

A.ÖNAL

IMPLEMENTING A WEB-BASED APPLICATION
AND
DESIGNING DATABASE FOR TURKISH AIRPORT
OPERATIONAL DATABASE (AODB)

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ÇANKAYA UNIVERSITY

FEBRUARY, 2019

IMPLEMENTING A WEB-BASED APPLICATION
AND
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DATABASE (AODB)

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

OF
CANKAYA UNIVERSITY

BY
ALATTİN ÖNAL

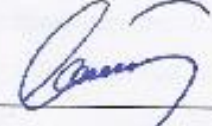
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
COMPUTER ENGINEERING

FEBRUARY, 2019

Title of the Thesis : **Implementing a Web-Based Application and Designing Database for Turkish Airport Operational Database (AODB)**

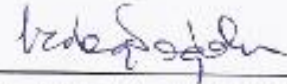
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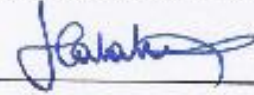
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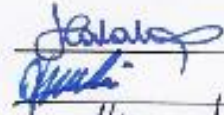
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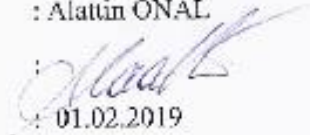
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ACKNOWLEDGMENTS

I wish to express my deepest gratitude to my supervisor Assoc. Prof. Dr. Hadi Hakan MARAŞ for his guidance, advice, criticism, encouragements and insight through the research.



ABSTRACT

IMPLEMENTING A WEB-BASED APPLICATION AND DESIGNING DATABASE FOR TURKISH AIRPORT OPERATIONAL DATABASE (AODB)

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February 2019, 33 pages

This study is designed to be a guide for designing an Airport Operational Database (AODB) and developing Web-based applications using AODB. The purpose of the study is to give background information about Operations in an Airport, how these operations are connected to each other, to guide how an AODB is designed, to show how to develop a Web-base AODB application step by step, to show the importance of AODB and its applications for Collaborative Decision Making (CDM) applications, and to analyze the benefits of AODB applications to airport operations. This study also provides an example application on AODB.

Keywords: AODB, CDM, Airport Operations

ÖZ

TÜRK HAVALİMANI OPERASYONEL VERİTABANI İÇİN VERİTABANI TASARLANMASI VE WEB-TABANLI UYGULAMA GELİŞTİRİLMESİ

ÖNAL, Alattin

Yüksek Lisans, Bilgisayar Mühendisliği Anabilim Dalı

Tez Yöneticisi: Doç. Dr. Hadi Hakan MARAŞ

Şubat 2019, 33 sayfa

Bu çalışma, Havaalanı Operasyonel Veritabanının (AODB) tasarlanması ve bu veritabanını kullanan Web tabanlı uygulamalar geliştirilmesi konusunda bir kılavuz olması için tasarlanmıştır. Bu çalışmanın temel amacı, bir havaalanındaki operasyonlar ile ilgili temel bilgileri sunmak, bu operasyonların birbirleriyle olan ilişkilerini göstermek, AODB'nin nasıl tasarlanacağını göstermek, Web tabanlı bir AODB uygulamasının nasıl geliştirileceğini adım adım göstermek, AODB ve AODB uygulamalarının Birlikte Karar Alma (CDM) uygulamaları için olan önemini göstermek ve AODB uygulamalarının havaalanı operasyonları için faydalarını analiz etmektir. Bu çalışmada ayrıca örnek bir AODB uygulaması da sunulmuştur.

Anahtar Kelimeler: AODB, CDM, Havaalanı Operasyonları

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LIST OF SYMBOLS/ABBREVIATIONS

A-CDM	: Airport Collaborative Decision Making
AODB	: Airport Operational Database
DHMI	: Devlet Hava Meydanları İşletmesi
ICAO	: International Civil Aviation Organization
IATA	: International Air Transport Association
FIR	: Flight Information Region
ATC	: Air Traffic Control
FDPS	: Flight Data Processing System

CHAPTER 1

INTRODUCTION

An airport is an aerodrome with facilities, buildings, a runway and related units for aircrafts to take off and land. An airport also contains maintenance units, vehicles for passenger and cargo carriage. There are also Air Navigation Aids Systems such as Localizer, Distance Measurement Equipment and Instrument Landing System for aircrafts to take-off and land securely.

An airport consists of a landing area, which comprises an aerially accessible open space including at least one operationally active surface such as a runway for a plane to take off or a helipad, and often includes adjacent utility buildings such as control towers, hangars and terminals. An international airport has additional facilities for customs and passenger controls. [1].

The purpose of an airport is to provide high quality terminal buildings, passenger services, management and operations. The reasons are:

- To handle the passengers traffic flows effectively,
- To provide a quality experience for customers,
- To provide maximum safety for air traffics

The airport is managed by an airport operator. There are also Ground Handlers, Airline Companies, etc. in an airport. In Turkey, some of the airports such as Istanbul Ataturk Airport and Ankara Esenboğa Airport are operated by private companies. But these private companies only operate the terminal area.

The navigations services are held by Air Traffic Control Unit. Aircraft Ground Handling companies services aircrafts while they are on the ground and parked at a terminal gate at the airport.

All of the companies in an airport have their own services for aircrafts and passengers. This makes the information about a flight is created by different companies. Hence, this information has to be united for effective flight management. This situation makes Airport Operational Database (AODB) and its applications vital for all operations in an airport.

There are 55 airport in Turkey and the management of these airports has to be centralized. So, AODB has to contain information about all operations in these airports. It also has to deliver maximum efficiency. All operational data management activities should be stored in AODB. The information is derived from ATC-Tower, Ramp/Airfield and Terminal.

All over the world, almost every airport uses an AODB. Collecting and processing data of an airport is very important for airports and airport operators design their own AODB for their needs. My AODB and my application are similar to those used in other countries but there are some differences. My AODB application can run on different databases such as Oracle and MSSQL because i use Entity Framework in my application and it can work on any relational database.

In this study, we first present the information about airport and operations in an airport. Then, we introduce details of the development process of AODB for centralized management of multiple terminals and airports. We also give the details of the development process of Web-based AODB application. Finally, in the conclusion part, we present future recommendations for future studies.

CHAPTER 2

AIRPORT, AIRPORT OPERATOR AND AIRPORT OPERATIONS

2.1 What is an airport?

An airport is a station that consists of buildings and airfields used to house and provide runways for airplanes. [2] Figure 2.1 shows a visual of an airport.

Navigation towers at airports to help aircrafts to land and take off of runways. There are also passenger terminals at an airport to load onto and unload from aircrafts. In Figure 2.2, all airports in Turkey are illustrated.



