

# e-ALP

Web Network for FAA-Airport Coordination  
Improving Flight Safety  
Using

## electronic Airport Layout Plans



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## **ABSTRACT**

Our national airport system, led by the Federal Aviation Administration (FAA) and “fueled” by the airline and travel industry, has entered an era of mega airport capital improvement programs with multi-billion dollar budgets per individual airport becoming common place (e.g. Orlando-\$2B, Chicago-\$3B, Atlanta-\$5, Seattle-\$6, New York JFK-\$9B, Los Angeles-\$12B). These large sums of money mobilize as many as 100 construction projects at each airport. The consequent changes to an airport’s configuration and corresponding analysis and coordination, required to minimize risk to flight safety within the aerodrome, become staggering. Today’s web-enabled information technology tools can help. Airport Layout Plans (ALP)s are the principal mechanism used collaboratively by the FAA and airport owners for airport configuration management and associated flight safety within the aerodrome. The “e-ALP” (electronic - Airport Layout Plan) project involves the use of commercial-off-the-shelf web-enabled Geographic Information System (GIS) software with the federal Spatial Data Standard (SDS). This pilot project will test GIS and SDS with the FAA's evolving ALP business process and recommend an implementation plan compatible with the National Airspace System (NAS). This project is technically supported by a joint effort involving the American Association of Airport Executives (AAAE) GIS Committee, the FAA’s NAS Information Architecture Committee (NIAC), the Federal CADD-GIS Technology Center, and National Oceanic and Atmospheric Administration (NOAA)’s National Geodetic Survey (NGS).

## **EXECUTIVE SUMMARY**

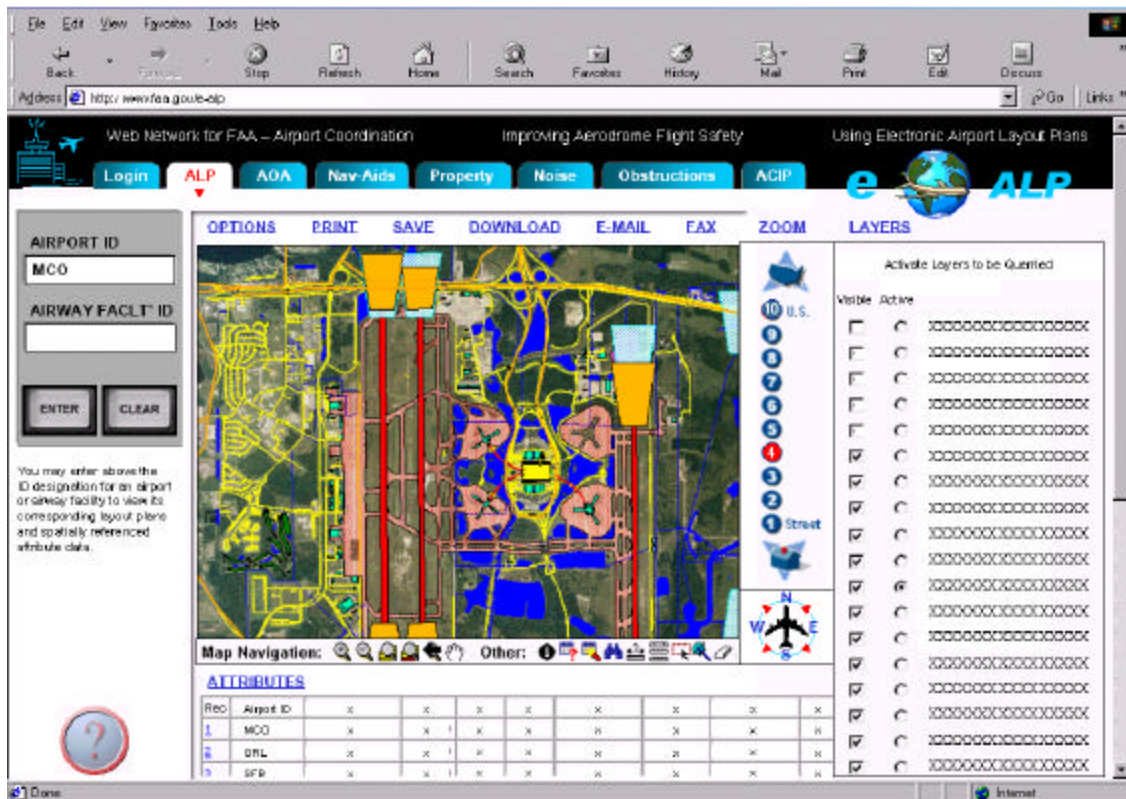
Airport Layout Plans (ALP)s are the principal mechanism used collaboratively by the FAA and airport owners for airport configuration management and associated flight safety. The ALP is needed by many areas of the FAA including Flight Procedures, Airway Facilities, Air Traffic, Logistics, and Civil Aviation Security. The FAA's Airports Division (ARP) is responsible for inter-division coordination of airport layout planning. The airport owner is responsible for updating the ALP. The FAA's local Airports District Office is responsible for coordinating FAA approval of ALP updates, helping to ensure flight safety within the respective aerodrome. With Airport Capital Improvement Programs (ACIP) increasing around the country to add capacity to our air transportation system's infrastructure, ALP changes, analysis, reviews, and approvals increase as well. In today's competitive economy, design-build projects and even traditional design and construction projects cannot afford long lead times (i.e., 2-3 months) associated with ALP change coordination. Three months need to be compressed to three days. This proposed project presents the solution using web-enabled information technology.

