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CONFLICT POINTS AND AIR TRAFFIC PROBLEM RESOLUTIONS OF AIR TRAFFIC CONTROLLERS IN ISTANBUL AIRSPACE

Abstract:

Every hour of a day, airlines make millions of flights. In this century, it is getting more and more important to manage air traffic effectively and regularly. In order to manage this job that is important and connected with the human lives directly, there are air traffic controllers in the tower or control centers. To be successful for managing this extreme and exciting air traffic, air traffic controllers have to know and apply the exact rules that have international validity. However, every process of air traffic is not very regular. There may be some problems that air traffic controllers have to solve to prevent air traffic crashes or air misses. These are called “conflict and conflict traffic”. There are some applications and solving methods in the job life. In this study, İstanbul Airspace conflict points and applications which are used by air traffic controllers to solve the conflicts and save the day for the crew, passengers and aircrafts are researched.

Keywords:

air traffic control, conflict resolution, percentage distribution, single screening model

JEL Classification: L93, J28, C10

Introduction

Every job has some difficulties as a connatural situation. This situation gives some problem to the personnel on the job. Some of them give small things to the job life, but some of them give more difficulties and tensions to the personnel, like air traffic control management.

Air traffic control is a complex and difficult structure to manage the air traffic control flow. Air traffic control is a dynamic system which to operate the air traffic flow. In this system, air traffic controllers have a very important value.

After the developments of aviation, air traffic flow increased rapidly day by day. In addition to this, the number of aircrafts and airports were run up. These increments brought some difficulties near them, air traffic volume.

An example of increment of the air traffic in Turkey, according to the total aircraft traffic statistics of General Directorate of State Airports Authority of Turkey, the number of aircraft traffics of January in 2013 is 95,922, of January in 2014 is 109,538 and of January in 2015 (within not exact numbers just for 2015) is 119,620 (DHMI, Statistics). It is obvious that every year, the air traffic flow density is getting more and more. These numbers are total in Turkey with overflights. So, this causes the increasing of demand to the people who manage the air traffic control flow.

The aviation needs to manage by a person or a group. The person who manages the air traffic flow is air traffic controller. Air traffic controller is a person who manages the whole phase of flight from one airport to another airport by giving more importance about safety. As in all type of jobs, air traffic control has some rules to operate the air traffic flow and separate the aircrafts into the determined minima.

In basically, separation methods and minima are 2 types; vertical and horizontal separation.

Vertical Separation

Vertical separation is a method to separate the aircrafts vertically within minima. If the RVSM (Reduce Vertical Separation Minima) is not applied in airspace, vertical separation minima is 1,000 feet until FL290 (Flight level 29000 feet) and vertical separation minima 2,000 feet at or above this level. But, if RVSM is applied in the airspace, the vertical separation minima is 1,000 feet until FL410. But, of course the aircrafts have to have RVSM approval and suitable equipment to manage the flight in RVSM airspaces (ICAO, Doc 4444). Air traffic controller manages the vertical separation by changing flight level of the aircrafts.

Horizontal Separation

About the separation minima, a state can determine different minima for determined situations or can determine additional conditions to use the determined separation minima by providing all conditions for safety level (ICAO, Doc 4444).

Horizontal separation has 2 parts, as lateral and longitudinal separations. The minimum horizontal separation is applied as given 10 NM (Nautical Mile) distance between the aircrafts (DHMI, AIP TURKEY).

These separations can be provided by giving vectors directives to the aircrafts, applying speed limitations or giving level change directives.

Conflict Points and Conflict Solutions

If the aircrafts do not have the minimum separation values between themselves, it causes the conflicts. Conflict means a situation that aircrafts do not have the minimum separation to manage a safe flight.

In this study, İstanbul Airspace was determined as sample airspace to research which methods are used by air traffic controllers. To analyze the number of the conflicts, it needs to know the conflict points in İstanbul airspace.

In İstanbul airspace there are ATS (Air Traffic Service) routes and RNAV (Area Navigation) routes. In addition, there navigation aids on these ways. There are some VOR/DME stations that are located on a geographical area. Also, there are some fixes that are created by intersections of the navigation aids' signals. These are imaginary point. So, they are not located in physically on a geographical area. 3 digits mean that it is a station in physically, but 5 digits mean that it is not located anywhere in physically.

One of the researches that is made with one of our students explains the conflict points according to random election of the flights. These conflict points are IST VOR/DME, EKI VOR/DME, BKZ VOR/DME, YAA VOR/DME, BIG VOR/DME, BIG-IST VOR/DME, VADEN exit point, DUGLA exit point and MAKOL exit point.