Figure 2.1: An Airport

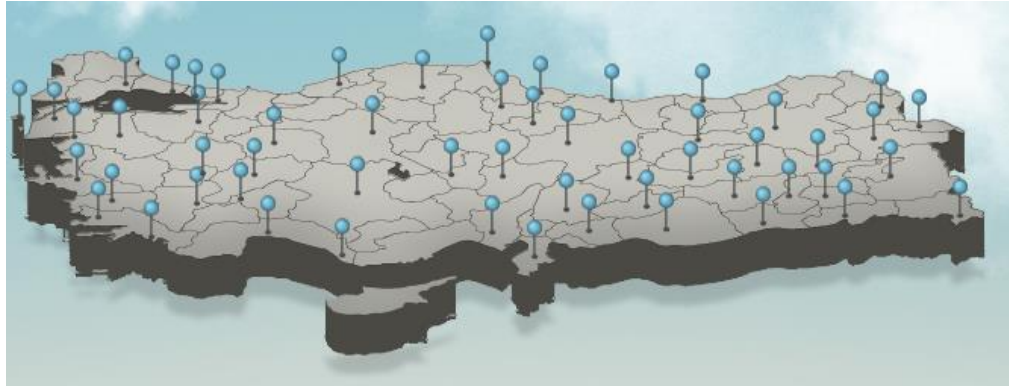


Figure 2.2: Airports in Turkey

2.2 What is an airport operator?

An airport operator is an organization responsible for the direction and management of one or more airports. The airport operator manages the passenger terminal and airfield. It also maintains facilities in an airport. It also provides ground transportation and security.

2.3 Structures of an Airport

2.3.1 Runway

A Runway is a defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. [3] A runway is shown in Figure 2.3.

It may be made by asphalt or concrete, or a natural surface like grass or salt. Runways are named by a number between 01 and 36. It is because of the magnetic azimuth of the runway's heading in decades. [4]

For example, in Istanbul Ataturk Airport, there are three runways:

- 17L/35R and its surface is concrete
- 17R/35L and its surface is concrete
- 05/23 and its surface is asphalt



Figure 2.3: A Runway

2.3.2 Control Tower

A control tower in an airport give information and clearances to aircrafts under their control to provide a safe flow of air traffic. It prevents collisions of aircrafts. Air traffic controllers work in a control tower to handle this air traffic without any problem.

A control tower provides services to private and commercial air traffic. There are some airports which military aircrafts also use and the control tower also provides services to military aircrafts in these airports. Figure 2.4 shows a visual of a tower in Turkey.

The control tower primarily controls air traffic with visual observation. Air traffic controllers control the movements of the aircrafts and vehicles operating on the taxiways and runways. They also controls the aircrafts in the air near the airport.



Figure 2.4: A Control Tower

2.3.3 Terminal Buildings

An **airport terminal** is a building at an airport where passengers transfer between ground transportation and the facilities that allow them to board and disembark from aircraft. [5]

In a terminal, passengers buy tickets, transfer their luggage and board on an aircraft. After a departure, passengers get off an aircraft and get their luggage in the terminal building. Figure 2.5 shows an airport terminal.



Figure 2.5: An Airport Terminal

2.3.4 Aircraft Hangars and Repair Facilities

Aircraft hangars are places for aircrafts to park on an airport. Before and after a flight, an aircraft is parked in a hangar. The aircraft is controlled and checked about a technical issues or something else before the next flight. If there is a problem about the aircraft, it is pulled in to repair facilities to be checked and repaired by aircraft technicians. Structure of an airport is illustrated in Figure 2.6.

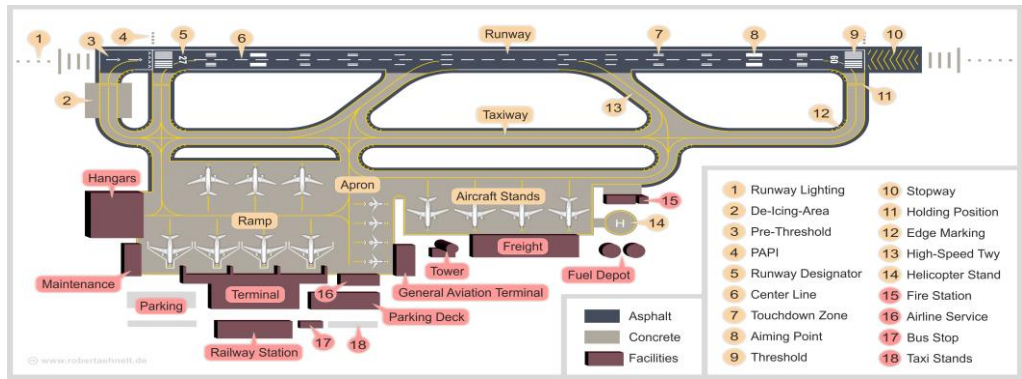


Figure 2.6: Structure of An Airport



CHAPTER 3

AIRPORT OPERATIONAL DATABASE (AODB)

3.1 What is AODB?

The Airport Operational Database (AODB) is the "Airport Information Center" and is the central database or repository for all operative systems and provides all flight-related data accurately and efficiently in a real-time environment.

The AODB takes account of the different information requirements of the various users. For example, the System supplies specific information to airport personnel in the various departments, to airlines, passengers, visitors and authorities operating at the airport, such as customs and police. The AODB Flight Schedule Processing module enables smooth processing of flight schedules and their augmentation with all flight-event relevant information. The AODB supports all scheduling and operative processes, ranging from the automatic transfer of the Seasonal Flight Schedule data, the generation of Daily Flight Schedules to the processing and provision of billing data. [6]

AODB solution provides one central repository for all operational data; ensuring airport staff, customers such as airlines and handlers, and ultimately the passenger have timely and accurate information. A centralised architecture removes the need for multiple data entry, guarantees data consistency and minimizes the effort required to manage and maintain such a dataset. [7]

3.2 The Key Features and Benefits of AODB

The key features and benefits of AODB are:

- A web-based application and client-server model
- Centralized database consisting of all information in an airport
- The main functions are:
 - Reference-data processing
 - Seasonal Scheduling
 - Daily Flight Schedule procession
 - Provision for billing data
- Integrating to existing systems in an airport is easy
- Specific airport management databases can be customized
- Support for all databases including Oracle and Microsoft SQL Server
- Storing data for historical analysis
- Simple reporting processes
- Managing the operations in real time [8]

The components of an airport operational database are illustrated in Figure 3.1.



Figure 3.1: Components of Airport Operational Database

- **Airport Collaborative Decision Making (A-CDM) Support**

What is Collaborative Decision Making (CDM)?