The "e-ALP" (electronic - Airport Layout Plan) Pilot Project involves the use of commercial-off-the-shelf (COTS) web-enabled Geographic Information System (GIS) software with the federal Spatial Data Standard (SDS). This pilot project will prototype an electronic ALP repository (i.e., spatial database server); populate it with sample ALPs using the federal SDS structure; test the effectiveness of a web-enabled GIS interface for ALP updates, analysis, review, and approval; test linking the prototype ALP spatial data server to other FAA database servers and tools which require ALP data, and recommend an implementation plan compatible with the evolving National Airspace System (NAS). This proposal is the product of a year-long joint effort involving the FAA's NAS Information Architecture Committee (NIAC), the American Association of Airport Executives (AAAE) GIS Committee, the Federal CADD-GIS Technology Center, and NOAA's National Geodetic Survey (NGS) Division.

This project's overall purpose is improving flight safety within the aerodrome through more effective FAA-Airport collaboration involving ALP data. Potential benefits are numerous and far-reaching, even beyond the FAA's ARP division. The following is a sample list of benefits:

- Improved airport data quality for flight safety obstruction analysis within the aerodrome (e.g., Part-77, TERPS, ATCT line-of-sight, AOA, NAVAIDS, underground cabling)
- Reduction of runway incursions due to construction projects
- Reduction of redundant airport NOTAMs and improved airport NOTAM tracking

- Improved tracking and control of airfield adjacent wildlife attractants (i.e., water bodies)
- Improved airport data for Part-139 certification
- Improved airport data access mechanism for NAS
- Improved airfield pavement condition management
- Improved ACIP information mapping with linkage to NPIAS



Conceptual e-ALP web-enabled GIS Interface  
Showing Orlando International Airport Data

## **ACRONYMS**

3DAAP	Three Dimensional Airspace Analysis Program
AAAE	American Association of Airport Executives
AC	Advisory Circular
ACIP	Airport Capital Improvement Programs
AIP	Airport Improvement Program
ALP	Airport Layout Plan
AOA	Aircraft Operational Area
AOMS	Airfield Obstruction Management System
CADD	Computer Aided Design and Drafting
CAEG	Computer Aided Engineering Graphics
COTS	Commercial Off The Shelf
DBMS	DataBase Management System
EAFB	Eglin Air Force Base
FGDC	Federal Geospatial Data Consortium
GASB	Government Accounting Standards Board
GIS	Geographic Information System
GOAA	Greater Orlando Aviation Authority
MCO	Aeronautical designation for Orlando International Airport
NAS	National Airspace System
NAVAIDS	Navigational Aids
NGS	National Geodetic Survey
NIAC	NAS Information Architecture Committee
NOTAM	Notice To Air Men
NPIAS	National Program for Integrated Airport System
OE-AAA	Obstruction Evaluation – Airport Airspace Analysis System
QA/QC	Quality Assurance / Quality Control
SDS	Federal Spatial Data Standard
VPS	Aeronautical designation for Okaloosa Airport

