

FIDS & FAS

Flight Information Display & Announcement System

Presented by ACAES Team

TABLE OF CONTENTS


Revision History.....	3
Document approval.....	4
acronyms and abbreviations.....	5
1 Introduction.....	6
1.1 Purpose.....	6
1.2 Document Conventions	6
1.3 Intended Audience and Reading Suggestions.....	6
1.4 Product Scope.....	6
2 Overall Description	8
2.1 Product Perspective.....	8
2.2 Product Functions	9
2.3 User Classes and Characteristics	9
2.4 Operating Environment	10
2.5 Design and Implementation Constraints	12
2.6 User Documentation.....	12
2.7 Assumptions and Dependencies.....	12
3 External Interface Requirements	13
3.1 User Interfaces.....	13
3.2 Hardware Interfaces	13
3.3 Software Interfaces	13
3.4 Communications interfaces	13
4 System Features	14
4.1 Flights schedule	14
4.1.1 Description and Priority.....	14
4.1.2 Stimulus/Response Sequences	14
4.1.3 Functional Requirements	14
4.2 Flights Announcement.....	15
4.1.1 Description and Priority.....	15
4.1.2 Stimulus/Response Sequences	15
4.1.3 Functional Requirements	15
5 Other Nonfunctional Requirements.....	16
5.1 Performance Requirements	16
5.2 Safety Requirements	16
5.3 Security Requirements.....	16

5.4	Software Quality Attributes.....	17
5.4.1	Availability.....	17
5.4.2	Usability.....	17
5.5	Business Rules.....	17
6	Other Requirements.....	18
6.1	Maintenance.....	18
6.2	Documentation.....	18
6.3	Usability.....	18
6.4	Transferability.....	18
6.5	System Use and Dissemination Rights.....	18
	References.....	19

REVISION HISTORY

Name	Date	Revision Description	Version
Mirwais Farahi	June 22, 2021		Version 1.0
Mirwais Farahi	July 01, 2021		Version 1.1

DOCUMENT APPROVAL

Signature	Printed Name	Title	Date
	Augustin Adizen	HKIA Technical Deputy	07, 07, 2021

ACRONYMS AND ABBREVIATIONS

The following table describes the abbreviation and acronym used throughout this Software Requirements Specification.

Abbreviation	Meaning
USAID	U.S. Agency for International Development
ACAA	Afghanistan Civil Aviation Authority
ACAE	Afghanistan Civil Aviation Enterprise Solution
FIDS	Flight Information Display System
FAS	Flight Announcement System
SRS	Software Requirements Specification
DSS	Data Storage System
HTTPS	Hypertext Transfer Protocol Secure
FTP	File Transfer Protocol
SSL	Secure Sockets Layer
IATA	International Air Transport Authority
AODB	Airport Operational Database
HKIA	Hamid Karzai International Airport

I INTRODUCTION

I.1 PURPOSE

The purpose of this document is to describe the Software Requirements Specifications (SRS) for the Flight Information Display System (FIDS) and Flight Announcement System (FAS) within the context of Afghanistan Civil Aviation Enterprise Solution (ACAES) for Afghanistan Civil Aviation Authority (ACAA) supported by USAID. The information of this SRS document is collected from flight announce department. The main purpose of this document is to work as a guideline to develop and implement FIDS and FAS that fulfills all the organization requirements. Furthermore, it will illustrate system constraints, interface, and interactions with other external applications. The document is also intended to be proposed to the business owners and involved departments of ACAA for their approval and is a reference for developing the first version of the system for the development team.

I.2 DOCUMENT CONVENTIONS

The SRS document uses few different font sizes for clear distinction. In addition, main headings are numbered with whole numbers like 1. Introduction, 2. Overall Description. The subheadings are numbered with decimals like 1.1 Purpose, 1.2 Document Conventions.

I.3 INTENDED AUDIENCE AND READING SUGGESTIONS

The document is intended to be read by ACAA directors, head of ACAA departments, managers of ACAA departments, project managers, developers, testers, users, and documentation writers. The document is organized into 5 parts as 1. Introduction, 2. Overall Description, 3. External Interface Requirements, 4. System Features, 5. Other Nonfunctional Requirements, and 6. Other Requirements. All the parts are independent but reading the whole file in a sequential manner helps the reader to understand well the Flight Information Display System.