Collaborative decision-making (CDM) is defined as a process focused on how to decide on a course of action articulated between two or more community members. Through this process, ATM community members share information related to that decision and agree on and apply the decision-making approach and principles. [9] Parts of Airport Collaborative Decision Making are shown Figure 3.2.

Benefits of A-CDM

- For the **Airport Operator**, improved use of stands/gates leads to fewer late stand changes. More stable traffic flows and reduced taxi times make for fewer queues on runways and less congestion on the apron or taxiways.
- As an **Aircraft Operator**, you will have enhanced awareness of the status and location of your aircraft, as you will receive more accurate aircraft arrival times as well as improved departure sequence information. Fuel burn due to queues at the runway threshold will be reduced; this naturally has both economic and environmental benefits.
- **Air Traffic Control** will benefit from improved runway and capacity planning. More accurate take-off time predictions will help the Network Manager make more precise calculations of network demand. This enhanced flow and capacity management will result in better ATFM slot allocation, improved compliance and a reduced number of missed slots.
- The **Ground Handler** will benefit from having more accurate in-block times for arrivals, as well as from knowing the exact time departing aircraft have been given start-up clearance. This makes for more accurate planning and a more efficient use of resources.
- **Passengers** will benefit from reduction in delays and fewer missed connections. After disruptions, recovery will be faster. Also for arrivals, more accurate information can be delivered to Flight Information Display Systems and service desks. [10]



Figure 3.2: Parts of Airport Collaborative Decision Making (A-CDM)

CHAPTER 4

IMPLEMENTATION

A Web-based AODB application was developed in this study. The reason why a web-based application was developed is that this kind of applications are accessible anywhere and easily customizable. In this chapter, implementation details will be explained in order to give guidance for the programmers. Implementation can be divided into two parts as hardware and web application. In this chapter we will explain each of them.

4.1 Hardware

Hardware is the system requirements used in this application to work. We need a database server and an application server. These two servers are connected via Intranet. The specifications of the servers vary according to the number of users.

4.1.1 Database Server

The databaser server is a usual server which has a Relational Database Management System (RDMBS). We used Oracle 11g R2 as a relational database. The infrastructure of the application is compatible to work with different databases such as Microsoft SQL Server and MySQL.

4.1.2 Application Server

The application server is also a usual server which stores, processes and delivers our application to clients. We used Windows Server 2012 R2 as web server.

The application server works in Intranet. Only domain users can reach the application.

4.2 Web Application

The main function in AODB application is the input of arrival/departure informations of a flight. The air traffic controllers in control tower input these informations to system. The information of arrival or departure flight is generated in control tower. The most important informations about a flight in AODB are landing/take off time, registration code of the aircraft, arrival or departure airport of the aircraft, and the company. The air traffic controllers input these information to system after the landing or take-off. The reason of this process to be the first and the most important is that all operations in an airport are held using this information created by the air traffic controllers.

The main page is shown in Figure 4.1. On the main page, there are informations about the user such as permitted pages, exchange rates, etc.

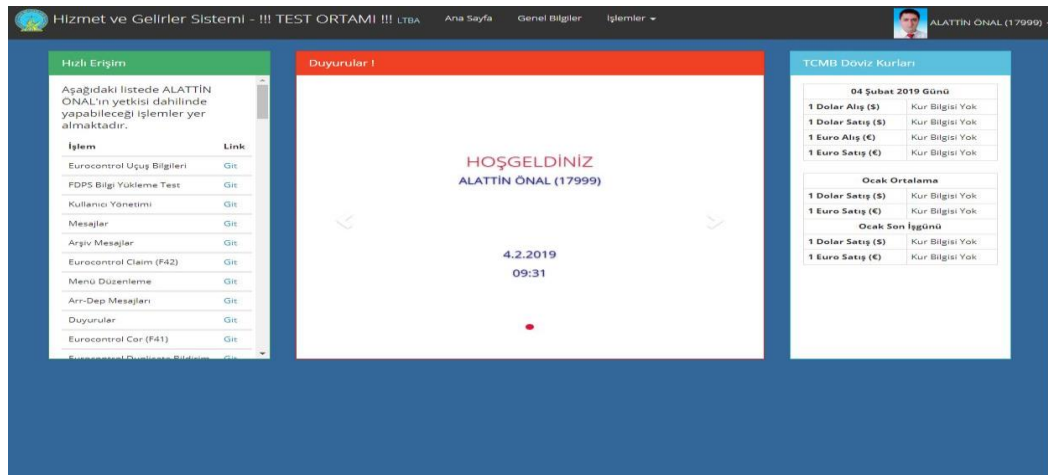


Figure 4.1: Main Page of The Application

4.2.1 Flight Information Input

Figure 4.2: Flight Information Input

The main of the application is the “Flight Information Input/Update” page. All the processes in the system start from this page as shown in Figure 4.2. It is visible to all users to display the general information of flights. There is a filtering option on the page. On this page, the date, call sign, alphanumeric call sign, flight purpose, registration code, slot time, hour, arrival/departure airport and lighting informations of a flight are displayed.

The user can select a flight to display extra informations about the flight and enter/update information about it. If the billing process of a flight is completed, the user can display the flight but can not make any changes about its information.

4.2.2 Adding New Flight/New Registration Code

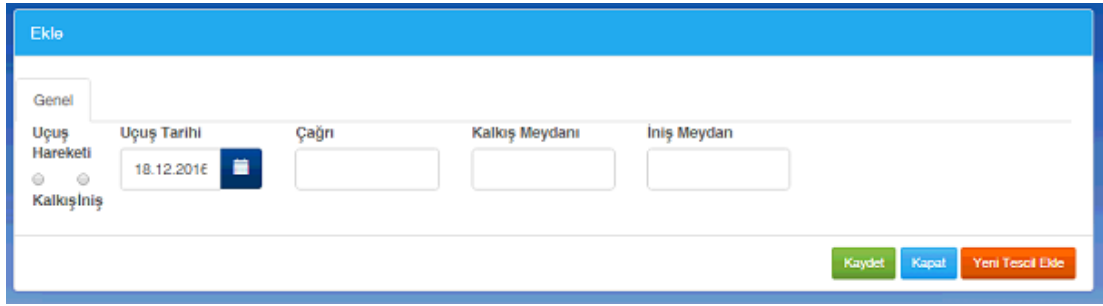


Figure 4.3: Add New Flight

The user can also enter a new flight using the “Add New Flight” button. Figure 4.3 shows the screen for adding a new flight. In the first step of adding a new flight, the user selects whether it is arrival or departure. When arrival is selected, then the “Arrival Airport” information is automatically selected to the current airport where the user work at. When departure is selected, this time the “Departure Airport” information automatically selected to the current airport. Then the user select the time of the flight, and writes “Call Sign”. As the call sign, some airline companies may use the registration code of the aircraft. The system automatically understands that it is a registration code. If the registration code that users want to enter to flight does not exist, the user can enter the new registration code of the aircraft using “Add New Registration Code” screen as shown in Figure 4.4.