## **BACKGROUND**

Our national airport system, led by the FAA and “fueled” by the airline and travel industry, has entered an era of mega Airport Capital Improvement Programs (ACIP) with multi-billion dollar budgets per individual airport becoming common place (e.g. Orlando-\$2B, Chicago-\$3B, Atlanta-\$5, Seattle-\$6, New York JFK-\$9B, Los Angeles-\$12B). These large sums of money mobilize as many as 100 construction projects at each airport. The consequent changes to an airport’s configuration and corresponding analysis and coordination, required to minimize risk to flight safety within the aerodrome, become staggering. Airport Layout Plans (ALP)s are the tool by which an airport’s configuration is jointly managed by the FAA and the airport owner. FAA Advisory Circular (AC) 150/5300-13 and Airport Improvement Program (AIP) Handbook (Order 5100.38A) address ALP requirements. Order 5100.38A paragraph 428d states:

A current ALP that has sponsor and FAA approval from the standpoint of the safety, utility, and efficiency of the airport is required by 49 USC 47107(a)(16). ALP’s are the key documents for coordinating between off-airport parties, private users, the financial community, airports, local or State agencies, and Federal program offices. The ALP is needed by many areas of FAA including Flight Procedures, Airway Facilities, Air Traffic, Logistics, and Civil Aviation Security. The Airports Division is responsible for inter-division coordination of airport layout planning. Adequate review and coordination of airport plans prior to FAA approval establishes the basis for use of the ALP.

Airport configuration management (i.e., tracking and controlling airport configuration changes) involves an ALP change request process between the “sponsor” (Airport Owner) and the FAA. This process involves flight safety obstruction analysis, which examines any potential intrusion of ACIP projects into protective buffer zones setup around airspace, aircraft operations area (AOA), the Air Traffic Control Tower (ATCT), various types of navigational aids (NAVAIDS), and corresponding underground cabling. This process is coordinated by FAA Airport District Offices (ADOs). Technical review and approval of analysis results is performed by the ADO and corresponding regional office, as required. The FAA requests airport owners to allow two to three months processing time for ALP change requests. In this era of mega ACIPs and compressed design-build schedules, three month processing time needs to be compressed to three days given the dynamics of such large projects.

Throughout the 1990s, the Orlando Florida ADO in joint effort with the Florida Department of Transportation (FDOT) and the Greater Orlando Aviation Authority (GOAA) developed a tool-set, standards, and business process known as the Three Dimensional Airspace Analysis Program (3DAAP). This tool-set, based on Computer Aided Design and Drafting (CADD) technology, enables the airport owner to perform flight safety obstruction constraints analysis during the project

