Web-Based Airport Licensing

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16. Abstract

This project created a revised method of airport inspection and licensing for public-use airports in the State of Alabama using Web-based technology.

The primary objective of the project was to update the existing MS-DOS® inspection algorithm with a MS-Access® algorithm for airport inspection, using weighting-factors for various inspection features. For example, safety was given preference over convenience and aesthetics in the revised algorithm. The revised algorithm was created and tested by working with an Alabama Department of Transportation (ALDOT) airport inspector. Based on the literature review preceding this study, this is a pioneering work in this field.

The revised inspection algorithm is suitable for posting results on the ALDOT Web site and is currently used by the ALDOT airport inspector for scheduled annual inspections. The methodology section of the report provides insight into creation of the algorithm and the design of the Web site.

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Executive Summary

This project created a revised method of inspecting and licensing for public-use airports in Alabama using Web-based technology. The primary objective of the project was to generate an algorithm for airport inspection that gave appropriate weight to various inspection features by working in unison with an Alabama Department of Transportation (ALDOT) airport inspector. After developing the algorithm, a spreadsheet program was developed and field-tested for various conditions at different airports. The spreadsheet program was eventually transferred to the Web page of ALDOT, which places the inspection results online. This reduces inspection paperwork and allows the public to procure the latest licensing status of any airport in the state.

Section 1

Introduction

Aviation has played a dominant role in worldwide transportation over the past few decades. As aviation has grown, accidents and incidents have become more numerous and safety has emerged as a primary matter of concern. This has resulted in the establishment of agencies by state and federal governments with the objectives of improving aviation safety, capacity, and efficiency.

The civil aviation sector is divided into two categories: commercial aviation and general aviation (GA). Commercial aviation comprises scheduled and chartered operations, while all other flying falls into the GA category. GA constitutes an important role in air traffic. Since World War II, there has been a relatively high growth in the number of people using small aircraft for personal transportation as well as recreation in the United States. This has resulted in growth in the number of GA public use airports throughout the nation.

Today there are more than 5,025 public use airports (averaging roughly 100 per state) and 9,433 private use airports in the USA, for a total of 14,458 general aviation airports (Transportation Research Board, 2001). The public use airports are open to the public and the state government has the responsibility to ensure that they operate according to prescribed safety measures with minimal risk to the safety of the flying public.

1.1 Study Purpose

The State of Alabama currently has 96 public-use airports and 181 private-use airports. The Aeronautics Bureau, part of the Alabama Department of Transportation (ALDOT), oversees the safety aspects of public-use airports. There is only one official (designated as 'Airport Inspector') to ensure airport safety and to issue annual operating licenses to these airports.

The airport inspector is hard pressed to conduct recurring inspections, traveling throughout the state and conducting laborious inspections. The paperwork necessary to prepare the licensing information status for distribution to the public is extensive, and often delays the reporting of the airport licensing status. This delay could become a safety and economic issue.

This project created a revised method of inspecting and licensing public-use airports in Alabama using Web-based technology. The primary objective of the project was to generate an algorithm for airport inspection using appropriate weighting factors for various inspection features, by working in unison with the airport inspector. After developing the algorithm, a spreadsheet program was developed and field-tested on various conditions at different airports.

The spreadsheet program was transferred to the ALDOT Web page, which has the option to place the inspection reports online. This reduces the inspection paperwork and allows the public to procure the latest licensing status of any airport in the state.

1.2 Methodology

The following methodology was adopted for accomplishing the study objectives:

(i) Conduct a three-phase literature review on the following topics:
   a. Investigate licensing procedures in Alabama and other southeastern states with reference to the UTCA Project 01111, "Comparing Airport Licensing Requirements: Alabama vs. Selected States and the FAA."
   b. Examine existing standards of the Federal Aviation Administration for GA airports that qualify for and participate in the national Airport Improvement Program (AIP).
   c. Review GA airport licensing standards and procedures adopted by most states in the United States, to identify potential improvements for methods being used in Alabama.

(ii) Accompany the airport inspector on airport inspections and identify the critical factors of airport licensing.

(iii) Develop an algorithm for all important factors, and assign weighting factors to each feature according to its importance.

(iv) Embed the algorithm in a spreadsheet, field test it, and make necessary revisions for practicality.

(v) Repeat the field test for lighted/non-lighted airport conditions, and update the algorithm.

(vi) Prepare a database in MS-Access® and post the algorithm on the ALDOT Web site while maintaining Web security privileges for the airport inspector.

1.3 Report Organization

Section One (Introduction): This provides an overview of the report, including the study purpose and various work steps.

Section Two (Historical Overview): This is a detailed description and definition of general aviation concepts, and the status of Alabama in comparison with other states.

Section Three (Literature Review): An examination of the different phases of the literature review is found in this section.

Section Four (Methodology): This section includes a discussion of the various meetings, field trips, airport features considered, the different phases of the algorithm development, and the details of converting the algorithm to the ALDOT Web page.

Section Five (Conclusions and Scope of Further Work): Conclusions are presented for this project, along with the scope of further work to enhance the airport licensing procedure.

Section 2

Historical Overview

This section provides a historical overview on aviation in Alabama, and defines general aviation along with a perspective on national trends in GA.

2.1 Alabama in Aviation History

Alabama holds a very important place in aviation history since the inception of modern-day engine-driven aircraft. On December 17, 1903, two innovative self-motivated engineer brothers, (Orville and Wilbur Wright), flew successfully after yearlong flight experiments. Just seven years after the historic flight of the Wright brothers, Wilbur Wright traveled to Montgomery, Alabama to open a temporary civilian flying school. This flying school was located near "Douglasville," a small village northwest of Montgomery. By the end of February 1910, one of the world's earliest flying schools was opened in Alabama. It subsequently became Maxwell Air Force Base.

Today the transportation infrastructure of Alabama is dependent on a network of airports spread across the state. The network consists of eight commercial airports and numerous GA airports. The commercial airports offer scheduled commercial service and are governed by the Federal Aviation Administration (FAA). Of general aviation airports, 96 are open to the public and another 181 are privately owned and maintained. In Alabama, the Aviation Bureau oversees the licensing of public use airports.