Figure 1 gives the number of conflicts according to the conflict points in İstanbul airspace.

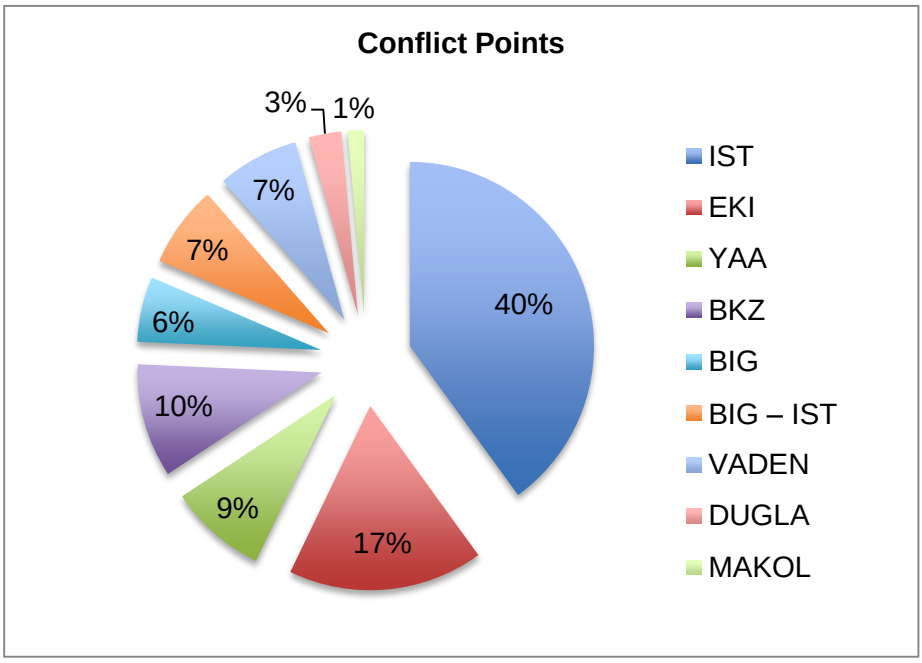
Figure 1: Conflict Points of İstanbul Airspace

Conflict Points	Number of conflicts	Percentage of conflicts
IST	28	40%
EKI	12	17%
YAA	6	9%
BKZ	7	10%
BIG	4	6%
BIG – IST	5	7%
VADEN	5	7%
DUGLA	2	3%
MAKOL	1	1%

Source: Undergraduate Thesis

Figure 2 shows the percentage of the conflicts at conflict points in İstanbul airspace.

Figure 2: The Percentages of Conflict Points in İstanbul Airspace



Some flights were determined randomly to analyze in İstanbul Area Control. 140 flights are examined and 70 conflict traffics are determined to understand the conflict solve methods clearly.

According to this research, there are 70 conflicts between the aircrafts. Of the results, %56 is owned level change method, %41 vector techniques, and %3 speed adjustments.