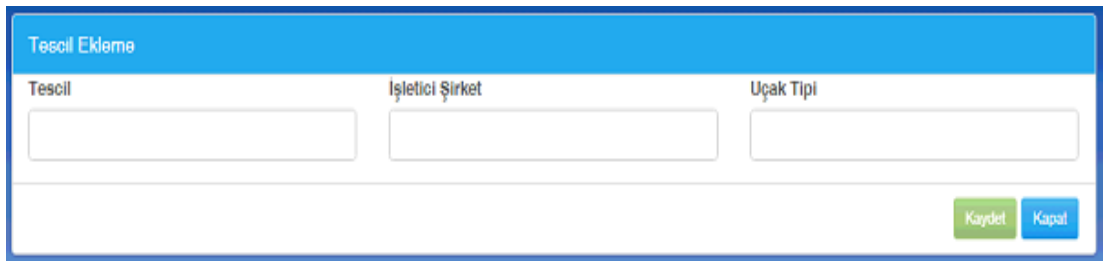


Figure 4.4: Add New Registration Code

On “Add New Registration Code” screen, there are only primary information about the aircraft such as “Registration Code”, “Actuator Company” and “Aircraft Type”. The other important information such as weight, number of seats about the aircraft is entered to system by the authorized user.

4.2.3 Flight Information Update

Düzenle - THYINIS - 06.09.2016

Uçuş Detayları

Askeri / Sivil
 T.C. Sivil Yabancı Sivil T.C. Askeri Yabancı Askeri

Pist: 36R - ILS (1)

İç Hat / Dış Hat
 İç Hat Dış Hat

Aydınlatma
 Evet Hayır

Tescil Kodu: TCSAK

Şirket: TÜRK HAVA YOLLARI A.O.

Tıp ve Model: B738

Koltuk Sayısı: 189

Ağırlık: 71

İniş / Kalkış Zamanı: 09:00

Alfanümerik Çağrı Adı:

Kule Açıklaması: Apron Açıklaması: Yol Kontrol Açıklaması:

Kaydet Sil Kapat Yeni Tescil Ekle

Uçuş Bilgisi Gir/Düzeltil

+ Ekle

Başlangıç Tarihi: 01.07.2016

Bitiş Tarihi: 18.09.2016

Filtre Türü: Çağrı

Filtre Değeri:

Tarih Türü: Sabit GMT Tarih Tarih

Ara Aydınlatma Kapat

İniş Uçuş Bilgisi
Kriterlere Uyan İniş Kayıt Sayısı: 1

Tarih	Çağrı	AlfaNumerik Çağrı Adı	Uçuş Amacı	Tescil	Slot Saati	Saat	Kalkış Meydanı	Aydınlatma
06.09.2016	THYINIS			TCSAK	09:00	LTCE	0	

Kalkış Uçuş Bilgisi
Kriterlere Uyan Kalkış Kayıt Sayısı: 2

Tarih	Çağrı	AlfaNumerik Çağrı Adı	Uçuş Amacı	Tescil	Slot Saati	Saat	Varies Meydanı	Aydınlatma
27.08.2016	PGT7002			TC***	00:00	LTAI	0	
08.09.2016	THYKALK			TCSAK	10:10	LTBA	0	

Figure 4.5: Flight Information Update

According to the call sign of a flight, the system automatically decides the type of the flight whether it is military or commercial, and domestic or international as shown in Figure 4.5.

The airports all over the world have a 4-letter code provided by ICAO (International Civil Aviation Organization). The first two letters of this code is the country code. And the first letter of the country code is given according to the location of the country. For example, letter 'L' is the code for Southern Europe, Israel and Turkey. After the first letter, there comes the second letter to create the 2-letter country code. The country code for Turkey is 'LT' according to ICAO.

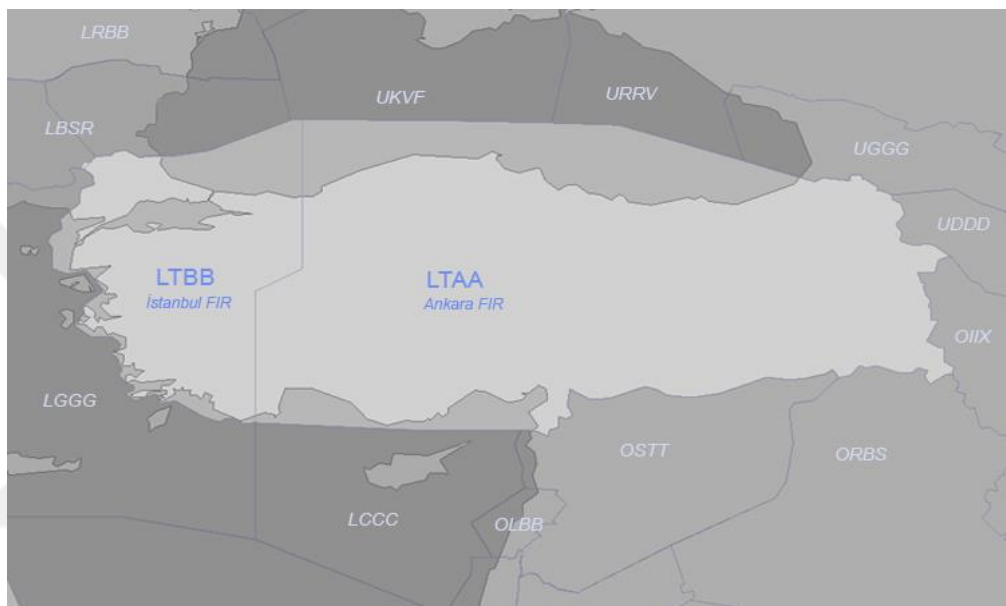


Figure 4.6: Flight Information Regions (FIR) of Turkey

There is also a term call FIR (Flight Information Region) in aviation that is a specified region of airspace in which a flight information service and an alerting service are provided. [11] Flight Information Regions of Turkey are illustrated in Figure 4.6.

In Turkey, there are two FIRs called LTAA for Ankara FIR and LTBB for Istanbul FIR. The code of airports in Ankara FIR generally starts with 'LTA-' and in Istanbul FIR with 'LTB-'. After this 3-digit code, there comes the fourth and the last letter to indicate the airport.