2.2 What is General Aviation?

The International Civil Aviation Organization defines general aviation as:

> *An aircraft operation other than a commercial air transport operation or an aerial work operation is termed as general aviation. Aerial work is defined as specialized commercial aviation operations performed by aircraft, e.g. flying training, agriculture, construction, photography, surveying etc.*

The Aircraft Owners and Pilots Association defines General Aviation as:

> *All civilian flying except scheduled passenger airlines and military aircraft operations.*

2.2.1 Facts about General Aviation

- Three out of four take-offs at United States (US) airports are by GA aircraft.
- More than 92 percent of civil aircraft are registered in the US as GA aircraft; GA is the largest aviation sector, regionally and nationally.
- GA serves as a springboard for many of the world's commercial pilots in learning how to fly. Roughly 70-80 percent of pilots in commercial aviation come through the GA field.
- GA includes diverse flying such as air ambulances, business flying, recreation flying and medical repatriation.
- GA assists in personal transportation as it offers speed, productivity and flexibility, unlike any other mode of travel.
- GA is the most efficient and cost-effective way to conduct environmental activities such as wildlife surveys, fighting forest fires and air sampling. It also helps highway commuters by traffic reporting, and by providing advanced traveler information regarding upstream gridlocks or accidents.
- GA boosts production of the nation's agriculture through chemical application, and it also helps law enforcement in federal, state and local jurisdictions.

2.3 General Aviation Airports

General Aviation airports include public as well as privately owned airports that do not offer commercial scheduled or chartered air transportation services. Most have paved runways and a few have lighted runways that are capable of conducting operations at night. The United States averages one airport for every 50,000 people, or about one for each 700 square miles. However, these airports differ significantly in their overall conditions, facilities provided and safety characteristics.

2.3.1 Airport Facilities An airport has landside and airside facilities. Airside facilities are those that are instrumental in directly supporting aircraft or flying needs, or that play a critical role in serving airside needs. Airside facilities consist of runways, taxiways, aprons, aircraft parking places, maintenance buildings, hangars, fueling stations, air traffic control facilities and navigational aids. Landside facilities serve those who use the aircraft or provide better coordination of activities on the airside. Examples include cargo buildings, access roads, automobile parking lots and similar facilities for passengers or other airport users.

Some key indicators of a functional airport include runway condition (e.g., paved, lighted, sufficiently long), navigation aids, traffic control facilities and passenger facilities and amenities.

2.4 Airports and Communities

Airports have a direct impact on nearby communities from a safety and economics point of view. The most important is the safety of those who fly to and from these airports. However, the economic aspect can be far-reaching in terms of industry attraction and economic development. Alabama has been gradually transformed from a raw materials provider to a service and finished products provider. In this transformation, general use airports have become an important fixture for providing flexibility for corporate aircraft to reach remote factory destinations.

2.4.1 Safety Impacts A variety of factors determine airport safety, such as length of runway, condition of runway pavement, approach path slope, whether runways are paved, lighted or unlighted, and other pertinent airside conditions. Airport features such as navigation aids, traffic control and safety services are considered critical factors to commercial airports, and they are of equal value for improving public safety at all airports during reduced visibility and bad weather.

Table 2.1 provides statistics on accidents in Alabama from 1997-2001 (National Transportation Safety Board, 2001). Of the 116 accidents listed, 113 were in the GA sector which resulted in 48 fatalities. The National Transportation Safety Board cites a variety of reasons as the cause of these accidents, with the primary factor being pilot error. However, for many accidents unsafe airport operating conditions were also contributing factors.

Table 2.1 Alabama aviation accident statistics (1997-2001)

Year	Accidents	General Aviation (GA)	Commercial Aviation (CA)	Fatalities	
				GA	CA
1997	17	17	-	7	-
1998	27	25	2	7	-
1999	30	30	-	14	-
2000	17	16	1	2	-
2001	25	25	-	18	-
Total	116	113	3	48	-

Current airport safety information is essential to those flying to an unfamiliar airport. In other words, furnishing the public with information about the current operating status of an airport will assist in proper flight planning and contribute to the overall safety of flight operations. Quite often, the most recent information regarding the condition of a general aviation airport may not be available.

2.4.2 Economic Impacts Most of the GA flights are conducted for business services that need more flexible transportation than commercial airlines can offer. The GA aircraft is the mainstay of a $20 billion-a-year industry which generates $64 billion in economic activity. Thousands of communities benefit as their local airports create a positive effect on the local economy and businessmen take advantage of rapid, flexible air transportation.

In Alabama, GA airports generate billions in indirect economic benefits. Some $800 million are generated annually from businesses using these airports, paying airport fees, buying aviation fuel, and other purchases that fliers make in the community.

Most corporations will not locate a plant, headquarters or distribution center in a town without an airport. It is no coincidence that many of the world's most profitable companies operate their own aircraft to improve their productivity and to increase the flexibility to travel quickly, cost-effectively and by the most direct route.

GA airports definitely have an economic impact on the communities where they are located. From the economic point of view, potential industrial users of the airport may overlook its

improvements and forego opportunities to develop the airport or adjacent areas. In other words, having an airport will not be a primary reason for a city to get onto the shortlist for industrial development, but not having a good airport will definitely keep a city off the shortlist.

Section 3.0

Literature Review

A previous search was conducted for UTCA Project 01111, "Comparing Airport Licensing Requirements: Alabama vs. Selected States and the FAA." It provided the foundation for the present literature search.

3.1 Literature Review Methodology

A thorough three-phase review was conducted using Web sites, library sources, and personal contact with authorities in various states.

3.1.1 Other States' Approaches The first phase consisted of reviewing the airport licensing requirements for the states which were studied previously in UTCA Project 01111. Since those states (Florida, Kentucky, Georgia, Michigan, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and Wisconsin) had already developed regulations on airport licensing procedures that were comparable to Alabama, they were reviewed for potential information on Web-based licensing procedures.

3.1.2 FAA regulations The second phase of the work was conducted by examining FAA regulations and guidelines on general aviation airport licensing procedures. The FAA has standards for participating in the Airport Improvement Program (AIP) conducted nationally. The FAA provides funds or bears partial expenses for improving the state general aviation airport conditions.

Basically, the only requirement of the FAA in the construction or alteration of an airport is the filing of FAA Form 7480-1, "Notice of Landing Area Proposal" (Federal Aviation Administration form). The main purpose of this document is to allow the FAA to evaluate the federal airspace requirements for the airport. All landing areas, whether public-use or private-use, must register this document with the FAA. Licensure for public-use airports not falling under 14 CFR Part 139 is under the control of the individual states. However, the FAA gives guidance to the states for the development of standards for non-primary airports in Advisory Circular (AC) 150/5100-13A (Federal Aviation Administration, Advisory Circular), which is the standard adopted by most states.

