312	39,792	63	62.75	65,503	64,512	110,072	48,102
University of Houston-Downtown	40	34.10	67,448	67,240	80,808	53,532	61	59.36	55,634	53,068	82,770	27,822
University of Houston-Victoria	12	10.75	72,992	69,390	82,678	63,452	14	12.35	64,982	53,436	156,752	45,434
Midwestern State University	55	50.50	77,473	72,000	130,752	54,360	53	49.34	60,833	57,365	110,016	45,108
University of North Texas	253	246.40	77,786	75,522	125,000	27,140	231	226.40	59,759	56,196	99,584	40,632
Stephen F. Austin State University	139	130.47	63,136	61,991	83,472	45,900	84	80.58	52,491	50,904	108,576	39,742
Texas Southern University	71	69.58	69,024	65,658	152,420	41,010	69	68.16	55,407	52,342	107,132	31,616
Texas Tech University	295	275.17	86,898	82,306	185,000	51,042	296	279.58	60,780	57,000	130,000	41,904
Texas Woman's University	85	84.50	61,069	59,994	122,980	46,998	93	92.25	48,982	49,496	60,070	40,848
Angelo State University	63	59.56	66,892	62,688	144,269	56,608	35	33.67	57,011	53,620	89,158	45,510
Lamar University	86	80.70	65,974	64,588	111,658	35,902	62	60.93	53,503	53,298	85,236	26,708
Sam Houston State University	120	111.99	71,698	70,326	96,840	49,320	94	87.75	56,993	54,486	89,658	33,308
Southwest Texas State University	225	217.28	69,083	67,922	94,460	50,624	173	165.67	57,155	54,746	83,106	41,032
Sul Ross State University	28	25.58	62,334	61,699	93,636	35,376	21	20.67	45,066	44,846	57,358	37,558
Sul Ross State University Rio Grande College	8	7.83	59,694	56,522	87,089	45,460	8	7.75	50,253	50,846	72,552	36,738
Total	4,818	4,441.11					3,668	3,475.39				
Weighted Average			$84,693						$60,343			

Note: Average Faculty Salaries use appointment codes 1 and 2 as assigned by the institution.
Fall 2002 salaries are doubled to represent an academic year of nine months.
Date 2/7/03

Source: CBM008 for Fall, 2002

Public Universities
Average Budgeted Salaries by Rank
FY2003 (Fall 2002 Doubled)