The codes for airports in a country have to start with this 2-letter country code. For example, the code for Istanbul Ataturk Airport is LTBA and for Ankara Esenboğa Airport LTAC.

In the web application, if the arrival and departure airports have codes starting with 'LT' means that this is domestic flight because the aircraft takes off from a domestic airport and lands on a domestic airport. If one of the arrival or departure airport has a different country code, that means the flight is international.

All of the information about the aircrafts landed on an airport in Turkey is stored in the system. This information is given to the airport authority by the owner of the aircraft. This information is very important and has to be updated. All the billing processes about a flight is completed according to this information. Figure 4.7 shows "Aircraft Definitions Page".

4.2.4 Aircraft Definitions

The screenshot shows the 'Aircraft Definitions Page' in a web application. The page is titled 'Düzenle' (Edit) and contains a form for editing aircraft information. The form has tabs for 'Genel', 'İşletme Bilgileri', and 'Teknik Bilgiler'. The 'Genel' tab is active, showing fields for 'Tescil' (TC JJK), 'Eski Tescil', 'Şirket' (TÜRK HAVA YOLLARI A.O.), 'Sahip Şirket' (TANIMSIZ), 'Tip' (0), 'Milliyet' (TÜRKİYE), 'Icao' (A320), 'Iata', and 'Tahditlimi' (Hayır). Below the form are buttons for 'Kaydet', 'Sil', and 'Kapat'. Below the form is a section titled 'Uçak Tanımları' (Aircraft Definitions) with a search bar and buttons for 'Pdf' and 'Excel'. The table below shows a list of aircraft definitions:

Tescil	Şirket	Sahip Şirket	Tonaj	Koltuk Adedi	Tip	Milliyet	Icao	Iata	Tahditlimi
TC JJK	TUAF	0	0	0	0	TURKEY	H00		Hayır
TC AAN	PGT	0	0	0	0	TURKEY	B738		Hayır
TC AAR	PGT	0	0	0	0	TURKEY	B738		Hayır
TC ADO	TGADO	0	0	0	0	TURKEY	H25B		Hayır
TC ETD	001	0	38	00	0	TURKEY	CRJ9		Hayır
TC FBO	MENEKS	0	5	4	0	TURKEY	D 28		Hayır

Figure 4.7: Aircraft Definitions Page

There is a page for displaying, inserting, updating and deleting the information of an aircraft in the system named “Aircraft Definitions Page”. Since this information is very important, only authorized users can make changes on this information.

There are three types of information about an aircraft. The first one is the general information such as registration code, company, type etc. The second type of information is the operational information. In this section, there is the type of the aircraft, the situation of it like active or inactive for flights, the certification date etc. The third type of information is the technical information about the aircraft such as weight, model, number of seats, length of the aircraft’s body etc. Using this information, the billing operation is held.

After the air traffic controller inputs the information about a flight, that information is displayed to other users to make changes on it.

4.2.5 Permit, FIR and Flight Purpose

Flight permits are permissions required by an aircraft to overfly, land or make a technical stop in any country’s airspace. [12] If there is no permit, the aircraft can not overfly or land. This permit is taken from T.C. Directorate General of Civil Aviation. In the next step, the users input some information such as permit and purpose of flight (commercial flight, ambulance flight, vip flight etc.). Permit, FIR and Flight Purpose Input page is shown in Figure 4.8.

Düzenle

Genel
Açıklamalar

FIR Noktası

FIR Zamanı

Uçuş Amacı

Permi No.

Kalkış Meydanı

Varış Meydanı

18.09.2016 21:14

0 - TANIMSIZ

Erzurum Airport (LTCE)

Ankara Esenboğa Intern

Divert Meydanı

Kaydet
Sil
Kapat

Permi ve FIR Girişi

01.09.2016 00:00

18.09.2016 23:59

Çağrı

Q Ara

Uçuş Amacı Olmayanları Göster

Pdf
Excel

Tarih	Saat	İniş/Kalkış	Çağrı	Uçuş Amacı	Uçuş Planı Çağrısı	Tecil	Slot Saati	Kalkış Meydanı	Varış Meydanı
	00.09.2016	09:00	İniş	THY1115		TCSAK		LTCE	LTAC
	00.09.2016	10:10	Kalkış	THYKALK		TCSAK		LTAC	LTBA
	00.09.2016	05:00	İniş	BRJ1001	110	TCYAC		EDDK	LTAC
	00.09.2016	07:25	Kalkış	BRJ1002	110	TCYAC		LTAC	LTBA

< 1 >

[+ Ekle](#)
[Yardım](#)
[Hata Bildir](#)

Figure 4.8: Permit, FIR and Flight Purpose Input Page

If there is a situation about the flight or something else, the user can write an explanation for that flight. The user can also change the arrival, departure or divert airports of the flight.

4.2.6 Apron Flight Information

Düzenle

Yer Hizmetleri Genel

Ramp ÇELEBİ HAVA SERVİSİ A.Ş.(ICAO: ÇEL Yolcu Trafik ÇELEBİ HAVA SERVİSİ A.Ş.(ICAO: ÇEL Hat Bakım BORAJET HAVACILIK TAŞ. UÇAK BAKIM Uçuş Opr. BORAJET HAVACILIK TAŞ. UÇAK BAKIM

Yük Kontrol ve Haberleşme ÇELEBİ HAVA SERVİSİ A.Ş.(ICAO: ÇEL İkrım Gözetim Yönetim Temsil

Kargo

Kaydet Sil Kapat

Apron Uçuş Bilgileri Takip Ekranı

01.09.2016 00:00 18.09.2016 23:59 Çağrı Q Ara Yer Hizmetleri Anlaşmalar

Kriterlere Uyan Kalkış Kayıt Sayısı: 4

Tarih	İniş/Kalkış	Uçuş Amacı	Tescil	Çağrı Adı	Kalkış Meydanı	Varış Meydanı	İp/Diğ Hat	Slot Saat	İniş/Kalkış Zamanı	Yönlendirme	Hat Bakım	Uçuş Operasyon	Yolcu Trafik	Yük Kontrol	Ramp/Köprü	İkrım	Temsil	Gözetim Yönetim	Kargo	Milliyet
00.00.2010	1	110	TOYAC	BRJ1001	EDDK	LTAC	1	05:00	0		BRJ	BRJ	ÇEL	ÇEL	ÇEL					TÜRKİYE
00.00.2010	0	110	TOYAC	BRJ1002	LTAC	LTBA	0	07:25	0		BRJ	BRJ	ÇEL	ÇEL	ÇEL					TÜRKİYE
00.00.2010	1		TCSAK	THYINIS	LTCE	LTAC	0	00:00	0											TÜRKİYE
00.00.2010	0		TCSAK	THYKALK	LTAC	LTBA	0	10:10	0											TÜRKİYE

Ekle Yardım Hata Bildir

Figure 4.9: Apron Flight Information Page

In the next step, the flight information is displayed on a page named Apron Flight Information as illustrated in Figure 4.9. In this page, the services that are given to the flight by the Ground Services companies are entered to the system. These services are Ramp, Passenger Traffic, Line Maintenance, Flight Operation, Load Control and Communication, Catering, Surveillance Management, Representation and Cargo.