AC 150/5100-13A provides for development of state standards other than those for safety of approaches, dealing with factors such as pavement design (including the use of state highway standards for paving airport surfaces), drainage, and construction (materials). It recommends that AC 150/5300-13 be followed for configuration standards, but deviations may be approved which conform to terrain or expected use of a facility. Standards that must conform to federal regulations without state deviation relate to safety of approaches, and consist of (but are not

limited to) runway and taxiway lighting configurations; runway and taxiway markings and signage; visual aids; approach size, surface, and slope; and obstruction removal and protection. Despite the fact that the FAA mandates the standards in these areas, they are still inspected by state aviation officials and not the FAA. There are rare instances in which deviations are made from these standards for airports if they serve a vital purpose (e.g., forest firefighting) and can still be used by the general public, but severe restrictions are placed on the airport (e.g., restriction to day-only use, one-way runways, etc.) and strict warnings are published.

Airports capable of serving air carrier operations with more than 30 seats are governed by the FAA in 14 CFR Part 139. They are inspected by the FAA and not by a state-run aviation authority. These airports must conform to federal standards (Federal Aviation Administration, Airport Certification)

3.1.3 Web Resources The third phase of the review work was conducted by collecting licensing procedure information for all states. An extensive review was conducted to find public information available on the Web regarding the licensing status of GA airports. No such information about airport status was available in two Web resources or a handbook.

3.2 Resources for Pilots

Currently, the flying public relies on three sources for checking airport status:

1. The official 'Airport/Facility Directory'(AFD) published through a joint effort by the United States Department of Transportation (USDOT), FAA and National Aeronautical Charting Office (NACO).
2. The "5010 Database" published in accordance with the FAA Airport Master Record.
3. A privately maintained Web resource, referred to as "Airnav.com."

The flying public and state aeronautics authorities rely mainly on the two Web sites to obtain the operating status of airports.

3.2.1 Airport/Facility Directory The AFD is an official United States Government flight information publication in the form of a handbook. Agencies such as USDOT and NACO are involved in publishing it, in accordance with specifications and agreements approved by the FAA. The handbook is published once every 56 days and is sold for a nominal fee through mail order subscription, a network of "Chart Agents" conveniently located at principal civil airports, or through airport Fixed Base Operators (FBOs).

The publishers divided the nation into seven different regions and different handbooks are released for each region. The regions are Northwest, North Central, North East, East Central, South West, South Central, and South East (including Puerto Rico and the US Virgin Islands). Each region contains five to thirteen states and Alabama falls under the South East US region.

The directory contains a sketch of most airports, location details (latitude and longitude), runway details such as number of runways and their orientations, and general remarks and relevant information to assist pilots in safely reaching their destination.

Of all the three resources identified, the AFD is the only FAA-recognized official source of information for pilots. The only downfall of the AFD is that its information is taken directly from the FAA Airport Master Record (FAA Form 5010-1) which is updated by individual states. General aviation airports in Alabama are directly under the jurisdiction of the state Aeronautics Bureau. There is no current commitment from state authorities to update the FAA sources for airport status or licensing information. Hence the information in the AFD is not always the most recent. Further information on the AFD is available at 'http://www.naco.faa.gov.'

3.2.2 The 5010 Database The 5010 database is published in accordance with the FAA Airport Master Record and is available online at 'http://www.gcr1.com/5010web.' It is maintained by a private firm, GCR & Associates, Inc. The airport data accessible via this site are structured in accordance with the FAA Airport Master Record (FAA Form 5010-1) and is unedited information derived from the National Flight Data Center (FAA, *800 Independence Avenue, S. W., Room 634, Washington, D.C. 20591*).

The date of the data set matches the date of the most recent AFD. Any known criteria may be used to access the data for specific airports. The search can be performed by entering the location identifier, airport name, city, or state and the system will give a list of all airports associated with that name.

The search will bring general information on the airport selected, such as the location map, address, location info (latitude and longitude), information regarding services and facilities, based aircraft and operations, runway information, lighted or non-lighted runway conditions, approach path obstructions, and general remarks.

The shortcoming of the 5010 database is that it relies on an airport's licensing authority to relay the information for the FAA to disseminate and report. Therefore, the information is not always the most recent.

3.2.3 Airnav.com Of all the Web resources available, Airnav.com is the most extensively searched or used by pilots and the flying public. This private Web site is maintained by an individual and contains necessary airport information for aviators. Apart from providing a geographical location map, the Web site provides a photograph of the airport including the runway pattern. Information on airport operations, airport communications, radio navigation aids, airport services (e.g. fuel, service, restaurants, hotels, etc.), and runway conditions is typically included. The URL for the Web site is "*http://www.airnav.com."* The web user can browse and procure detailed information in four categories, including Airports, Navaids, Airport Fixes and Aviation Fuel.

The airport status is usually obtained from the airports section of the site by searching using the location ID, airport name, or city name. The amount of information Airnav.com provides is vast and includes all information from the other Web sites. Moreover, data on airport inspection, airport operational statistics, and services or businesses available at the airport can usually be obtained. Often the Web site provides the user with fuel prices, and it may even allow the user to reserve a hotel accommodation through a hot key on the Web site.

Although the Web site provides useful information, the drawback is the same as the other two sources. For most of the airports, the inspection date is two - three years old and obsolete. For example the Aeronautics Bureau closed the Freddie Jones Field Airport at Linden, Alabama at the beginning of 2002 because of its runway surface condition. But at the time of this report, Airnav.com listed the airport as "Open to Public," did not mention the indefinite closure of the airport, and stated the date of the last inspection as 27 March 2000. For those who completely rely on Airnav.com, this shortcoming may cause a serious safety risk.

The cause of the discrepancy is weak and sporadic communication of data between the states and the FAA. It is noteworthy that the owner of the Web site uses a disclaimer that claims no accuracy of information and encourages everyone to cross check the information disseminated:

> *This information may not be accurate or current and is not valid for navigation, flight planning, or for use in flight. Always consult the official publications for current and correct information. Check NOTAMS before flying. No warranty of fitness for any purpose is made or implied.*

3.2.4 Comparison of the Three Resources The information provided by the three above-mentioned sources was compared for a few airports. Recently, Alabama authorities revoked the operating license of eight general aviation airports due to a variety of safety problems. The issues embraced poor runway condition, obstructions to the approach path, insufficient runway markings and poor lighting. The airports whose licenses were revoked as of Oct, 2002 include:

1. Abbeville Municipal Airport, Abbeville
2. Atmore Municipal Airport, Atmore
3. Bay Minette Municipal Airport, Bay Minette
4. Camden Municipal Airport, Camden
5. Roy Wilcox Airport, Chatom
6. Chambers Municipal Airport, Lanett
7. Pine Hill Municipal Airport, Pine Hill, and
8. Franklin Field Airport at Union Springs

These airports are currently under probation and the Aviation Bureau gave concerned airport authorities 360 days to correct safety flaws. The conditions leading to the license revocation are too important to be ignored. Yet, none of the three resources mentioned the operating status of these airports.