	Assistant Professor						Instructor					
	No. Faculty	No. FTE Faculty	Average Salaries	Median	Highest Salaries	Lowest Salaries	No. Faculty	No. FTE Faculty	Average Salaries	Median	Highest Salaries	Lowest Salaries
The University of Texas at Arlington	132	128.29	$55,632	$50,714	$95,152	$30,068	0	0.00	$0	$0	$0	$0
The University of Texas at Austin	362	350.91	61,674	55,008	142,000	25,036	21	18.87	58,090	42,900	134,000	39,000
The University of Texas at Dallas	87	75.46	74,351	74,210	119,000	44,000	0	0.00	0	0	0	0
The University of Texas at El Paso	142	139.44	50,864	47,380	85,000	35,980	0	0.00	0	0	0	0
The University of Texas-Pan American	138	136.47	51,357	47,724	94,802	36,000	0	0.00	0	0	0	0
The University of Texas at Brownsville	72	49.98	47,989	45,230	66,965	37,395	6	3.09	47,057	44,000	57,218	41,000
The University of Texas of the Permian Basin	37	37.00	48,416	43,896	70,556	38,110	0	0.00	0	0	0	0
The University of Texas at San Antonio	151	146.26	53,680	49,106	110,000	40,000	7	6.67	51,204	40,000	84,430	40,000
The University of Texas at Tyler	57	57.00	47,435	45,330	77,692	36,000	0	0.00	0	0	0	0
Texas A&M University	316	280.46	58,855	54,448	123,786	31,364	1	1.00	47,996	47,996	47,996	47,996
Texas A&M University at Galveston	12	11.22	45,717	44,948	57,265	36,054	0	0.00	0	0	0	0
Prairie View A&M University	96	91.68	47,910	44,888	76,500	36,000	3	3.00	40,637	42,000	43,472	36,440
Tarleton State University	82	79.77	44,952	43,116	64,758	38,000	2	2.00	38,816	38,422	39,210	38,422
Texas A&M University-Commerce	66	65.25	47,486	44,020	80,000	35,300	1	1.00	54,148	54,148	54,148	54,148
Texas A&M University-Corpus Christi	71	61.89	47,931	45,156	78,000	32,968	0	0.00	0	0	0	0
Texas A&M University-Kingsville	59	54.59	46,036	43,200	73,008	34,992	0	0.00	0	0	0	0
Texas A&M International University	54	53.50	48,638	44,296	79,500	39,242	0	0.00	0	0	0	0
Texas A&M University-Texarkana	11	9.42	48,890	46,124	65,000	42,630	1	1.00	60,900	60,900	60,900	60,900
West Texas A&M University	81	81.00	45,193	42,000	73,302	35,500	0	0.00	0	0	0	0
University of Houston	172	170.10	56,419	54,000	98,508	35,000	0	0.00	0	0	0	0
University of Houston-Clear Lake	48	48.00	51,941	46,326	81,896	39,834	2	2.00	40,000	38,000	42,000	38,000
University of Houston-Downtown	85	84.50	46,742	43,000	72,558	39,000	10	10.00	45,352	40,000	70,000	39,000
University of Houston-Victoria	37	36.50	54,284	54,994	70,700	41,500	0	0.00	0	0	0	0
Midwestern State University	47	44.66	50,698	46,872	73,488	41,508	0	0.00	0	0	0	0
University of North Texas	202	200.19	49,824	46,500	86,488	33,886	1	1.00	45,150	45,150	45,150	45,150
Stephen F. Austin State University	126	122.65	43,405	41,402	71,000	34,106	10	10.00	37,228	36,042	45,000	33,000
Texas Southern University	51	49.16	45,132	42,444	76,752	25,800	5	5.00	38,406	36,822	52,000	29,484
Texas Tech University	297	291.17	52,544	48,000	118,000	33,750	0	0.00	0	0	0	0
Texas Woman's University	75	74.75	44,100	44,774	59,000	37,662	5	5.00	40,506	40,000	43,532	38,000
Angelo State University	76	73.50	47,750	45,668	73,618	41,554	0	0.00	0	0	0	0
Lamar University	97	94.85	47,434	44,312	70,000	27,750	17	14.45	38,083	35,592	70,680	25,056
Sam Houston State University	120	111.42	48,327	45,540	75,924	25,632	2	2.00	44,082	43,632	44,532	43,632
Southwest Texas State University	134	130.40	46,527	43,991	83,304	33,140	3	3.00	43,263	44,378	45,918	39,492
Sul Ross State University	18	17.25	39,126	38,706	43,394	26,478	4	3.50	37,249	36,664	38,960	36,310
Sul Ross State University Rio Grande College	5	4.75	41,757	39,674	51,888	35,624	0	0.00	0	0	0	0
Total	3,616	3,463.44					101	92.58				
Weighted Average			$52,130						$45,377			

Note: Average Faculty Salaries use appointment codes 1 and 2 as assigned by the institution.
Fall 2002 salaries are doubled to represent an academic year of nine months.
Date 2/7/03

Source: CBM008 for Fall, 2002

Public Universities
Average Budgeted Salaries by Rank
FY2003 (Fall 2002 Doubled)