There are Ground Services Contracts made between the Ground Services Companies and Airline Companies. These contracts are informed to General Directorate of State Airports Authority. Then these contracts are published in our website (www.dhmi.gov.tr). These contracts are also entered to the system.

When a user inputs the information about the services given to a flight, if there is a contract between the Airline Company and the Ground Services Company, the company that gives a service to that flight is automatically written on the page.

After all the necessary information about a flight is created by different users in the system, then the billing operation begins. First of all, the user controls the accuracy of the information of the flight. If there is a wrong information, the user asks the other users to change the information. If there is no wrong information, then the user creates accrual of the services given to the flight.

There are two types of payment method for the billing of services that are given to flight. Some airline companies such as Turkish Airlines prefer to pay their bills of flights as credited. These companies regular flights during the year and they do not want to make payment flight by flight. These companies are called Credited Payment Companies in the system.

Some airline companies, generally do not have regular flights, prefer to pay their bills flight by flight. These companies are called Advance Payment Companies in the system.

An airline company may want to change the payment status on the system according to its flight numbers. An authenticated user changes the status of the company on the system.

4.2.7 Company Information

Düzenle

Genel Diğer Bilgileri

Şirket Adı TÜRK HAVA YOLLARI A.O. IATA TK ICAO THYGN1 Adres GENEL YÖNETİM BİNASI ATATÜRK H.

Posta Adresi Telefon Numarası 0212 4636363 Faks Numarası SITA Adresi

E-Posta Adresi Web Sayfası WWW.THY.COM Açıklama

Kaydet Sil Kapat

Şirket Bilgileri Güncelleme

Şirket Adı TÜRK HAVA Q Pdf Excel

Şirket Adı	IATA	ICAO	Telefon	E-Posta	Faks	Vergi Numarası	Tahdit Durumu
TÜRK HAVA YOLLARI A.O.	TK	THYGN1	0212 4636363			8700047404	0
TÜRK HAVA YOLLARI A.O.	TK	THY48	2124030303			870004740	0
TÜRK HAVA YOLLARI A.O.	TK	THY	2124030303/18277	ESAVAS@THY.COM	0212 4652421	8700047404	0
TÜRK HAVA YOLLARI A.O.	TK	HTHY	0 212 4030303			8700047404	0
TÜRK HAVA YOLLARI A.O.		T.H.Y				0	0
TÜRK HAVA YOLLARI A.O.		00078				8700047404	0

Figure 4.10: Company Information Page

Figure 4.10 shows the Company Information Page of the system. On this page, only authenticated users make change about a company or insert a new company to the system.

There are some basic information about a company such as name of the company, IATA code, ICAO code, phone number, e-mail address, fax number, tax number and a code about restriction. The restricted airline companies can not have any flight across Turkey.

4.2.8 Create Accrual Form

Tarih	İniş Çağrı Adı	Kalkış Çağrı Adı	Tescil	İniş/Kalkış Zamanı	Slot Saat	Uçuş Amacı	Kalkış Meydanı	Varış Meydanı	Follow Me	Hat Bakım	Uçuş Operasyon	Yolcu Trafik	Yük Kontrol	Ramp/Köprü	İkram	Temail	Gözetim	Yönetim	Kargo
06.09.2016	BRJ1001	BRJ1002	TCYAC	05:00:10T25	110	110	EDDK	LTSA	0	BRJ	BRJ	ÇEL	ÇEL	ÇEL					

Figure 4.11: Create Accrual Form for Advance Payment Company

If the payment type of the company is Advance Payment, then the flight information can be displayed on Advance Payment Accrual Page. On this page shown in Figure 4.11, the information of the flight and the companies that served to the aircraft are displayed. The user controls these information and if there is nothing wrong, then the user creates the accrual form of the flight.

The accrual form contains of information which services are given to the flight, what are the costs of these services and the total cost for the payment.

Uçağın (Aircraft)					
Şirket Adı (Name Of Company)	Milliyeti (Nationality)	Uçak No. (Aircraft Nr.)	Çağrı Adı (Call Sign)	Tip ve Model (Type and Model)	Tonaj/Koltuk (Mtow/Seat)
BORAJET HAVACILIK TAŞ. UÇAK BAKIM	TÜRKİYE	TCYAC	BRJ1002	0	23
Geliş (Arrival)		Gidiş (Departure)			
Tarih (Date)	Saati (Time)	Tarih (Date)	Saati (Time)	Nereden (From)	Nereye (To)
06.09.2016	05:00	06.09.2016	07:25	LTAC	LTBA
			USD	EUR	TRY
KONMA ÜCRETİ (Landing Charges)				82.11	
KONAKLAMA ÜCRETİ (Parking Charge)					20.70
ZAMLI KONAKLAMA ÜCRETİ (Addition Parking Charge)					
YAKLAŞMA ÜCRETİ (Approach Charge)				40	
AYDINLATMA ÜCRETİ (Lighting Charge)					52
YOLCU SERVİS ÜCRETİ (Provided Services Charges for Passenger)					
UÇAK YÖNLENDİRME ÜCRETİ (Follow-Me)				21	
EMNİYET TEDBİR ÜCRETİ (Safety Measures Charge)					411
KÖPRÜ (Extensible Tube)					
400 Hz					
HAT BAKIM (Line Maintenance)					
UÇUŞ OPERASYON (Flight Operation)					
MEYDAN ÇALIŞMA SAATİNİN UZATILMASI					
TOPLAM ÜCRET (Total Charges)				0	143.11 483.70

Tahsil Defterine Kayıt Eden

Tahakkuk Memuru
(Inconer Officer)

Figure 4.12: Sample Accrual Form

As seen on Figure 4.12, all the information of the flight, the services and their costs are displayed. According to the Charges Tariff of DHMİ, some some charges are Euro, some charges are TRY and some charges are USD.