I.4 PRODUCT SCOPE

The ACAA flight announce department is receiving manually flight information in advance for display purpose. The flight information is entered to the database system by the ACAA's staff. The entries to the database needs to be accurate according to the airline shared report for flight schedules. The ACAA needs to handle every airline schedule data which needs high efforts, and it is time-consuming. In addition, there is also concern for the validity and accuracy of data that is added to the database by flight announcement department.

To address all above problems, there must be an automated Flight Information Display System that handle flight schedules. The data shared from airlines for flight schedules should be added to the database automatically through integration or pushing an excel sheet to the system. The Airlines should be capable to update the scheduled time for arrival and departure if there is a delay. The Announcement Department of ACAA should be capable to view the schedules for upcoming flights and there should be no manual entries for flight schedules to the system.

FIDS is a module of Enterprise Software Solution for ACAA. It is web-based application for flight displays across all the airports of Afghanistan. Its main purpose will be to automate the movement of data from Airline to the Announcement Department and brings transparency, accuracy, and efficiency, reduce errors and timely update the flight schedules for flight delays and changes. In addition, the system will assist the Announcement Department to generate various kinds of reports.

Flight Announcement System (FAS) is also considered in the scope of this SRS. It is a platform in which the FIDS data will be shared for announcement. FAS is used to communicate with people present on the airport. Using FAS, announcements and messages can be shared to people all around the airport at the right time and place.

The functionality and Scope of the system is as follows: -

- i. To automatically share flights schedule information to ACAA
- ii. Data capture and validation.
- iii. Integration with Flight Announcement System (FAS).
- iv. Integration with the Airline System.
- v. To generate reports.

2 OVERALL DESCRIPTION

This section provides an overall description of the whole system. The basic functionality of the system and interaction with other systems will be explained. Furthermore, describes various types of users that will use the system and available functionality for each type of user. Finally, the constraints and assumptions for the system will be presented.

2.1 PRODUCT PERSPECTIVE

This system will consist of two parts: one client web portal and one management web portal. The client web portal will be used to share daily flight plan by the Airline, while the management web portal will be used for managing the information about the flights schedules, assigning check-in counters departure flights, assigning baggage conveyor for arrived flights, defining gate number for flights and overall system management.

The Flight Information Display System will be a module of ACAE solution for ACAA. Figure 1 shows the major components of the overall system, and other system interactions to the system.