Three other airports in Alabama are indefinitely closed due to safety reasons (See Table 3.1):

1. Red Bay Municipal Airport
2. Freddie Jones Field Airport, Linden, and
3. Mallard Airport, York

The Red Bay Municipal Airport is not listed in the three data resources, and no current information on the closure of the Linden Airport is given in the three resources. The closure of

the York Airport is stated by all three sources, probably because of its extended period of inoperability.

Table 3.1, Comparison of 5010 Database, Airnav.com, and AFD

Closed Airport	5010 Database	Airnav.com	AFD
Red Bay	Not Listed	Not Listed	Not Listed
Linden	Not Mentioned	Not Mentioned	Not Mentioned
Mallard	Mentioned	Mentioned	Mentioned

3.3 State Airport Agency Web Sites

The third-phase of the review consisted of examining the licensing status of airports. Since web-based licensing was planned for this project, a thorough Web search was conducted to determine the licensing methods of all 50 states.

The data were collected from all 50 states and compiled in Table 3.2. The Web sites from which the data were collected are shown in Appendix A, along with a synopsis of available information.

Table 3.2, State GA licensing information available on Web site
(Legend: ✔ = available, ✕ = not available)

State	Licensing Info (On Web)	Online Licensing	Information Available
Alaska	✕	✕	Moderate
Arizona	✕	✕	✕
Arkansas	✕	✕	✕
California	✕	✕	Extensive
Colorado	✕	✕	Moderate
Connecticut	✔	✕	Moderate
Delaware	✕	✕	Moderate
Florida	✔	✕	Extensive
Georgia	✕	✕	Moderate
Hawaii	✕	✕	✕
Idaho	✕	✕	✕
Illinois	✔	✕	Moderate
Indiana	✔	✕	Moderate
Iowa	✔	✕	Moderate
Kansas	✕	✕	Moderate
Kentucky	✕	✕	✕
Louisiana	✕	✕	✕
Maine	✔	✕	Moderate
Maryland	✔	✕	Extensive
Massachusetts	✕	✕	Moderate
Michigan	✔	✕	Moderate
Minnesota	✕	✕	Moderate
Mississippi	✕	✕	✕
Missouri	✕	✕	✕
Montana	✕	✕	Moderate
Nebraska	✕	✕	Moderate
Nevada	✕	✕	Moderate
New Hampshire	✕	✕	✕
New Jersey	✕	✕	✕
New Mexico	✕	✕	✕
New York	✕	✕	Moderate
North Carolina	✕	✕	Moderate
North Dakota	✔	✕	Moderate
Ohio	✔	✕	Moderate
Oklahoma	✕	✕	Moderate
Oregon	✕	✕	Moderate
Pennsylvania	✔	✕	Moderate
Rhode Island	✕	✕	Moderate
South Carolina	✕	✕	✕
South Dakota	✕	✕	Moderate
Tennessee	✕	✕	Moderate
Texas	✔	✕	Moderate
Utah	✕	✕	✕
Vermont	✕	✕	Moderate
Virginia	✔	✕	Moderate
Washington	✕	✕	Moderate
West Virginia	✕	✕	✕
Wisconsin	✕	✕	Moderate
Wyoming	✕	✕	✕

The following conclusions were drawn as a result of the Web search:

(i) No state aviation bureau or transportation division has a Web-based licensing procedure and this project is a pioneering work in this area.

(ii) Very few states have a dedicated Web page for the aeronautics (Alabama Aeronautics Bureau has a separate Web page under ALDOT's Web site).

(iii) Eighteen states (36 percent) display only contact information and other insignificant information for the GA users. This causes users to depend on other resources that are not regularly updated and accurate. The Alabama Aeronautics Bureau Web site provides better information when compared to these states.

(iv) Fourteen states list useful FAA and state licensing information and application forms, which can be downloaded for an airport license application.

(v) Four states link officially to Airnav.com or the 5010 Database, to help users obtain information from other resources.

(vi) Five states have information on runway pavement conditions.

(vii) Three states (California, Florida and Maryland) provide extensive information about state aviation on their Web sites.

(viii) Ohio provides extensive information on airport pavement conditions and reports on MicroPAVER (a software that provides the Pavement Condition Index (PCI) value), while North Carolina developed and uses its own software called LEDGA (Layered Elastic Design for General Aviation) for runway conditions.

(ix) The California Department of Transportation delivers vital information on runway conditions using Geographic Information System (GIS) mapping.

(x) Though a few states link to the 5010 Database and Airnav.com, no state directly supplies state license information.

Section 4

Methodology

This section outlines the procedure adopted for the recommended new airport inspection algorithm. An overview on regulations and instructions which govern the periodic inspection and documentation of annual airport inspections is also provided in this section.

4.1 Referring Comparable Inspection Manual

Development of the inspection algorithm was based on similar procedures already in place at ALDOT. A very similar work was identified in the inspection of transportation structures. Inspections of bridge structures across the state are conducted to ensure the safety of these structures and thereby the public's safety. The researchers for this project reviewed the "Bridge Inspection Manual" and found that it had an extremely comprehensive description of the procedure adopted for regular inspection, and that it referred to a software program used by inspectors statewide.

A general idea for the deliverable of the airport inspection project was obtained by reviewing the "Bridge Inspection Manual." The general outline of the online airport inspection form was also based on the bridge inspection program.

The general layout proposed for the airport inspection algorithm was to analyze the different factors that the airport inspector takes into account during an airport inspection, and to assign points for each factor. It was decided to develop a computer program in simple spreadsheet format with validations for each factor. The program developed would be connected to a database to enable the inspector to store the data and to compare it to the previous inspection reports.