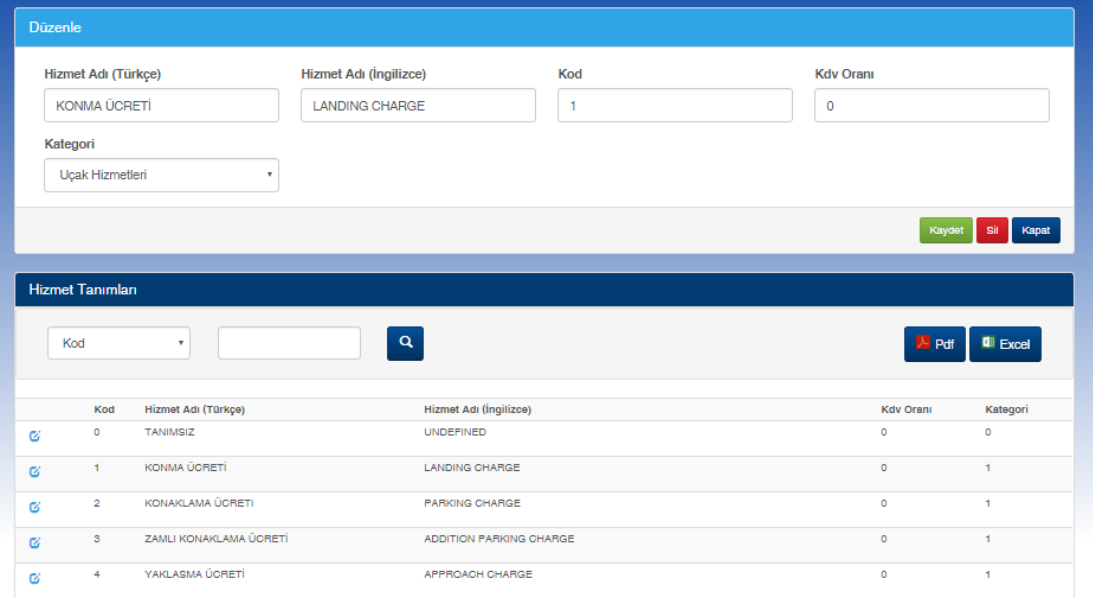
After the creation of the accrual form, it is saved to the database. Then, the user sends/gives this accrual form to the airline company for them to check whether everything is true or not.

As the payment type of the company is Advance Payment Company, there is only one flight information on the accrual form. After the accrual form is created and sent/given to the airline company and if there is no problem about the charges, then the user creates the invoice of the accrual form.

If the payment type of the company is Credited Payment Company, then there are all the flights of the airline company on the accrual form.

4.2.9 Service Types and Definitions

There are so many services that are given to an aircraft before and after the flight. These services are divided into two parts: Aircraft Services and Ground Services.



The screenshot displays a software interface for managing service definitions. It is divided into two main sections: 'Düzenle' (Edit) and 'Hizmet Tanımları' (Service Definitions).

Düzenle (Edit) Section:

- Hizmet Adı (Türkçe):** KONMA ÜCRETİ
- Hizmet Adı (İngilizce):** LANDING CHARGE
- Kod:** 1
- Kdv Oranı:** 0
- Kategori:** Uçak Hizmetleri
- Buttons: Kaydet (Save), Sil (Delete), Kapat (Close)

Hizmet Tanımları (Service Definitions) Section:

Search filters: Kod (dropdown), [input field], [Search icon]

Export buttons: Pdf, Excel

Kod	Hizmet Adı (Türkçe)	Hizmet Adı (İngilizce)	Kdv Oranı	Kategori
0	TANIMSIZ	UNDEFINED	0	0
1	KONMA ÜCRETİ	LANDING CHARGE	0	1
2	KONAKLAMA ÜCRETİ	PARKING CHARGE	0	1
3	ZAMLI KONAKLAMA ÜCRETİ	ADDITION PARKING CHARGE	0	1
4	YAKLAŞMA ÜCRETİ	APPROACH CHARGE	0	1

Figure 4.13: Service Types and Definitions

The Aircraft Services contain **Landing Service, Parking Service, Approach Service, Lighting Service, Provided Services for Passengers, Follow-Me Service, Safety Service, Line Maintenance Service, Flight Operation Service, Passenger Traffic Service, Load Control and Communication Service, Ramp Service, Catering Services, Representation Service, Supervision Administration Service and Cargo Transport Service.**

These services are displayed and updated using the page shown in Figure 4.13. Only authorized users can make changes on these services.

4.2.10 Local Airport Definitions

The screenshot displays the 'Lokal Meydan Tanımları' (Local Airport Definitions) page. The form includes fields for ICAO ID, Meydan (Airport Name), Yaz Saati Uygulaması (Summer Time Application), 24 Saat Çalışma (24 Hour Operation), Sadece İç Uçuş (Only Domestic Flights), Muhasebe Tipi (Account Type), Yeşil Meydan (Green Field), Engelsiz Meydan (Obstacle-free Field), Muhasebe Son Günü (Account End Date), Aydl. Açılış Zamanı (Monthly Opening Time), and Aydl. Kapanış Zamanı (Monthly Closing Time). Below the form is a table of existing airports.

ICAO ID	Meydan	Aydinlatma Açılış Saati	Aydinlatma Kapanış Saati	Yaz Saati Uygulaması	24 Saat Çalışma
LTAF	ADANA HAVALIMANI	11:17	00:00	Evet	Evet
LTOP	ADİYAMAN HAVA MEYDANI	11:30	13:30	Evet	Hayır
LTBJ	ADINAN MENDERES HAVA LIMANI	17:10	03:11	Hayır	Evet
LTAP	AMASYA HAVA MEYDANI			Hayır	Hayır
LTAI	ANTALYA HAVA LIMANI	10:23	10:24	Hayır	Evet
LTOO	AĞRI HAVA MEYDANI			Hayır	Hayır

Figure 4.14: Local Airport Definitions Page

There are 55 airports in Turkey and the number of airports are increasing year after year. Local Airport Definitions Page shown in Figure 4.14 is used by the authorized user to add new airport information to the system.

The user can also update the information of an airport on this page.

There are so many different specifications of an airport. An airport may service only domestic flights or domestic and international flights together.

There may be a Summer Time Application on the airports. Also, some airports work 24 hours a day even though some airports work only daytime.

In Turkey, Directorate General of Civil Aviation gives “Green Airport” certificate to airports according to their criteria about focusing on accelerating the process of greening airport operations. Also, there is another certificate called “Unobstructed Airport” that is given to the airports that make necessary changes on the terminal area for disabled passengers.