	First Four Ranks			Other			Teaching Assistant			All Ranks		
	No. Faculty	No. FTE Faculty	Average Salaries	No. Faculty	No. FTE Faculty	Average Salaries	No. Faculty	No. FTE Faculty	Average Salaries	No. Faculty	No. FTE Faculty	Average Salaries
The University of Texas at Arlington	493	482.20	$66,985	501	300.03	$35,912	160	80.42	$21,945	1,154	862.65	$47,250
The University of Texas at Austin	1,701	1,608.30	85,080	838	558.75	47,306	468	226.39	25,788	3,007	2,393.44	65,325
The University of Texas at Dallas	288	254.00	83,347	306	169.99	36,110	63	30.61	23,911	657	454.60	55,647
The University of Texas at El Paso	419	403.20	60,749	415	273.26	31,181	41	20.20	19,469	875	696.66	44,791
The University of Texas-Pan American	336	332.00	59,143	251	177.88	28,697	16	8.78	17,382	603	518.66	45,362
The University of Texas at Brownsville	164	118.79	52,401	178	75.82	20,863	0	0.00	0	342	194.61	35,987
The University of Texas of the Permian Basin	80	74.25	54,196	73	32.02	26,437	4	1.92	20,833	157	108.19	40,439
The University of Texas at San Antonio	433	402.63	67,026	463	257.50	24,923	147	63.76	17,518	1,043	723.89	41,358
The University of Texas at Tyler	147	145.50	55,521	148	71.64	29,817	2	0.40	40,000	297	217.54	42,608
Texas A&M University	1,499	1,284.73	79,293	694	482.18	39,807	667	320.24	23,700	2,860	2,087.15	56,746
Texas A&M University at Galveston	41	36.32	59,207	62	37.89	38,116	26	14.62	21,931	129	88.83	41,557
Prairie View A&M University	221	204.06	55,852	159	113.29	38,645	6	3.74	32,878	386	321.09	48,407
Tarleton State University	204	194.02	52,216	239	142.46	28,996	0	0.00	0	443	336.48	39,689
Texas A&M University-Commerce	188	186.25	56,561	301	131.17	32,029	53	23.00	16,008	542	340.42	38,972
Texas A&M University-Corpus Christi	217	189.71	56,405	220	96.49	26,219	74	36.00	19,108	511	322.20	38,008
Texas A&M University-Kingsville	224	205.98	54,963	158	100.61	29,179	25	8.88	12,481	407	315.47	42,344
Texas A&M International University	117	114.75	55,792	95	53.77	25,001	0	0.00	0	212	168.52	41,994
Texas A&M University-Texarkana	46	40.30	58,560	44	12.25	25,135	0	0.00	0	90	52.55	42,219
West Texas A&M University	173	170.10	52,708	144	91.35	30,749	40	19.83	13,852	357	281.28	39,497
University of Houston	849	826.36	77,866	811	409.67	38,393	692	328.93	21,581	2,352	1,564.96	47,695
University of Houston-Clear Lake	162	160.50	64,857	286	108.32	25,847	68	34.25	10,081	516	303.07	36,016
University of Houston-Downtown	196	187.96	53,664	328	154.14	25,937	0	0.00	0	524	342.10	36,309
University of Houston-Victoria	63	59.60	60,225	45	13.19	22,125	0	0.00	0	108	72.79	44,350
Midwestern State University	155	144.50	63,665	153	96.69	28,472	23	9.75	15,989	331	250.94	44,085
University of North Texas	687	673.99	63,455	535	311.95	31,871	469	226.51	19,268	1,691	1,212.45	41,207
Stephen F. Austin State University	359	343.70	52,998	215	139.76	26,696	94	45.40	16,218	668	528.86	39,357
Texas Southern University	196	191.90	57,232	230	171.96	34,662	12	7.00	16,940	438	370.86	44,276
Texas Tech University	888	845.92	66,702	338	218.03	35,082	816	373.46	21,104	2,042	1,437.41	43,247
Texas Woman's University	258	256.50	51,381	323	185.86	29,364	151	68.73	17,152	732	511.09	34,605
Angelo State University	174	166.73	56,543	134	87.95	30,482	2	0.66	19,333	310	255.34	45,038
Lamar University	262	250.93	54,349	176	108.20	26,070	24	10.99	16,557	462	370.12	41,613
Sam Houston State University	336	313.16	59,073	203	123.69	27,203	120	51.85	22,514	659	488.70	42,598
Southwest Texas State University	535	516.35	59,431	818	393.00	30,315	65	32.08	21,418	1,418	941.43	40,893
Sul Ross State University	71	67.00	49,930	52	32.00	17,393	18	5.26	7,776	141	104.26	32,549
Sul Ross State University Rio Grande College	21	20.33	51,827	28	10.50	18,542	0	0.00	0	49	30.83	32,807
Total	12,203	11,472.52		9,964	5,743.26		4,346	2,053.66		26,513	19,269.44	
Weighted Average			$67,399			$32,750			$21,131			$46,793