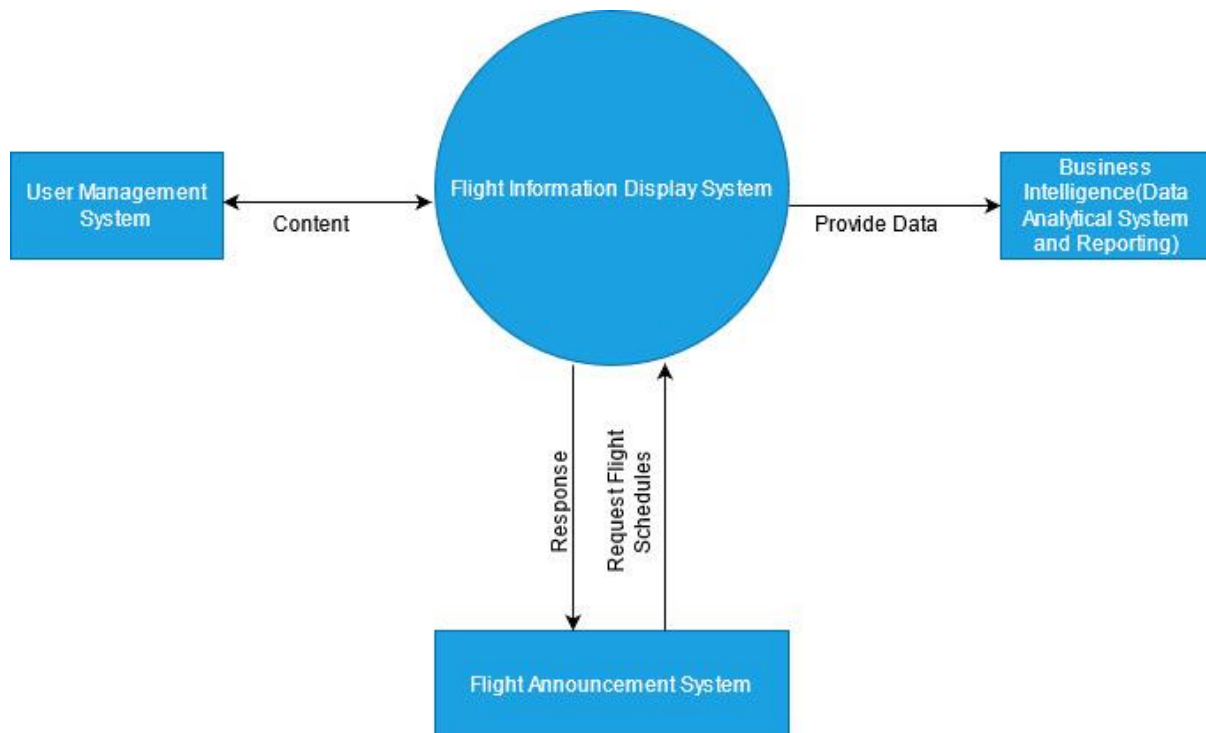


Figure 1: FIDS Context Diagram

The system is using a central Airport Operational Database (AODB) to store the data. Both the client and management web portals will communicate with the database. The client web portal will use the database to send flight schedules for display and announcement while management web portal will view and modify data. All the database communication will go over the Internet.

The following list shows the main functionalities of system: -

- To Receive daily flight plan from the airline.
- Data capture and validation.
- Integration with FAS.

- To display flight gate information (Boarding flight information including next flight).
- Display Flight Check-in information (economy/business/all flights).
- Display Baggage belt or Conveyor for an arrival flight.
- Archived flights directory.
- To generate reports.
- Restrict and allow user control based on standards and policy of ACAA.

2.2 PRODUCT FUNCTIONS

FIDS is a standalone system that provides functionality described in the Product functions section. It includes automatically receiving flights schedules, modification of flight schedules (for delay flights, canceled flights, adding remarks), updating flight status for boarding and next flight, assigning check-in counter, assigning baggage conveyor and other features such as archived flights directory and report generation to fulfill software requirements. In addition, FIDS has interfaces to the external system, such as Flight Announcement System, and Business Intelligence System.

The Flight Announcement System is explained in this SRS which is considered as a module for FIDS. Any detailed definition of other external system is out of the scope of this document. Figure 2 shows the decomposition of FIDS on the functionality area and supported external systems.