The various factors considered for granting the license were identified and weighting factors were assigned to each. Also, a decision was made to alter the factors based on the night or day operations of the airport. If an airport was found to pose a safety threat for night operations (e.g., due to lighting disorders) but the same airport functioned well for day operations, the inspection algorithm should generate an appropriate score and report for both the day and night operating modes. A spreadsheet program was developed to organize the data. The fields of the table and the weighting factors allotted to each factor are shown in Table 4.1, "Weighting Factors and Points Allotted."

Table 4.1 was developed from the information in section three of UTCA Report 01111, "Comparing Airport Licensing Requirements: Alabama vs. Selected States ad the FAA." The procedure gave appropriate weight to standard airport dimensions, lighting standards, and safety and convenience facilities stipulated for GA airport design.

Table 4.1 Preliminary weighting factors and points allotted

Weighting Factors	Max. Score
Paving Conditions	15
Primary Surface	9
Approach Path Slope	10
Runway Protection Zone	10
Approach Path Length	10
Runway Safety Area	9
Runway Threshold	9
Runway Markings	10
Approach Zones Owned by 2005	1
Fire Extinguisher	2
Grounding Cable for Fuel Area	3
Defect Free Fuel Hoses	3
Runway End Identifiers	10
Edge Lights	7
Lighted Beacon	10
Lighted Windsock	3
Windsock	9
Total	**130**

4.2 Role of the ALDOT Airport Inspector

Several consultations with the airport inspector were used to apportion the preliminary weighting factors shown in Table 4.1. The factors were analyzed and revised during meetings with the inspector, and a few minor factors were removed from the table. After several such meetings, it was decided to test the revised table during a regular airport inspection.

4.2.1 Field Test One A field-test was conducted at the Richard Arthur Field Airport in Fayette, Alabama. The inspector found that the airport was operating under safe conditions. The inspection algorithm was tested and some minor revisions were suggested. Data fields such as "Approach Path Length," "Runway Protection Zone," "Approach Path," and "Runway Threshold" were removed since other areas of inspection covered them. This helped to simplify the algorithm and program. Of all the features the inspector considers for granting the license, certain ones deserve more weight than the rest. These factors are considered critical because failure to meet the specified standards could cause a continual threat to safety. During this project, the key aspects that primarily determine licensing status were designated as "Approach Path Slope" and "Runaway Pavement Conditions."

The approach path slope is defined as the vertical angle to the runway, above which no obstructions can be present. A 20:1 slope is considered to be a fair representative for ALDOT inspection purposes. If any obstructions are present, such as trees or rising construction that hinder the safe approach and landing of flights, the inspector will require that the obstructions be removed. The airport will be kept under probation until the obstructions are cleared.

Runway pavement condition refers to the status of the runway or landing area. A variety of reasons can render the paved runway or turf unsafe for landing, such as loose or cracked pavement or inadequate primary surface. The inspector will determine the operating status of the airport depending on pavement conditions, such as when surface distresses are causing a hazard to safe airport operation.

4.2.2 Field Test Two A closed airport was chosen as the second test site so that failing conditions could be easily recognized. Mallard Airport in York was selected for testing the revised program. It was shut down due to unsafe pavement conditions as well as obstructions for landing. Project researchers concluded that if all other features were adequate, but if the two critical features received failing grades, then the airport should fail the inspection procedure. Hence the majority of total points were distributed between the two critical safety features. The passing score was set at 70 percent, and the two critical factors shared 70 percent of the score. If either of these factors fails to generate a passing score, the license will be revoked or the airport will be placed under probation until the inadequacies are corrected.

Based on the Mallard Airport field test, a few additional changes were made to the overall scoring system. Separate programs were developed for lighted and non-lighted inspections. If the lights are not operating as required by ALDOT standards, the inspector will license the airport for day operations only. This will result in revoking the operating status during night or low-visibility conditions. The lighting conditions are not significant to the overall score for day-only operations. In addition, scores for other features such as availability of fire extinguishers, defect-free fuel hoses, grounding cables for fuel area, etc., were lowered because they are less important from a safety point of view. Failure of any of these lower-risk features will not cause an airport to lose its license.

4.2.3 Field Test Three The revisions made as a result of the second field test resulted in a major revision to the algorithm, so a third field test was conducted. This time a functional airport conducting day and night operations was chosen, the Walker County-Bevill Field Airport in Jasper, Alabama. It had adequate safety features such as sufficient approach path slope and well-paved runways, ranking the airport as well maintained. The lighting conditions were found to meet the state standard, and signage and markings were also satisfactory. The inspector tested the algorithm and found that the program (algorithm) was adequate for a well-maintained airport.

The algorithm was developed to organize and standardize the entire airport inspection procedure while maintaining simplicity. Care was taken to ensure that inspection factors received appropriate weights, and that the inspection reports or procedures would not change even if different inspectors license the airport in the future. The inspection will then generate the same (or very similar) output because of the algorithm. This was not always the case under the previous ALDOT inspection system.

4.3 Paving Conditions

The paving condition inspection factor deserves special mention because runway conditions are a critical factor in airport licensing. A variety of factors such as whether the runway is made of asphalt or concrete determine the runway conditions. For concrete runways, distresses range from low-severity to high-severity, with blow-up, buckling, joint or corner spalling, shrinkage, scaling, patching, cracking, faulting and an array of other defects causing a risk to safety. For asphalt runways, distresses differ from low-severity to high-severity, with alligator cracking, bleeding, block cracking, and longitudinal cracking determine the relative safety conditions. Most GA airports are not well maintained due to scarcity of funds, and hence have medium to high severity pavement distresses. The seriousness of distresses and the hazards these situations might cause to small aircraft are sometimes overlooked. This may be because of the inspector's inadequate exposure to pavement distress levels, lack of time, or non-availability of equipment for conducting a detailed inspection. Currently, the airport inspector grants a license if (in his opinion) the pavements do not seriously endanger safety. This is a subjective decision because there is no fixed level at which this determination is made.

A potential method to solve this problem is to employ a Pavement Condition Index (PCI) for inspection. PCI is a numeric scale ranging from 1-100, which represents the pavement condition for asphalt as well as concrete. A score of 100 denotes an excellent condition or a brand new runway. A PCI score of 35 or lower usually demands closing the runway. A widely used method for determining PCI is to employ software during the inspection to generate an accurate PCI based on few inputs. This allows the inspector to utilize a quantitative rating of runway condition rather than a subjective decision. Utilizing such software will result in implementing a technically sound and standardized procedure.