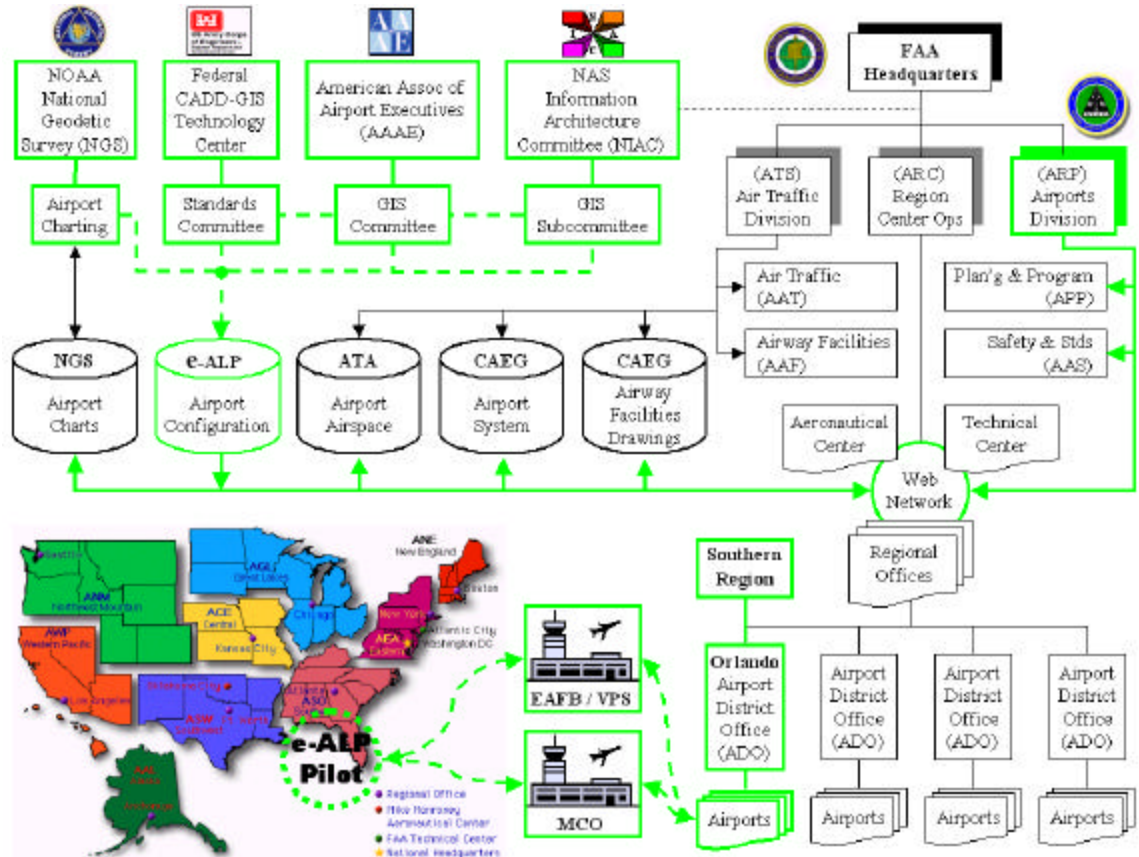
planning and design phase. This has resulted in a significant time reduction of processing ALP change requests involving obstructions, from three months to approximately thirty days. After a decade of experience and lessons learned from 3DAAP, today's web-enabled Geographic Information System (GIS) technology is ready to take 3DAAP to the next level of efficiency – reducing processing time (including analysis) to approximately three days. This requires updating FAA data standards and business practices for ALP generation and maintenance.

GIS Technology has extended CADD into the world of integrated database management systems (DBMS) and web-enabled information mapping. Electronic data standards for GIS are an order of magnitude more complex than for CADD, due to various types of data attributes linked with each graphical spatial feature of an airport. The FAA's NAS Information Architecture Committee (NIAC) has recognized the need for GIS standards meeting FAA requirements. During the 1990's, the Department of Defense (DoD) established the Tri-Services CADD-GIS Technology Center (today known as the Federal CADD-GIS Technology Center). This center has been funded at a multi-million dollar level to develop and maintain GIS standards for both military and civilian applications, including airports. The center has also been developing a GIS-based Airfield Obstruction Management System (AOMS). The American Association of Airport Executives (AAAE) GIS Committee has adopted the Federal Center's standards, and has been striving for the past couple of years to coordinate the Federal CADD-GIS Technology Center's efforts and the FAA's NIAC efforts for mutual benefit of all parties. This proposal is a manifestation of this coordinated push. Moreover, the National Geodetic Survey (NGS) of the National Oceanic and Atmospheric Administration (NOAA) has taken a keen interest in this proposed joint effort, which closely relates to their mission of airport survey standards and charting.

Airports, airport contractors, private charting companies, as well as NOAA and its contractors, are rapidly moving to electronic tools as a means to produce ALPs and other forms of spatial data. Much of this work is being funded by the FAA (i.e., FAA reimburses airport ALP generation costs up to 90%). The FAA, however, does not currently have the means to take advantage of this information on an enterprise scale. Not only is the value that is being created not utilized, but in some cases it is depleted because the FAA does not have a system to receive, store and disseminate such data. The e-ALP proposal outlines an initiative to change this and, in doing so, increase flight safety and operational efficiency in our nation's airports, while reducing ACIP processing time and costs.