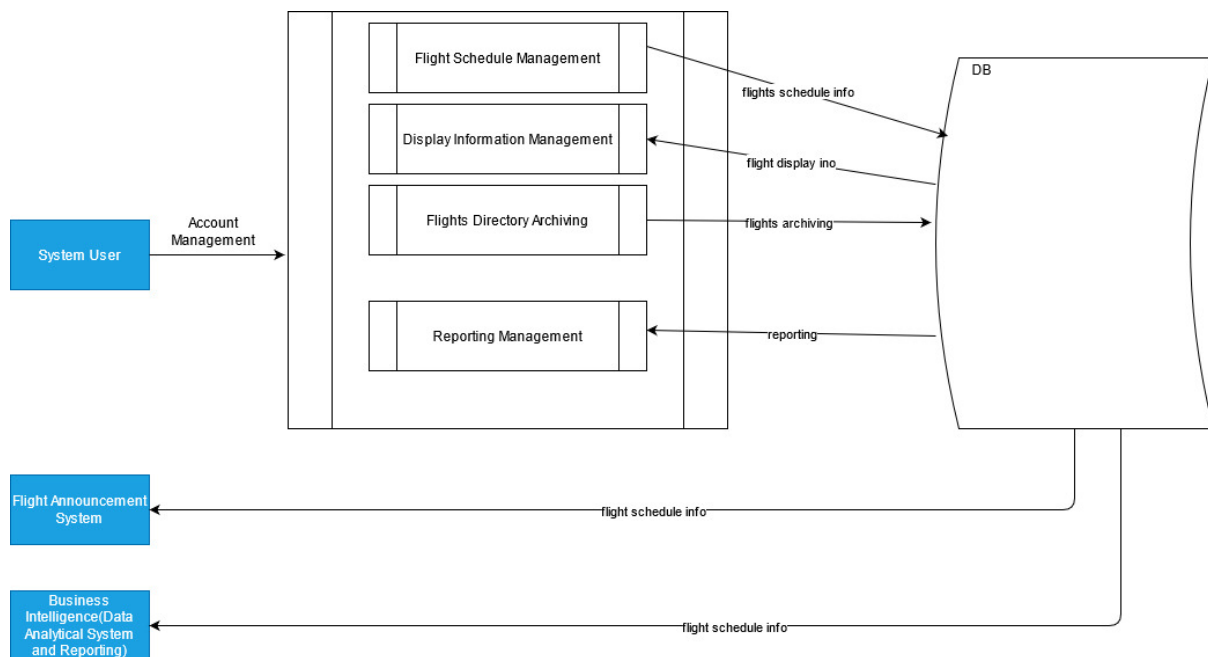


Figure 2: FIDS Data Flow Diagram

It is required to have a Data Storage System (DSS) for FIDS and all other external systems. FIDS stores all the information and data in the DSS and the connection between FIDS and DSS shall be made through standard interface (ADO .NET and Entity Framework).

2.3 USER CLASSES AND CHARACTERISTICS

There are two types of users to access and use the system. The users are defined as follows: -

- ACAA Staff:** The employees account will be used to view flight schedules, modify details and add check-in counter number, gate number, baggage conveyor number and other details.

- ii. **Administrators:** They are managing the overall system so there is no incorrect information within it. The level of access for administrators shall be defined as system super admins and admins. The super admins are responsible for managing all database users, taking backup, restoring recovery, maintaining the system and there is no system access level restrictions for them. The admins are responsible to create other system users and validate the data of system based on their access level.

2.4 OPERATING ENVIRONMENT

The following hardware and software components are required for FIDS: -

i. Hardware Components

a. Server Side

- Linux Based Server: Two Linux Centos Servers
 - 1) First Servers: for running the ERP
 - Operating System: Linux Centos
 - Model: DELL EMC R940xa
 - Ram at least: 8GB*8 = 64GB or 8GB*16= 128GB
 - Ram Type: DDR3
 - Processors: Core i7(at least 7th generation)
 - Internet Bandwidth: 10Mbps
 - SSL Certificates
 - Yearly Operating System License fee: NO
 - SQL server License: YES (have to calculate)
 - Storage: 10 TB
 - 2) Second Server: for taking backup or use a secondary point to keep the system up and running.
 - Operating System: Linux Centos
 - Model: DELL EMC R940xa
 - Ram at least: 8GB*8 = 64GB or 8GB*16= 128GB
 - Ram Type: DDR3
 - Processors: Core i7(at least 7th generation)
 - Internet Bandwidth: 10Mbps
 - SSL Certificates
 - Yearly Operating System License fee: NO
 - SQL server License: YES (have to calculate)
 - Storage: 10 TB
- Windows Based Server: Two dedicated Windows 2016 servers
 - 1) First Server: for running the ERP
 - Operating System: Windows
 - Model: DELL EMC R940xa
 - Ram at least: 8GB*8 = 64GB or 8GB*16= 128GB
 - Ram Type: DDR3
 - Processors: Core i7(at least 7th generation)
 - Internet Bandwidth: 10Mbps
 - SSL Certificates

- Yearly Operating System License fee: YES
 - SQL server License: YES (have to calculate)
 - Storage: 10 TB
- 2) Second Server: for taking backup or use a secondary point to keep the system up and running.
- Operating System: Windows
 - Model: DELL EMC R940xa
 - Ram at least: 8GB*8 = 64GB or 8GB*16= 128GB
 - Ram Type: DDR3
 - Processors: Core i7(at least 7th generation)
 - Internet Bandwidth: 10Mbps
 - SSL Certificates
 - Yearly Operating System License fee: YES
 - SQL server License: YES (have to calculate)
 - Storage: 10 TB