Other factors contribute toward functionality of airports. Availability of airport communication facilities, radio navigation aids, and airport services such as a pilot lounge, restroom facilities, telephones, helipads, and dependable fuel supplies will determine whether the airport is acceptable from a public point of view. Although these are important, they are not essential to granting the operating license. Hence, they were not included in algorithm development. Aesthetics was not included for the same reason. While airports with an unkempt physical condition are not in keeping with prudent airport management, these factors alone (if apart from the airside facilities) should not cause an airport to lose its license. In these cases, debriefing comments by the inspector may be sufficient to improve the physical appearance of the airport.

Table 4.2 represents the final spreadsheet program developed for the revised airport inspection procedure. The transition from Table 4.1 to Table 4.2 was achieved through systematic steps which were significant in the evolution of the revised inspection procedures. It evolved as a result of numerous telephone conferences, discussions, consultations with professionals across the nation and Canada, and field testing.

Table 4.2 Inspection algorithm for lighted airports (final layout)

Weighting factors for airport inspection (lighted)				
Day Operation	**General Inspection Factors**	**Points (Max.)**	**Points (Scored)**	**Section Score**
Approach (43)	Approach Path Slope	33	0	0
	Runway Safety Area (RSA)	10	0	
Surface (48)	Paving Conditions	33	0	0
	Primary Surface	10	0	
	Runway Markings	5	0	
General (5)	Fire Extinguisher	2	0	0
	Grounding Cable for Fuel Area	1	0	
	Defect-Free Fuel Hoses	1	0	
	Tank Label	1	0	
Lighting (10)	Lighted Windsock	2	0	0
	Beacon	2	0	
	Taxiway Lights	2	0	
	Edge Lights	2	0	
	Threshold Lights	2	0	
Overall	**Total Points**	**106**	**0**	

Table 4.3 Inspection algorithm score for lighted airports (final layout)

Score in Percentage	**0.00**	
Licensing Status	**PASS/FAIL**	
Criterion for Licensing	**≥70%**	**<70%**

Table 4.4 Inspection algorithm for day-only airports (final layout)

Weighting factors for airport inspection (day only)				
Day Operation	**General Inspection Factors**	**Points (Max.)**	**Points (Scored)**	**Section Score**
Approach (43)	Approach Path Slope	33	0	0
	Runway Safety Area (RSA)	10	0	
Surface (48)	Paving Conditions	33	0	0
	Primary Surface	10	0	
	Runway Markings	5	0	
General (5)	Fire Extinguisher	2	0	0
	Grounding Cable for Fuel Area	1	0	
	Defect-Free Fuel Hoses	1	0	
	Tank Label	1	0	
Overall	**Total Points**	**96**	**0**	

Table 4.5 Inspection algorithm score for day-only airports (final layout)

Score in Percentage	**0.00**	
Licensing Status	**PASS/FAIL**	
Criterion for Licensing	**≥70%**	**<70%**

4.4 Placing the Algorithm Online

An important objective of this project was to promote accurate and prompt reporting of GA airport licensing status in Alabama. This will enable the Aeronautics Bureau to inform the public of potentially unsafe conditions at airports. To ensure speedy reporting, the algorithm was placed on the Aeronautics Bureau's Web page. To accomplish this task the services of a professional Web designer were used to install the program online. The inspector tested the program during regular inspections and found that it was performed satisfactorily. Fig 4.1 gives a general view of the Web page layout.

The algorithm was linked to a database, where the inspection details and the inspection report are stored as soon as the inspection is completed. Currently, the inspection report status is not accessible to the public through the Web site. However, as part of the concurrent UTCA Project 02410 (A Revised System for Airport Licensing in Alabama), the task of making the report available online will be completed.

For security reasons, accessibility to the inspection Web site is limited to only the airport inspector and concerned Aviation Bureau officials.