## PROJECT DESCRIPTION & APPROACH

The e-ALP pilot project will essentially demonstrate the filling of a gap among existing FAA databases with a dedicated spatial database for serving ALP data. Using open-architecture Oracle Spatial and the federal SDS data standard, the e-ALP airport configuration database would be prototyped. The e-ALP spatial database will be populated for demonstration purposes using data from two airports in Florida: a large-hub airport (Orlando International Airport) and a small joint-use military-civilian airport (Eglin AFB – Okaloosa Airport). The e-ALP database will demonstrate the capability of securely serving spatial data to the FAA and the respective airport owners using a web-enabled GIS interface developed with COTS software such as ESRI's ArcIMS or Intergraph's WebMap or Autodesk's Mapguide. Database linking of existing FAA systems desiring ALP data will also be tested with Airways Facilities Computer Aided Engineering Graphics (CAEG)'s Airport System (AS) and Air Traffic's (ATA)'s Obstruction Evaluation – Airport Airspace Analysis (OE-AAA) System. Electronic ALP changes/updates, to be performed by the airport owners, will be demonstrated from the two test airports using various CADD and GIS platforms (e.g., Autodesk, Intergraph, ESRI). This pilot project will be closely coordinated with NIAC, AAAE, the federal CADD-GIS Tech Ctr, and NOAA's NGS.





## PROJECT JUSTIFICATION

This section formulates justification for the e-ALP project through a listing of goals, objectives, drivers, and benefits. The goals are general major purposes towards which this endeavor is directed. The objectives are specific quantifiable tasks which this pilot project is set to accomplish. The drivers are regulation-based requirements towards which the e-ALP will help the FAA and airport owners achieve compliance. Finally, the benefits of the e-ALP are additional improvements advantageous to the FAA.

### Goals:

- (G1) Improve communication, coordination, and collaboration between the FAA and airport owners during an era of “mega” Airport Capital Improvement Projects (ACIP) nation-wide.
- (G2) Expedite ALP change coordination while improving thorough flight safety obstruction analysis.
- (G3) Increase flight safety in the aerodrome including reduction of runway incursions due to construction projects.
- (G4) Introduce GIS as a critical enabling COTS technology for FAA business process improvement and NAS upgrade.

### Objectives:

- (O1) Demonstrate capability to lower ALP change/update process costs by 50%.
- (O2) Demonstrate capability to Reduce ALP change approval coordination time by 75%.
- (O3) Demonstrate how to electronically store and exchange ALP information using an open architecture spatial database which is compatible with non-CADD-based web-enabled systems and upcoming NAS subsystems.
- (O4) Test and enhance the Federal CADD-GIS Technology Center’s Spatial Data Standard (SDS) using the e-ALP database for FAA adoption, and provide corresponding recommended revisions to Advisory Circular (AC) 150/5300-13 Appendices 6, 7, and 15.
- (O5) Setup a demonstration e-ALP web server and user interface for FAA-Airport configuration management and information mapping, using cost-effective and secure web technology (comparable in usefulness to

<http://www.mapquest.com/> and other internet-based business information collaboration tools).

- (O6) Test e-ALP prototype with data from a large-hub airport (Orlando International Airport) and a small joint-use military-civilian airport (Eglin AFB – Okaloosa Airport), demonstrating business process improvement for FAA and airport owners with ALP changes and updates, corresponding flight safety obstruction analysis review and approval, Exhibit-A property ownership updates, and ACIP information mapping with linkage to NPIAS.

Drivers:

- (D1) AIP requirements for continual ALP updates (Order 5100.38A).
- (D2) Federal Geospatial Data Consortium (FGDC) metadata requirements.
- (D3) New international airport mapping standard (RTCA#193).
- (D4) Testing and revising of federal GIS standards for use by FAA (SDS 2.1).
- (D5) Update of Airport Design Advisory Circular (AC 150/5300-13) Appendices 6, 7, and 15.
- (D6) Government Accounting Standards Board (GASB)-34 requirement for facilities inventory using GIS.

Benefits:

- (B1) Improved coordination between ATCT and airport construction projects.
- (B2) Reduction of redundant airport NOTAMs and improved airport NOTAM tracking.
- (B3) Improved ALP data quality and trace-ability via regimented metadata.
- (B4) Improvement of Three Dimensional Airspace Analysis Program (3DAAP) upgrade/improvement via user-friendly web interface for FAA reviews.
- (B5) Improvement of Airways Facilities Airport System (AS) and Air Traffic's Obstruction Evaluation – Airport Airspace Analysis (OE-AAA) System via links to ALP database.
- (B6) Improved airport data access mechanism for NAS.
- (B7) Improved tracking and control of airfield adjacent wildlife attractants (i.e., water bodies).
- (B8) Improved airport data for Part-139 certification.
- (B9) Improved airfield pavement condition management.