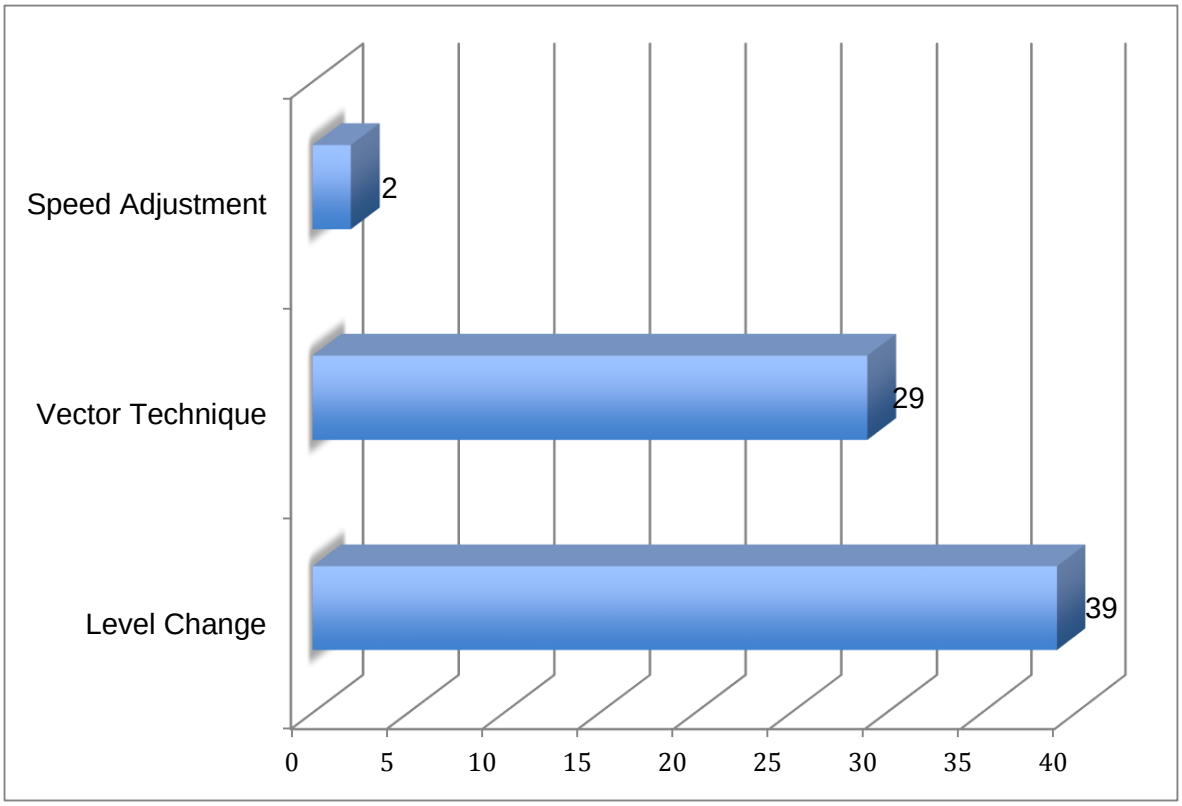
Level changes are applied to the 1,000 feet separation in minima, vector techniques are applied to separate the aircrafts minimum 10 Nm and speed restrictions are applied increasing speed or decreasing speed to obtain 10 Nm separation between the aircrafts.

The numbers of these methods are analyzed. The number of the level changes is 39 (%56), number of vector techniques is 29 (%41) and number of speed adjustments is 2 (%3).

These methods are chosen for the best situation by the air traffic controllers.

Figure 3 shows us the graphic indication for the number of methods that were applied in area control center in İstanbul airspace by air traffic controllers.

Figure 3: Number of Separation Methods



Source: Source: Undergraduate Thesis

Conclusion

Air traffic control is an essential issue to manage the air traffic safely, rapidly and in an exact order.

Every year, over billion passengers have flights to one city to another. These are very important moments for the passengers. Because they are flying by a plane. It is really imaginable thing that it is on air and there are lots of aircrafts on air at that moment. So, there must be some people to control this excellent air traffic flow. Not only controlling the navigation of the aircrafts, but also, these people do some important and well-respected missions, “passenger safety”.

In order to manage this, there are air traffic controllers in job positions in Tower Control, Approach Control or Area Control Centre. All of the flights have to separate at least in minima. It means that all of the aircrafts fly by providing some separation minima, as vertical or horizontal. This is possible by air traffic controllers’ directives to the aircrafts. So, the aircrafts generally can be separated in 2 ways, vertical and horizontal.

When air traffic controllers manage the air traffic flow and separate the aircrafts according to the vertical or horizontal, they need to use some techniques and methods to provide safe flights. These methods and techniques are level change to provide at least 1,000 feet to separate the aircrafts in area control, vector techniques and speed adjustments to obtain the 10 Nm between the aircrafts to separate them safely. These

techniques are applied to separate the aircrafts in order to manage safe, steady and rapid air traffic flow.

Among the separation methods, the first and most common method is level change. It is easy to apply to separate the aircrafts. Second one is vector technique that is used in order to separate the aircrafts by air traffic controller. But, it causes long flight route for the aircrafts. But, if the air traffic controller use this technique with speed adjustment is more effective to airlines and air traffic flow. The third one is speed adjustment that is used to separate the aircrafts by changing their speed. Speed adjustment takes effect during long time period by comparing to others.

In conclusion, air traffic controllers work in a position that has connection the human lives directly. So, they have to know the common conflict points and conflict solution methods and techniques to ensure safe flights.

Reference

DHMI (General Directorate of State Airports Authority of Turkey). *AIP (Aeronautical Information Publication)*. [Online] Available from: http://www.dhmi.gov.tr/home.aspx. [Accessed: 02nd April 2015].

DHMI (General Directorate of State Airports Authority of Turkey). *Statistics*. Available from: http://www.dhmi.gov.tr/istatistik.aspx. [Accessed: 02nd April 2015].

ICAO (International Civil Aviation Organization). (2007) *Doc 4444 Rules of The Air and Air Traffic Services*, 15.Edition.

Kuşçu, M. (2014) *Undergraduate Thesis*, at Air Traffic Control Department, Anadolu University.