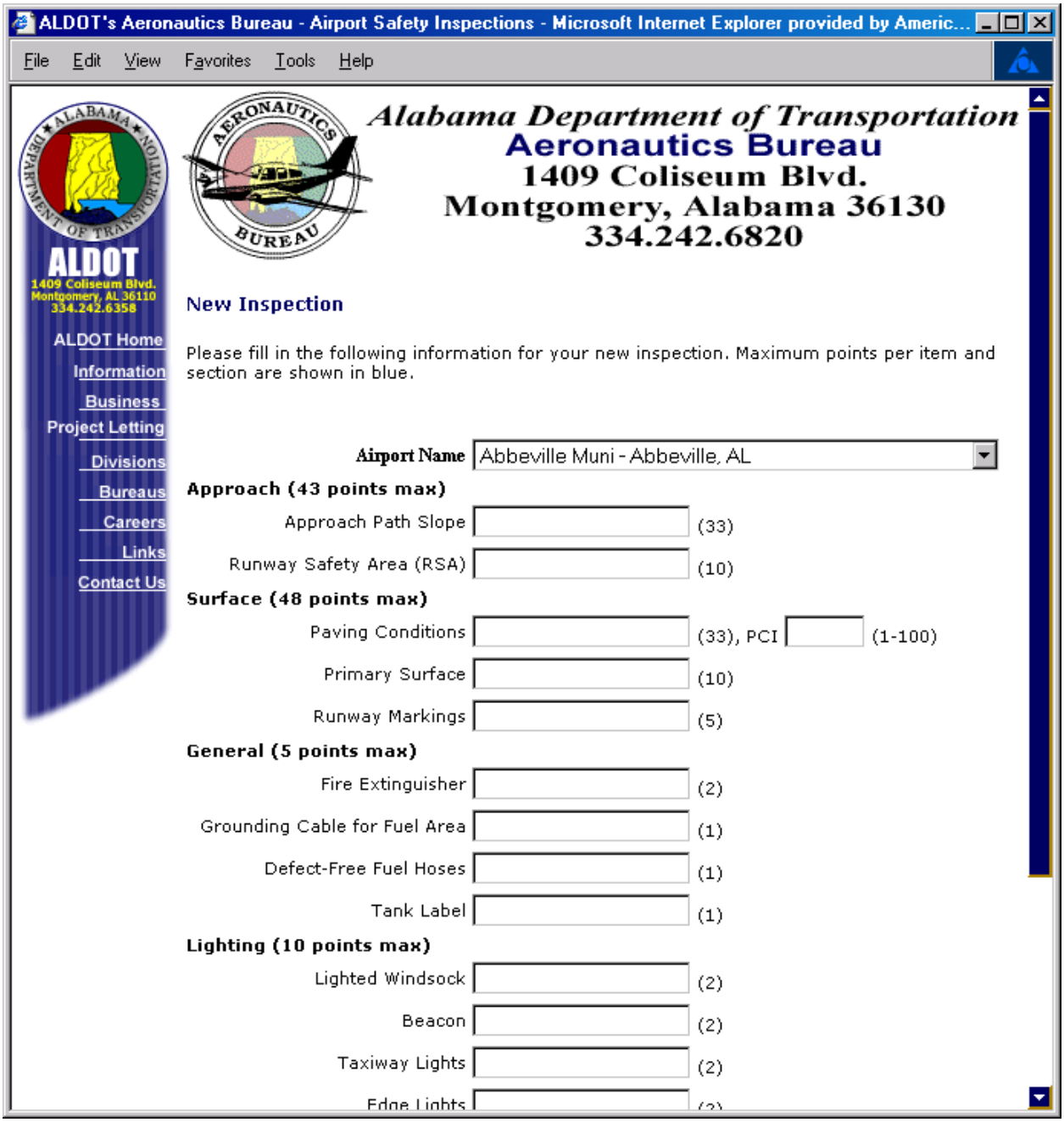

Fig. 4.1 Web page layout of online inspection (partial)

Section 5

Conclusions and Recommended Scope for Further Work

The objective of this project was to revise the public use airport inspection algorithm for the Aeronautics Bureau of the Alabama Department of Transportation. Essential revisions included weighting factors, MS-Excel® and MS-Access® formatting, and reconfiguration so that it could be executed and placed online by the airport inspector in real time.

The project involved a detailed literature review, and analysis of FAA statements given in various Advisory Circulars for public use airports. The project team worked with the state airport inspector to generate an inspection algorithm and format it in an MS-Excel® spreadsheet. The program was field tested three times during regular airport inspections and was found to work satisfactorily. It replaced previous inspection algorithms and is currently being used by the airport inspector. The study team made the following observations and drew several conclusions from the study.

5.1 Results

1. None of the 50 states has conducted a similar work in the area of GA.
2. The ALDOT "Bridge Inspection Manual" served as a model for developing the procedure.
3. Most of the paperwork involved in conducting airport inspections was eliminated as a result of the on-line algorithm. The MS-Access® database stores inspection information for all airports in the state.
4. The airport inspector issues licenses for different airports by verifying essential factors, of which approach path slope and runway pavement conditions are most critical for safety. These are given prominent weighting factors.
5. The algorithm was based on the conclusion that failure of either critical factor should result denial of licensing.
6. Airports with defective lighting fixtures will be certified as unfit for night/low-visibility operations and will be granted permission for day-only operations.
7. Through the successful completion of this project, ALDOT is now able to provide current and relevant information to the flying public regarding the condition of all general aviation airports across the state.

5.2 Recommended Scope for Further Work

As mentioned in section 4.3 of this document, pavement inspection should be given additional importance. Employing the use of software such as MicroPAVER appears to be the most reliable option for better assessment of pavement conditions. This will produce a Pavement Condition Index (PCI), which is a widely accepted standard for determining pavement condition whether the runway is concrete or asphalt.

Section 6
References

Transportation Research Board Data, from Airport Planning and Programming Office, Federal Aviation Administration, August 2001.

National Transportation Safety Board, from: http://www.ntsb.gov.

Federal Aviation Administration Form 7480-1, 'Notice of Landing Area Proposal', from: http://www1.faa.gov/ats/ata/ATA400/7480-1.pdf.

Federal Aviation Administration Advisory Circular, AC on development of state standards for non-primary airports from: http://www1.faa.gov/arp/pdf/5100-13a.pdf.

Federal Aviation Administration, Airport Certification details from: http://www1.faa.gov.arp/certification/index.cfm?ARPnav=cert.

Appendix A
Web site information on airport licensing

1. General Info Pages
    - http://members.tripod.com/~Barusa/transprt/states.htm
    - http://www.rmlibrary.com/db/agencydot.htm
        - Links to 50 state DOTs and other transportation-related sites
2. Alaska
    - http://www.dot.state.ak.us
        - No licensing procedures
        - No online licensing
        - Thorough website – vital for remote airstrip operations
        - Link to GCR & Associates 5010 Database
3. Arizona
    - http://www.dot.state.az.us/ABOUT/aero/index.htm
        - No licensing procedures
        - No online licensing
        - No airport info
        - Not much usable information
4. Arkansas
    - http://www.ahtd.state.ar.us/
        - No aeronautical information
5. California
    - http://www.dot.ca.gov/hq/planning/aeronaut/htmlfile/index.html
        - Licensing and permitting procedures and forms – masses of info
        - No online permitting or licensing system
        - Has a nice GIS state map with airports shown
            - http://www.gcr1.com/ca_aims/
            - Variety of airport information
            - No licensing info
6. Colorado
    - http://www.colorado-aeronautics.org/
        - No licensing procedures
        - No online licensing
        - Individual airport information
            - Aerial photos
            - Road map of area
            - Vital info for small mountain airstrips

7. Connecticut
    - http://www.dot.state.ct.us/bureau/ap/ap.html
        - Licensing and permitting forms online
        - No online licensing
        - Limited info on a few airports – Airnav.com style

8. Delaware
    - http://www.drbaairports.com/
        - No licensing procedures
        - No online licensing
        - Limited info on a few airports – Airnav.com style
        - No authority or contact found for other airports
9. Florida
    - http://www11.myflorida.com/aviation/
        - Licensing procedures online
        - Very comprehensive site
    - http://www.florida-aviation-database.com/
        - Masses of airport info – Airnav.com style
        - Actual 5010s.
        - Extremely informative and excellent site
10. Georgia
    - http://www.dot.state.ga.us/dot/plan-prog/intermodal/aviation/index.shtml
        - No licensing procedures
        - No online licensing
        - No airport info
        - Not much useful information, more of a master plan
11. Hawaii
    - http://www.hawaii.gov/dot/airports/index.htm
        - No licensing procedures
        - No online licensing
        - No airport info
        - Not much information
12. Idaho
    - http://www2.state.id.us/itd/aero/aerohome.htm
        - No licensing procedures
        - No online licensing
        - No airport info
        - Not much information
13. Illinois
    - http://www.dot.state.il.us/aero/index.html
        - Licensing and permitting forms and procedures online
        - No online licensing
        - Limited information on a few airports – Airnav.com style
14. Indiana
    - http://www.in.gov/dot/modetrans/
        - Licensing procedures online