Note: Average Faculty Salaries use appointment codes 1 and 2 as assigned by the institution.
Fall 2002 salaries are doubled to represent an academic year of nine months.
Date 2/7/03

Source: CBM008 for Fall, 2002

Public Universities
Change in Average Budget Faculty Salaries

	Professor			Associate Professor			Assistant Professor			Instructor			First 4 Ranks		
	FY 2002	FY 2003	Change	FY 2002	FY 2003	Change	FY 2002	FY 2003	Change	FY 2002	FY 2003	Change	FY 2002	FY 2003	Change
The University of Texas at Arlington	$78,030	$80,475	3.13%	$57,277	60,165	5.04%	$52,274	55,632	6.42%				$64,379	66,985	4.05%
The University of Texas at Austin	98,838	103,157	4.37%	63,502	65,913	3.80%	59,919	61,674	2.93%	$45,807	58,090	26.81%	81,589	85,080	4.28%
The University of Texas at Dallas	90,244	97,516	8.06%	67,436	72,634	7.71%	74,716	74,351	(0.49%)				79,542	83,347	4.78%
The University of Texas at El Paso	73,133	75,139	2.74%	56,391	57,690	2.30%	48,287	50,864	5.34%				58,732	60,749	3.43%
The University of Texas-Pan American	67,792	70,807	4.45%	56,850	59,877	5.32%	48,214	51,357	6.52%				56,268	59,143	5.11%
The University of Texas at Brownsville	58,771	59,984	2.06%	52,551	54,584	3.87%	47,443	47,989	1.15%	42,494	47,057	10.74%	50,894	52,401	2.96%
The University of Texas of the Permian Basin	65,918	69,375	5.24%	52,034	53,121	2.09%	45,841	48,416	5.62%				52,380	54,196	3.47%
The University of Texas at San Antonio	79,785	85,104	6.67%	62,753	66,385	5.79%	50,270	53,680	6.78%	40,750	51,204	25.65%	63,115	67,026	6.20%
The University of Texas at Tyler	65,869	68,343	3.76%	52,014	53,598	3.05%	48,216	47,435	(1.62%)				54,441	55,521	1.98%
Texas A&M University	90,126	93,572	3.82%	63,655	65,872	3.48%	56,783	58,855	3.65%	53,100	47,996	(9.61%)	76,893	79,293	3.12%
Texas A&M University at Galveston	73,644	72,476	(1.59%)	51,596	53,898	4.46%	43,552	45,717	4.97%				59,174	59,207	0.06%
Prairie View A&M University	59,718	71,134	19.12%	50,651	56,464	11.48%	43,558	47,910	9.99%	38,815	40,637	4.69%	50,156	55,852	11.36%
Tarleton State University	61,747	63,733	3.22%	50,534	51,281	1.48%	44,233	44,952	1.63%	37,332	38,816	3.98%	51,141	52,216	2.10%
Texas A&M University-Commerce	68,890	68,136	(1.09%)	53,070	52,150	(1.73%)	48,028	47,486	(1.13%)	58,564	54,148	(7.54%)	57,686	56,561	(1.95%)
Texas A&M University-Corpus Christi	63,051	64,564	2.40%	55,680	56,376	1.25%	47,812	47,931	0.25%				55,889	56,405	0.92%
Texas A&M University-Kingsville	60,523	62,340	3.00%	51,285	51,718	0.84%	43,808	46,036	5.09%				52,781	54,963	4.13%
Texas A&M International University	73,123	77,388	5.83%	55,791	55,739	(0.09%)	47,286	48,638	2.86%				55,622	55,792	0.31%
Texas A&M University-Texarkana	65,123	66,630	2.31%	61,759	55,274	(10.50%)	46,332	48,890	5.52%	60,000	60,900	1.50%	58,343	58,560	0.37%
West Texas A&M University	63,213	64,394	1.87%	52,050	52,732	1.31%	45,277	45,193	(0.19%)				52,983	52,708	(0.52%)
University of Houston	92,411	98,941	7.07%	63,574	65,358	2.81%	54,575	56,419	3.38%				74,119	77,866	5.06%
University of Houston-Clear Lake	77,675	77,691	0.02%	63,995	65,503	2.36%	49,890	51,941	4.11%	75,055	40,000	(46.71%)	64,475	64,857	0.59%
University of Houston-Downtown	64,690	67,448	4.26%	52,518	55,634	5.93%	45,629	46,742	2.44%	42,620	45,352	6.41%	52,044	53,664	3.11%
University of Houston-Victoria	71,317	72,992	2.35%	59,495	64,982	9.22%	51,866	54,284	4.66%				57,743	60,225	4.30%
Midwestern State University	74,037	77,473	4.64%	61,394	60,833	(0.91%)	49,848	50,698	1.71%				62,544	63,665	1.79%
University of North Texas	76,255	77,786	2.01%	59,071	59,759	1.16%	49,047	49,824	1.58%	44,010	45,150	2.59%	62,785	63,455	1.07%
Stephen F. Austin State University	61,842	63,136	2.09%	50,239	52,491	4.48%	41,902	43,405	3.59%	35,036	37,228	6.26%	51,050	52,998	3.82%
Texas Southern University	67,235	69,024	2.66%	52,811	55,407	4.92%	44,596	45,132	1.20%	37,000	38,406	3.80%	55,660	57,232	2.82%
Texas Tech University	86,367	86,898	0.61%	60,845	60,780	(0.11%)	51,074	52,544	2.88%				66,409	66,702	0.44%
Texas Woman's University	61,627	61,069	(0.91%)	49,200	48,982	(0.44%)	43,678	44,100	0.97%	41,729	40,506	(2.93%)	51,530	51,381	(0.29%)
Angelo State University	64,627	66,892	3.50%	54,655	57,011	4.31%	46,805	47,750	2.02%				55,491	56,543	1.90%
Lamar University-Beaumont	61,507	65,974	7.26%	52,362	53,503	2.18%	45,397	47,434	4.49%	38,635	38,083	(1.43%)	52,240	54,349	4.04%
Sam Houston State University	68,312	71,698	4.96%	54,430	56,993	4.71%	46,296	48,327	4.39%	41,940	44,082	5.11%	56,217	59,073	5.08%
Southwest Texas State University	67,462	69,083	2.40%	55,309	57,155	3.34%	44,081	46,527	5.55%	40,151	43,263	7.75%	57,453	59,431	3.44%
Sul Ross State University	58,874	62,334	5.88%	48,695	45,066	(7.45%)	41,152	39,126	(4.92%)	37,442	37,249	(0.52%)	50,150	49,930	(0.44%)
Sul Ross State University Rio Grande College	64,052	59,694	(6.80%)	49,979	50,253	0.55%	40,212	41,757	3.84%	35,290		########	50,486	51,827	2.66%
Weighted Average	$81,470	$84,693	3.96%	$58,635	$60,343	2.91%	$50,189	$52,130	3.87%	$42,551	$45,377	6.64%	$65,277	$67,399	3.25%