b. Client Side

- Code i3 Laptop or Desktop with 4GB Ram or higher version

ii. Software Components

a. Server side

- Ubuntu Server or Windows Server 2016 or higher version
- Docker server or Apache server
- Dot Net Framework 5 or higher version
- Visual Studio Software: Visual Studio is an integrated development environment for writing, compiling, and debugging the C# .NET code.
- SQL Server 2019: SQL Server to create and maintain database records of the system.
- SQL Server Management Studio: It is a software application first launched with Microsoft SQL Server 2005 that is used for configuring, managing, and administering all components within Microsoft SQL Server.
- NodeJS: Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that runs on the V8 engine and executes JavaScript code outside a web browser.
- Git: Git is software for tracking changes in any set of files, usually used for coordinating work among programmers collaboratively developing source code during software development.
- Microsoft IIS Web Server and Apache Web server to deliver HTML content to the system users.
-

b. Client Side

- Close source (windows 7, 8, 10) or open source (Ubuntu, Linux) operating system.
- Web browser (Mozilla Firefox, Google chrome, Internet explorer) latest version
- Internet connectivity

2.5 DESIGN AND IMPLEMENTATION CONSTRAINTS

- The information of all users, flight schedules, check-in counter, gate information, and baggage conveyor details must be stored in database.
- Microsoft .NET technologies will be used for development and SQL Server will be used as an engine and database.
- FIDS is a web-based system, and it must be running 24 hours a day.
- Users may access from any computer that has browser and Internet connection.
- Users must have their correct usernames and passwords to enter their online accounts and do activities.
- The ACAA Software and Information Technology Technical staff will be responsible to maintain the delivered system.

2.6 USER DOCUMENTATION

User Manual Guide: A guideline for new users on how to use the FIDS. This guide outlines the best practices for training a new user to use the system appropriately. In addition, training programs will be provided for the system users.

Technical Manual Guide: Technical manual document will be used by technical staff of ACAA for the system maintenance. Moreover, training sessions will be conducted for the technical staff.

2.7 ASSUMPTIONS AND DEPENDENCIES

It is assumed that the FIDS system will work correctly with windows and Linux operating systems environments.

The following dependencies shall be there after system implementation in ACAA: -

- Agreement and support from senior management in other to use system.
- ACAA staff in various departments must have Computer in their office to use system.
- Network infrastructure must there to provide connectivity from end user to sever.
- ACAA staff should know the usage of FIDS to store daily data related to flight schedules and manage the data.

3 EXTERNAL INTERFACE REQUIREMENTS

3.1 USER INTERFACES

The users will interact with FIDS through a web-based interface. There shall be a friendly user interface for non-technical and technical users. In addition, an error web page will be used for unexpected system operations stating the cause of the error.

3.2 HARDWARE INTERFACES

The FIDS is a web application, and for normal function of the system, it needs to interact with a Web server, Database server, Storage server, and required hardware to support operating system in server computer.

3.3 SOFTWARE INTERFACES

The Flight Information Display System is a web-based system where it consists of client-web portal and management web-portal for ACAA's business holders and ACAA's employees, respectively. The client-web portal connects with the database to flight schedules. The communication between the database and the database-web portal consists of operation concerning managing flight schedules, check-in counter, gate number and baggage conveyor and other required details.

3.4 COMMUNICATIONS INTERFACES

The architecture for communication shall follow the client-server model. The communication between client and server shall be maintained using a REST compliant web service and must be served over HTTPS protocol and the communication must be stateless. The FTP protocol shall be used to transfer files between client and server.

4 SYSTEM FEATURES

This section of the SRS describes requirements for the system's features.

4.1 FLIGHTS SCHEDULE

4.1.1 Description and Priority

The flights schedule is shared by the Airline to the Flight Announcement Department one or two days prior to the flight, Flight schedule shall be shared using integration with the Airline system for upcoming flights.

4.1.2 Stimulus/Response Sequences

- Stimulus: Airline system shall share the flight schedules data through API.
- Response: System saves the data to the database.
- Stimulus: ACAA Announcement department request to view the scheduled flights of the day.
- Response: System displays the flight schedules for departure and arrival flights.
- Stimulus: ACAA Announcement request to assign check-in counter, change flight status, gate number and baggage conveyor for departure and arrival flights.
- Response: System saves the updates to the database.
- Stimulus: ACAA Announcement request to archive the completed flights.
- Response: System archive the flights.