4.2.11 Charges Tariff Definitions

Düzenle

Tarife Bilgileri

MEYDAN	ESENBOĞA HAVA LIMANI	BAŞ.TAR.	01.01.201	KOLTUK KAPASİTESİ 1	0	GÜN SAYISI	0	DIŞ HAT	Evet
HİZMET	KONAKLAMA ÜCRETİ	BİT.TAR.	31.12.201	KOLTUK KAPASİTESİ 2	9999	SAAT SÜRESİ	0	KONMA SAYISI	
TARİFE TİPİ	SİVİL UÇAK	BAŞ.SAATI	00:00	TONAJ 1	0	TUTAR	2,20	PARA BİRİMİ	AVRO (EUR)
YIL	2016	BİT.SAATI	23:59	TONAJ 2	9999				

Kaydet Sil Kapat

Tarife Bilgisi Tanımlama (Uçak ve Yer Hizmetleri)

Meydan

Meydan	Hizmet	Yıl	Hat	Tip	Bağlama Tarihi	Biliş Tarihi	Bağlama Saati	Biliş Saati	Tonaj 1	Tonaj 2	Koltuk 1	Koltuk 2	Konma Sayısı	Tutar	Para Birimi
ESENBOĞA HAVA LIMANI	IKRAM SERVİSİ	2010	DIŞ HAT	SİVİL UÇAK	01.01.2010	31.12.2010	00:00	23:50	0	0000	101	150		10	EUR
ESENBOĞA HAVA LIMANI	IKRAM SERVİSİ	2010	DIŞ HAT	SİVİL UÇAK	01.01.2010	31.12.2010	00:00	23:50	0	0000	201	250		21	EUR
ESENBOĞA HAVA LIMANI	IKRAM SERVİSİ	2010	DIŞ HAT	SİVİL UÇAK	01.01.2010	31.12.2010	00:00	23:50	0	0000	251	300		23	EUR
ESENBOĞA HAVA LIMANI	IKRAM SERVİSİ	2010	DIŞ HAT	SİVİL UÇAK	01.01.2010	31.12.2010	00:00	23:50	0	0000	301	350		27	EUR
ESENBOĞA HAVA LIMANI	IKRAM SERVİSİ	2010	DIŞ HAT	SİVİL UÇAK	01.01.2010	31.12.2010	00:00	23:50	0	0000	351	0000		31	EUR
ESENBOĞA HAVA LIMANI	KONAKLAMA ÜCRETİ	2010	DIŞ HAT	SİVİL UÇAK	01.01.2010	31.12.2010	00:00	23:50	0	0000	0	0000		2,20	EUR

Figure 4.15: Charges Tariff Definitions Page

The only authority on airports in Turkey is General Directorate of State Airports Authority (DHMI – Devlet Hava Meydanları İşletmesi). All the charges that are applied to a flight are defined in DHMI Charges Tariff every year.

On the Charges Tariff Definitions Page shown in Figure 4.15, authorized users input the information of the charges by type, airport, date and flight type (domestic or international). During the billing process, the system reads these informations to calculate the charges.

4.2.12 Standard Ground Services Contracts

Hizmet Alan Şirket	Hizmet Veren Şirket	Bağlama Tarihi	Bitiş Tarihi	Onay Tarihi	Uzatma
THY - TÜRK HAVA YOLLARI A.O.	HVŞ - HAVAALANLARI YER HİZMETLERİ A.Ş.	22.5.2015	21.5.2018	14.9.2015	+ 0 Yıl
THY - TÜRK HAVA YOLLARI A.O.	TGSYER - TGS YER HİZMETLERİ A.Ş.	1.1.2015	31.12.2020	20.1.2015	+ Yıl
THY - TÜRK HAVA YOLLARI A.O.	HVŞ - HAVAALANLARI YER HİZMETLERİ A.Ş.	15.12.2014	31.12.2017	3.3.2015	+ Yıl
THY - TÜRK HAVA YOLLARI A.O.	GÖZGÜV - GÖZEN GÜV.HİZ.TİC.A.Ş.	10.10.2014		20.1.2015	+ Yıl
THY - TÜRK HAVA YOLLARI A.O.	BEŞTEP - BEŞTEPE GIDA GÜV.TEM.İNŞ.TUR.SAN.VE TİC.	1.10.2014	30.9.2017	25.12.2014	+ Yıl

Figure 4.16: Standard Ground Services Contracts Definition Page

As mentioned before, there may be contracts between an airline company and a ground services company to give necessary services to aircrafts. These contracts are entered to the system then this information is used during the billing process as shown in Figure 4.16.

CHAPTER 5

CONCLUSION

There are 55 airports in Turkey and the number of airports continues to increase every year. The management of these airports are a big deal for airport operators. In this study, we designed an AODB for airports in Turkey and developed a web application using this AODB. The system enables airport operators, airline companies, ground services companies and air traffic controllers to manage the data of a flight effectively.

The correctness of the information of a flight is vital. This information is firstly created by air traffic controllers in ATC Tower. After an air traffic controller inputs the primary information about a flight to system, then the next user can see the flight information. The next users also input different types of information about the flight into the system. Finally, all the information about a flight is used to create an accrual form and the system calculates charges of different services given to that flight.

There are similar AODB applications developed by foreign countries and companies, but this system is developed by considering the airports in Turkey. As DHMİ is the only authority on aviation and airports, we have all the data about the flights on Turkey. This system uses this data to manage. Using all this data, the operations in multiple airports can be managed by this system. This system stores, distributes and manages real-time flight data, aeronautical and non-aeronautical services data.

The main difference between my AODB design and others is that i can use any relational database form my application. I use Entity Framework for my all processes in my database and i use MSSQL Server. But if i want to use Oracle or another relational database, there can be no problem thanks to Entity Framework.

This study can be a model for developers to create a similar AODB and develop AODB applications. Developers may improve this system by using radar data to display aircraft locations on an airport.

As a result, the process of managing data of flight in one system is very important for airport operators. AODB makes this process very easy and effective.

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Appendix A

CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: ÖNAL, Alattin

Nationality: Turkish (TC)

Date and Place of Birth: 20 March 1986, Ankara

Phone: +90 544 343 76 26

Email: alattin.onal@dhmi.gov.tr

EDUCATION

Degree	Institution	Year of Graduation
BS	Çankaya University Computer Engineering	2010
High School	Aksaray Şehit Pilot Hamza Gümüşsoy Fen Lisesi	2004

WORK EXPERIENCE

Year	Place	Enrollment
2012 - ...	DHMİ Genel Müdürlüğü	Computer Engineer
2010 - 2012	İŞLEM Coğrafi Bilgi Sistemleri – ESRI Turkey	Computer Engineer – Software Project Expert

LANGUAGES

English – Advanced

Spanish – Beginner

German - Beginner