Source: CBM008 for Fall. 2002

Public Universities
Average Budgeted Faculty Salary by Rank
FY2003 vs FY 2002

	FY 2002		FY 2003		% Increase/Decrease	
	No. FTE Faculty	Average Salary	No. FTE Faculty	Average Salary	No. FTE Faculty	Average Salary
Professors	4,327.66	$81,470	4,441.11	$84,693	2.62%	3.96%
Associate Professors	3,417.67	58,635	3,475.39	60,343	1.69%	2.91%
Assistant Professors	3,154.44	50,189	3,463.44	52,130	9.80%	3.87%
Instructors	85.56	42,551	92.58	45,377	8.20%	6.64%
First Four Ranks	10,985.33	$65,277	11,472.52	$67,399	4.43%	3.25%
Teaching Assistants	2,069.01	20,661	2,053.66	21,131	(0.74%)	2.27%
Other	5,572.54	31,881	5,743.26	32,750	3.06%	2.73%
Total All Ranks	18,626.88	$45,130	19,269.44	$46,793	3.45%	3.68%

Source: CBM008 for Fall, 2002

APPENDIX L
CARNEGIE CLASSIFICATION DEFINITIONS
(CARNEGIE FOUNDATION)

Carnegie 2000 Classifications

Doctoral/Research Universities—Extensive
These institutions typically offer a wide range of baccalaureate programs, and they are committed to graduate education through the doctorate. They award 50 or more doctoral degrees per year across at least 15 disciplines.