4.1.3 Functional Requirements

- REQ: -1. Airline should be able to update flight schedule information.
- REQ: -2. ACAA Announcement department should be able to display flight gate information including boarding flight and next flights.
- REQ: -3. ACAA Announcement should be able to modify flight schedule information.
- REQ: -4. Completed flights archiving should be carried out by Announcement department.
- REQ: -5. There are various status for flights that must be handled, such as Scheduled (Flight is not airborne: Departure and arrival times are according to airline's schedule), Delayed (Flight will depart 15 or more minutes after its scheduled departure time), Departed (Flight has left the departure gate but may not be airborne yet), In Air (Flight is airborne: Takeoff time is actual takeoff or "wheels up" time and the arrival time is estimated and real-time map is available), Diverted (Flight has been diverted from its scheduled destination to a different location), Landed (Flight has landed and the landing time is actual touchdown or "wheels down."), Arrived (Flight has arrived at its destination gate) and Cancelled (Flight has been cancelled).
- REQ: -6. The gate numbers should be handled by the system and check-in counter should be assigned for a particular flight by ACAA Announcement.
- REQ: -7. System should generate reports of scheduled flights.

4.2 FLIGHTS ANNOUNCEMENT

4.1.1 Description and Priority

The data from FIDS will be shared with the Automatic Flight Announcement System (FAS). FAS will be used for automatic announcement of information about scheduled, non-scheduled, arrival and departure of flights, security checks or any other announcement. The system should work in three modes, as such fully automatic mode where no user intervention required, Semi-automatic mode in which the operator makes amendment to the queued message after receiving the information from the FIDS, and Manual mode where the operator strings messages from terminal and sends for the announcement.

4.1.2 Stimulus/Response Sequences

- Stimulus: ACAA FIDS sends the scheduled, non-scheduled, arrival and departure of flights, security checks or any other announcement.
- Response: FAS system receives the data and push the data string in the queue for announcement.
- Stimulus: ACAA Announcement department request to makes amendment to the queued message after receiving the information from the FIDS.
- Response: System apply the requested changes and announce them accordingly.
- Stimulus: ACAA Announcement sends the emergency or other information messages to the system.
- Response: System announce the messages.

4.1.3 Functional Requirements

- REQ: -8. System should be capable for simultaneous announcements that will help in zone-based communication.
- REQ: -9. System should be able to communicate in multiple languages including local and international languages.
- REQ: -10. ACAA Flight Announcement department should be able to manage the sequences for messages display such as add new message to the queue, update a message, delete a message and add other emergency messages.
- REQ: -11. ACAA Flight Announcement department should be able to pause sequences that are set for automatic playback.
- REQ: -12. ACAA Flight Announcement department should be able to replay any message in the sequence.
- REQ: -13. ACAA Flight Announcement department should be able to skip any message in the sequence.

5 OTHER NONFUNCTIONAL REQUIREMENTS

5.1 PERFORMANCE REQUIREMENTS

Flight Information Display System must be interactive and there must be less delays in each action-response of the system. There should be low delay in performance and below 2 seconds while opening the forms, saving the filled forms, popping of error messages, saving the sessions or settings, generating reports, and displaying the data.

5.2 SAFETY REQUIREMENTS

Information should be securely transmitted to the server without any changes. The system must secure the sensitive data. In addition, to improve the performance, the data should be divided into sensitive data and insensitive data. The insensitive data can be retrieved rapidly, and the sensitive data is encrypted/ decrypted using Encryption algorithms. Moreover, the following safety and protection should be considered: -

- User should be prevented, to the extent possible, from entering wrong data. Such as:
 - No letter should be inserted on numeric fields.
 - System should pop up a proper message if sensitive information is not entered.
- System should only be able to upload files in Excel, PDF, JPG format, and file with EXE and BAT formats should be prevented.
- User should enter his password after the first log in.
- System should prevent accepting simple password.

5.3 SECURITY REQUIREMENTS

There must be proper security mechanism for the system to avoid possible hacking of the system. The following web security practices should be considered in the development phase.

- Sanitize inputs at the client-side and server-side.
- Encode request/response.
- Use HTTPS for domain entries.
- Use only current encryption and hashing algorithms.
- Do not allow for directory listing.
- Do not store sensitive data inside cookies.
- Check the randomness of the session.
- Set secure and HttpOnly flags in cookies.
- Use TLS not SSL.
- Set strong password policy.
- Do not store sensitive information in a form's hidden fields.
- Verify file upload functionality.
- Set secure response headers.
- Make sure third-party libraries are secured.
- Hide web server information.