        - No online licensing
        - No airport information
15. Iowa
    - http://www.iawings.com/
        - Licensing procedures online
        - No online licensing
        - Limited info on a few airports – Airnav.com style
16. Kansas
    - http://kdot1.ksdot.org/public/kdot/divaviation/index.html
        - No licensing procedures
        - No online licensing
        - Airport information links to Airnav.com
17. Kentucky
    - http://www.kytc.state.ky.us/Aeronautics/home.htm
        - No licensing procedures
        - No online licensing
        - No airport information
        - Not much information
18. Louisiana
    - http://www.dotd.state.la.us/intermodal/aviation/index.shtml
        - No licensing procedures
        - No online licensing
        - Limited contact information for individual airports, no vital info
19. Maine
    - http://www.state.me.us/mdot/opt/airport/homepage.htm
        - Licensing procedures online
        - No online licensing
        - Good FAQ page
        - No airport information
20. Maryland
    - http://www.marylandaviation.com/
        - Licensing procedures online
        - No online licensing
        - Very large site with masses of information
21. Massachusetts
    - http://www.massport.com/airports/
        - No licensing procedures
        - No online licensing
        - Limited traveler info for large airports under Massachusetts Port Authority
        - Does not include all airports, cannot find information on controlling authority
22. Michigan
    - http://www.michigan.gov/aero/
        - Licensing forms and procedures online
        - No online licensing
        - Information on individual airports, airport diagrams

23. Minnesota
    - http://www.dot.state.mn.us/aero/
        - No licensing procedures
        - No online licensing
        - Links to 5010 Database
24. Mississippi
    - http://www.mdot.state.ms.us/
        - No aeronautical information
25. Missouri
    - http://www.modot.state.mo.us/trans/trans.htm
        - No licensing procedures
        - No online licensing
        - No airport information
        - Not much information
26. Montana
    - http://www.mdt.state.mt.us/aeronautics/
        - No licensing procedures
        - No licensing information
        - Extensive pavement information – PCI reports
            - http://www.mdt.state.mt.us/aeronautics/airplan.html
27. Nebraska
    - http://www.aero.state.ne.us/
        - No licensing procedures
        - No online licensing
        - Basic airport information
28. Nevada
    - http://www.nevadadot.com/traveler/aviation/
        - No licensing procedures
        - No online licensing
        - Basic airport information
        - Very nice airport diagrams, detail locations of pavement conditions
29. New Hampshire
    - http://www.state.nh.us/dot/
        - No aeronautical information
30. New Jersey
    - http://www.state.nj.us/dot/aviation/index.htm
        - No licensing procedures
        - No online licensing
        - No airport information
        - Not much information
31. New Mexico
    - http://nmshtd.state.nm.us/general/gen_depts/gen_depts_aviation/default.asp
        - No licensing procedures
        - No licensing information
        - No airport information
        - Not much information

32. New York
    - http://www.dot.state.ny.us/pubtrans/airhome.html
        - No licensing procedures
        - No licensing information
        - Limited contact information for individual airports, no vital info
33. North Carolina
    - http://www.ncdot.org/transit/aviation/
        - No licensing procedures
        - No licensing information
        - No airport information
        - Masses of information
            - Will soon have Airport Pavement Management System (APMS) report online
                - http://www.ncdot.org/transit/aviation/what/development/initiatives.html
            - Developed own APMS software – LEDGA (Layered Elastic Design for General Aviation)
                - http://www.ncdot.org/transit/aviation/what/development/ledga.html
34. North Dakota
    - http://www.state.nd.us/ndaero/
        - Licensing procedures online
        - No online licensing
        - Links to Airnav.com for airport information
35. Ohio
    - http://www.dot.state.oh.us/Aviation/
        - Licensing procedures and forms online
        - No online licensing
        - EXTENSIVE PAVEMENT CONDITION REPORTS - MICROPAVER
        - No airport info (except for pavement conditions)
36. Oklahoma
    - http://www.okladot.state.ok.us/aeroinfo/index.htm
        - No licensing procedures
        - No online licensing
        - Pavement Management System
            - University of Oklahoma
            - Broken web links – cannot view
        - Airport information, Airnav.com style
37. Oregon
    - http://www.aviation.state.or.us/
        - No licensing procedures
        - No online licensing
        - Vital warning airport (backcountry) information
38. Pennsylvania
    - http://www.dot.state.pa.us/internet/PdotBOA.nsf/HomePageAviation?OpenForm
        - Licensing procedures and forms online

        - No online licensing
        - Airport regulations online
        - Airport information, Airnav.com style
39. Rhode Island
    - http://www.dot.state.ri.us/WebTran/index.html
        - No licensing procedures
        - No online licensing
        - Traveler information for airports, no pilot information
40. South Carolina
    - http://www.dot.state.sc.us/
        - No aeronautical information
41. South Dakota
    - http://www.sddot.com/fpa/Aeronautics/index.htm
        - No licensing procedures
        - No online licensing
        - Basic airport information, Airnav.com style
42. Tennessee
    - http://www.tdot.state.tn.us/aeronautics_division/index.htm
        - No licensing procedures
        - No online licensing
        - Basic airport information, Airnav.com style
43. Texas
    - http://www.dot.state.tx.us/AVN/avninfo.htm
        - Online licensing forms
        - No online licensing
        - Includes Airport Pavement Management (APM) handbook
            - http://www.dot.state.tx.us/avn/pavementmanagement.htm
        - No airport information
44. Utah
    - http://www.udot.utah.gov/aer/default.htm
        - No licensing procedures
        - No online licensing
        - No airport information
        - Not much information
45. Vermont
    - http://www.aot.state.vt.us/maint/aviation/air.htm
        - No licensing procedures
        - No online licensing
        - Vital info on public-use airports, Airnav.com style
46. Virginia
    - http://www.doav.state.va.us/
        - Licensing procedures online
        - No online licensing
        - Not much information
47. Washington
    - http://www.wsdot.wa.gov/aviation/

        - No licensing procedures
        - No online licensing
        - Vital info on state-owned airports
            - Vital for safe operation from mountain airstrips

48. West Virginia
    - http://www.wvdot.com/1_airports/1_airports.htm
        - No licensing procedures
        - No online licensing
        - No airport information
        - Not much information
49. Wisconsin
    - http://www.dot.state.wi.us/dtid/boa/index.htm
        - No licensing procedures
        - No online licensing
        - Basic airport information
50. Wyoming
    - http://dot.state.wy.us/web/aero/index.html
        - No licensing procedures
        - No online licensing
        - No airport information
        - Not much information