Doctoral/Research Universities—Intensive
These institutions typically offer a wide range of baccalaureate programs, and they are committed to graduate education through the doctorate. They award at least ten doctoral degrees per year across three or more disciplines, or at least 20 doctoral degrees per year overall.

Master's (Comprehensive) Colleges and Universities I
These institutions typically offer a wide range of baccalaureate programs, and they are committed to graduate education through the master's degree. They award 40 or more master's degrees per year across three or more disciplines.

Master's (Comprehensive) Colleges and Universities II
These institutions typically offer a wide range of baccalaureate programs, and they are committed to graduate education through the master's degree. They award 20 or more master's degrees per year.

Baccalaureate Colleges—Liberal Arts
These institutions are primarily undergraduate colleges with major emphasis on baccalaureate programs. They award at least half of their baccalaureate degrees in liberal arts fields.

Baccalaureate Colleges—General
These institutions are primarily undergraduate colleges with major emphasis on baccalaureate programs. They award less than half of their baccalaureate degrees in liberal arts fields.

Baccalaureate/Associate's Colleges
These institutions are undergraduate colleges where the majority of conferrals are at the subbaccalaureate level (associate's degrees and certificates), but bachelor's degrees account for at least ten percent of undergraduate awards.

Associate's Colleges
These institutions offer associate's degree and certificate programs but, with few exceptions, award no baccalaureate degrees.

Theological seminaries and other specialized faith-related institutions
These institutions primarily offer religious instruction or train members of the clergy.

Medical schools and medical centers
These institutions award most of their professional degrees in medicine. In some instances, they include other health professions programs, such as dentistry, pharmacy, or nursing.

Other separate health profession schools
These institutions award most of their degrees in such fields as chiropractic, nursing, pharmacy, or podiatry.

Schools of engineering and technology
These institutions award most of their bachelor's or graduate degrees in technical fields of study.

Schools of business and management
These institutions award most of their bachelor's or graduate degrees in business or business-related programs.

Schools of art, music, and design
These institutions award most of their bachelor's or graduate degrees in art, music, design, architecture, or some combination of such fields.

Schools of law
These institutions award most of their degrees in law.

Teachers colleges
These institutions award most of their bachelor's or graduate degrees in education or education-related fields.

Other specialized institutions
Institutions in this category include graduate centers, maritime academies, military institutes, and institutions that do not fit any other classification category.

Tribal colleges
These colleges are, with few exceptions, tribally controlled and located on reservations. They are all members of the American Indian Higher Education Consortium.

APPENDIX M
TEXT OF LETTER TO TEXAS-BASED AIRLINES AND THEIR RESPONSES

Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

979-845-3326
Fax: 979-845-7548
http://tti.tamu.edu

July 18, 2002

Captain Deborah McCoy
Senior Vice President - Flight Operations
Continental Airlines
P.O. Box 4607
Houston, TX 77210

Dear Captain McCoy:

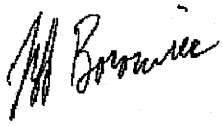
The Texas Transportation Institute at Texas A&M University has been asked by the Texas Department of Transportation - Aviation Division to review four-year degree programs in aviation and examine the process and elements (curriculum, facilities, etc.) involved in developing such a program at a university in the state of Texas. Currently there are no comprehensive, four-year degree programs in aviation in the state. Specifically, we are looking at degree programs that offer both the aviation management option and the professional pilot option.

As part of this work, our researchers visited three universities in Oklahoma that offer such programs. During our visit at Southeastern Oklahoma State University, Dr. David Conway mentioned you as a graduate of their program and suggested we talk with you. We are interested in getting some insight from a major air carrier regarding the desired background and qualifications of prospective employees for Continental Airlines and ExpressJet. We are particularly interested in what you are looking for in pilot candidates but would also be interested for non-pilot positions that may be of interest to aviation management students. We feel that this information is critical for developing appropriate curriculums and programs to adequately train students for careers in these areas. Industry needs, requirements, and demands will all play a part in the successful development and implementation of such an academic program.