In addition,

- Different and adequate system access levels should be defined.

- Different users such as director, manager, employee, and other officials should have special access to the system.
- System data should be accessed to users in a safe way and only based on rights.
- All log in steps and processes should be carried out under SSL protocol in an encrypted manner.
- Users' personal data should be stored on an exclusive server in an encrypted and protected way.

5.4 SOFTWARE QUALITY ATTRIBUTES

5.4.1 Availability

While saving the information or uploading the files to the system in case the internet service gets disrupted, the information or files can be saved again.

5.4.2 Usability

The system should be easy to handle and should operates in the most expected way with no delays. In addition, it should perform according to needs and transverse quickly between its states.

5.5 BUSINESS RULES

The ACAA top management and employees must have access to the system according to their duties and responsibilities. The ACAA policies and regulations must be considered while defining access levels for the ACAA staff. In addition, the airlines should be provided an account as a user to add flight schedules for their upcoming flights. Hence, there are three types of users to the FIDS, such as super admins who are having access to the whole system and system configuration, admins who are the top management of ACAA, user accounts for ACAA staff and user accounts for airlines.

6 OTHER REQUIREMENTS

6.1 MAINTENANCE

- Software should be developed in a standard way.
- Clarity and readability of source code should be preserved.
- Technical documents about system development should be provided to ACAA.

6.2 DOCUMENTATION

- In addition to given project, all documents should be delivered written.
- After project delivery, online back-up will kick start.
- A CD containing all information about system capabilities along with step-by-step approach will be delivered.

6.3 USABILITY

- System should be developed as generally expected with learning facilitation.
- System should instruct user to undertake different functions of the system.

6.4 TRANSFERABILITY

- Users and system data should be stored in a central room at ACAA using the software; and connection to central database will be possible by installing system on another server.

6.5 SYSTEM USE AND DISSEMINATION RIGHTS

- The system will be designed to be used by ACAA and four international airports of Afghanistan. All its rights will be reserved for ACAA, and no other person or agency will have commercial rights or system code to the system. ACAA has the right to change the code and project structure, after it is delivered.

REFERENCES

- i. Handoyo, Eko, R. Rizal Isnantoa, and Mikhail Anachiva Sonda. "SRS Document Proposal Analysis on the Design of Management Information Systems According to IEEE STD 830-1998." *Procedia-Social and Behavioral Sciences* 67 (2012): 123-134.
- ii. Ali, Syed Waqas, Qazi Arbab Ahmed, and Imran Shafi. "Process to enhance the quality of software requirement specification document." *2018 International Conference on Engineering and Emerging Technologies (ICEET)*. IEEE, 2018.
- iii. Elliott Sr, Robert A., and Edward B. Allen. "A methodology for creating an IEEE standard 830-1998 software requirements specification document." *Journal of Computing Sciences in Colleges* 29.2 (2013): 123-131.
- iv. Afghanistan Civil Aviation Regulation | Civil Aviation Authority of Afghanistan 2017 'http://acaa.gov.af/wp-content/uploads/2019/12/ACAR-Part-01-Rev.-3.0_150811.pdf'
- v. Afghanistan Civil Aviation Regulation | Civil Aviation Authority of Afghanistan 2017 'https://acaa.gov.af/wp-content/uploads/2019/12/ACAR-Part-02-Rev.-3.0_151014.pdf'
- vi. Afghanistan Civil Aviation Regulation | Civil Aviation Authority of Afghanistan 2017 'http://acaa.gov.af/wp-content/uploads/2019/12/ACAR-Part-04-Rev.-3.0_151014.pdf'
- vii. Afghanistan Civil Aviation Regulation | Civil Aviation Authority of Afghanistan 2017 'https://acaa.gov.af/wp-content/uploads/2019/12/ACAR-Part-05-Rev.-3.0_151014.pdf'
- viii. Afghanistan Civil Aviation Regulation | Civil Aviation Authority of Afghanistan. 2017 'https://acaa.gov.af/wp-content/uploads/2019/12/ACAR-Part-09-Rev.-3.0_150812.pdf'
- ix. Afghanistan Civil Aviation Regulation | Civil Aviation Authority of Afghanistan 2017 'http://acaa.gov.af/wp-content/uploads/2019/12/ACAR-Part-10-Rev.-3.0_151014.pdf'