Any information that you may be able to provide us in terms of minimum flight hour requirements, ratings, college degree requirements, course work, or any other information that you think is pertinent in training tomorrow's pilots and aviation managers would be very helpful. We would also enjoy any opportunity to meet with you or members of your staff if that would prove more convenient. Should you have any questions or need any additional information, please do not hesitate to call me at (979) 845-5200.

Thank you for your time and interest!

Sincerely,



Jeff Borowiec
Assistant Research Scientist

Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

979-845-3326
Fax: 979-845-7548
http://tti.tamu.edu

July 19, 2002

Mr. Gregory N. Crum
Vice President - Flight Operations
Southwest Airlines
P.O. Box 36611
Dallas, TX 75235

Dear Mr. Crum:

The Texas Transportation Institute at Texas A&M University has been asked by the Texas Department of Transportation - Aviation Division to review four-year degree programs in aviation and examine the process and elements (curriculum, facilities, etc.) involved in developing such a program at a university in the state of Texas. Currently there are no comprehensive, four-year degree programs in aviation in the state. Specifically, we are looking at degree programs that offer both the aviation management option and the professional pilot option.

As part of this work, we are interested in getting some insight from major airlines regarding the desired background and qualifications of prospective employees for American Airlines and American Eagle. We are particularly interested in what you are looking for in pilot candidates but are also interested for non-pilot positions that may be of interest to aviation management students. We feel that this information is critical for developing appropriate curriculums and programs to adequately train students for careers in these areas. Industry needs, requirements, and demands will all play a part in the successful development and implementation of such an academic program.

Any information that you may be able to provide us in terms of minimum flight hour requirements, ratings, college degree or course work requirements, or any other information that you think is pertinent in training tomorrow's pilots and aviation managers would be very helpful. We would also enjoy any opportunity to meet with you or members of your staff to discuss these issues if that would prove more convenient. Should you have any questions or need any additional information, please do not hesitate to call me at (979) 845-5200.

Thank you for your time and interest!

Sincerely,

Jeff Borowiec
Assistant Research Scientist

Transportation Planning Program

Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

979-845-3326
Fax: 979-845-7548
http://tti.tamu.edu

July 19, 2002

Mr. Robert P. Kudwa
Vice President - Flight
American Airlines
Mail Drop 5675
P.O. Box 619616
Dallas/Fort Worth Airport, TX 75261-9616

Dear Mr. Kudwa:

The Texas Transportation Institute at Texas A&M University has been asked by the Texas Department of Transportation - Aviation Division to review four-year degree programs in aviation and examine the process and elements (curriculum, facilities, etc.) involved in developing such a program at a university in the state of Texas. Currently there are no comprehensive, four-year degree programs in aviation in the state. Specifically, we are looking at degree programs that offer both the aviation management option and the professional pilot option.

As part of this work, we are interested in getting some insight from major airlines regarding the desired background and qualifications of prospective employees for American Airlines and American Eagle. We are particularly interested in what you are looking for in pilot candidates but are also interested for non-pilot positions that may be of interest to aviation management students. We feel that this information is critical for developing appropriate curriculums and programs to adequately train students for careers in these areas. Industry needs, requirements, and demands will all play a part in the successful development and implementation of such an academic program.

Any information that you may be able to provide us in terms of minimum flight hour requirements, ratings, college degree or course work requirements, or any other information that you think is pertinent in training tomorrow's pilots and aviation managers would be very helpful. We would also enjoy any opportunity to meet with you or members of your staff to discuss these issues if that would prove more convenient. Should you have any questions or need any additional information, please do not hesitate to call me at (979) 845-5200.

Thank you for your time and interest!

Sincerely,

Jeff Borowiec

Jeff Borowiec
Assistant Research Scientist

Transportation Planning Program

Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

979-845-3326
Fax: 979-845-7548
http://tti.tamu.edu

January 7, 2003

Mr. Robert P. Kudwa
Vice President - Flight
American Airlines
Mail Drop 5675
P.O. Box 619616
Dallas/Fort Worth Airport, TX 75261-9616

Dear Mr. Kudwa:

The Texas Transportation Institute at Texas A&M University has been asked by the Texas Department of Transportation - Aviation Division to review four-year degree programs in aviation and examine the process and elements (curriculum, facilities, etc.) involved in developing such a program at a university in the state of Texas. Currently there are no comprehensive, four-year degree programs in aviation in the state. Specifically, we are looking at degree programs that offer both the aviation management option and the professional pilot option.