Appendix A: Analysis Models

I. Entity Relationship Diagram

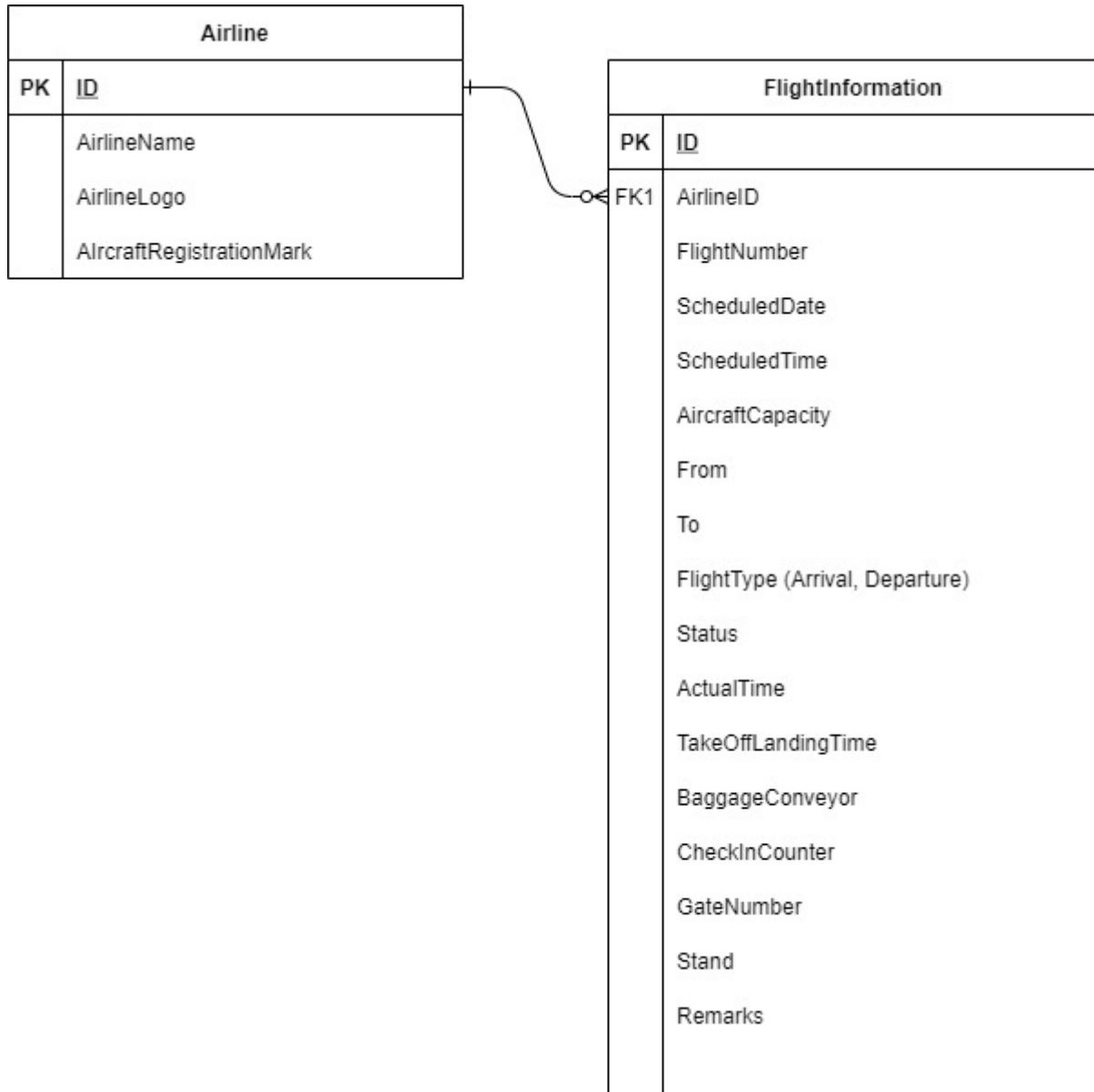


Figure 3: FIDS Entity Relationship Diagram