As part of this work, we are interested in getting some insight from major airlines regarding the desired background and qualifications of prospective employees for American Airlines and American Eagle. We are particularly interested in what you are looking for in pilot candidates but are also interested for non-pilot positions that may be of interest to aviation management students. We feel that this information is critical for developing appropriate curriculums and programs to adequately train students for careers in these areas. Industry needs, requirements, and demands will all play a part in the successful development and implementation of such an academic program.

Any information that you may be able to provide us in terms of minimum flight hour requirements, ratings, college degree or course work requirements, or any other information that you think is pertinent in training tomorrow's pilots and aviation managers would be very helpful. We would also enjoy any opportunity to meet with you or members of your staff to discuss these issues if that would prove more convenient. Should you have any questions or need any additional information, please do not hesitate to call me at (979) 845-5200.

Thank you for your time and interest!

Sincerely,

Jeff Borowiec
Assistant Research Scientist

Transportation Planning Program

SOUTHWEST AIRLINES CO.
Jeff Grenier
Manager Flight Safety Response

Southwest Airlines
P.O. Box 36611, HDQ 8FO
2702 Love Field Drive
Dallas, Texas 75235-1611
September 13, 2002

Jeff Borowiec
Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, Texas 77843-3135

Jeff:

Your letter was passed along to me. I apologize for the delay in response, but as I'm sure you are aware, the airline industry has been a little chaotic in the past year.

We regret to inform you that we can not assist you in your pursuit, as outlined in your letter, of those qualifications desired by American Airlines and American Eagle. However, here at Southwest Airlines, a four-year degree from an accredited University with an Aviation program is a highly valued commodity. Our requirements along with open positions can be found at:

http://www.iflyswa.com/careers/

As we are based in Dallas, we always recruit heavily from Texas schools. However, for certain positions that require more specialized aviation/aeronautical training, we recruit from schools like Embry-Riddle, Auburn, Ohio State, Purdue, and the University of North Dakota. I'm sure that if you research their web sites you will gain a wealth of knowledge on their programs.

If you have specific questions that are not answered on our web site, please feel free to contact me again in the future.

Respectfully,

Jeff Grenier
Manager Flight Safety Response

Continental Airlines

Deborah L. McCoy
Sr. Vice President
Flight Operations

Continental Airlines, Inc.
1600 Smith Street HQSFI
Houston TX 77002

Tel 713 324 2647
Fax 713 324 5875

October 16, 2002

Jeffery D. Borowiec
Assistant Research Scientist
Texas Transportation Institute
The Texas A&M University System
3135 TAMU
College Station, TX 77843-3135

Dear Mr. Borowiec:

Thank you for your interest in Continental Airlines. We applaud your effort to establish a four-year degree program in aviation management and aeronautics. Continental would obviously benefit from such a program, and we are glad to provide what help we can.

All our new-hire pilots have four-year degrees–many from an institution that specializes in aeronautics such as Embry-Riddle, or The Florida Institute of Technology. A pilot candidate with an aviation degree from Texas A&M would certainly have a distinct advantage.

Typical experience for a new-hire is between 2,500 to 5,000 hours of flight time with at least 1,000 hours in a complex multi-engine turbine aircraft. The pilot applicant should also have an Airline Transport Pilot Certificate. Between graduation and a career at Continental, pilots will gain experience in the military, flying corporate aircraft, or flying for a regional air carrier. In addition to their flight training, an education in aviation related courses such as aerodynamics, meteorology, and aviation management are helpful; although, we consider a well-rounded education in general academics to be just as valuable.

Continental also has established an intern program for aviation students in their fourth year. We would certainly be willing to discuss entering an arrangement with Texas A&M as well.

Our current Manager of Pilot Recruiting, KD Jost, has two children attending Texas A&M and would be more than happy to discuss aviation career requirements with you or your staff as well as career opportunities at Continental with students who are interested.

Sincerely,

Deborah L McCoy