Flight delay analysis and possible enhancements with big data

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Abstract - *Flight delays cause a lot of inconvenience to passengers. It could make them late to their scheduled events or miss a connecting flight, thus leading to anger and frustration. Also, passengers may not always be entitled to compensation when a delay occurs. A flight is said to be delayed when it arrives 15 or more minutes later than the schedule. Airlines claim that few of the reasons for flight delays are airline glitches, weather conditions, maintenance problems with the aircraft, congestion in air traffic, late arrival of the aircraft to be used for the flight from a previous flight and security issues. This paper analyzes On-time performance data collected by Indira Gandhi International Airport, Delhi, India for the year 2015 and identifies its use to reduce delays.*

Key Words: *Flight, delay, reduce, analyze, Delhi, India, weather, airline.*

1. INTRODUCTION

Indira Gandhi International Airport, Delhi, India has been monitoring on-time performance of flights since September 2011 and they share this data on their official website. Back in September 2011, they began with including airline-wise on-time percentage of departures and a bar graph to explain it visually. However, from October 2011, up to the current day, they have been monitoring the total number of departures, airline-wise breakup of on-time and delayed numbers and percentages with various categories for delays, along with pie charts to explain it visually. Also, they monitor all these information for different periods during the day, 3.00 hrs to 8.59 hrs, 9.00 hrs to 14.59 hrs, 15.00 hrs to 20.59 hrs and 21.00 hrs to 2.59 hrs[1].

1.1 Observations

The on-time performance of flights monitored by Indira Gandhi International Airport, Delhi, when looked at from a bird's eye view, determines that the major cause of delayed flights during the year 2015 were reactionary reasons which include awaiting load of passengers from another flight, check-in error, passenger and baggage errors, late arrival of aircraft from another flight, awaiting crew from another flight, operations control, rerouting, diversion, aircraft change for reasons other than technical[2]. The data reveals that weather played its role during winter in the months November to March, when the city is covered with fog. Also,

an increase in the number of inbound and/or outbound flights is also another cause for the delay.
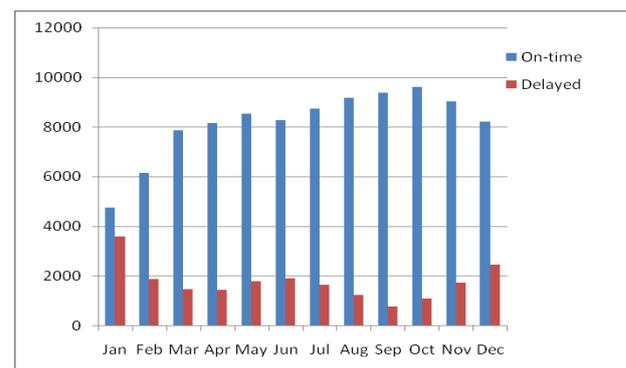

Chart - 1: On-time and delayed flights comparison

Chart 1 clearly exhibits a drastic decrease in delays right from the month of February when the total number of flights were below 9600 each month. However, this number increased to lie between 10100 and 10400 thereafter, which probably led to an increase in the delayed flights from May to July. Again, the number increased to 10600 and above from October, which justifies the increase in the delayed flights.
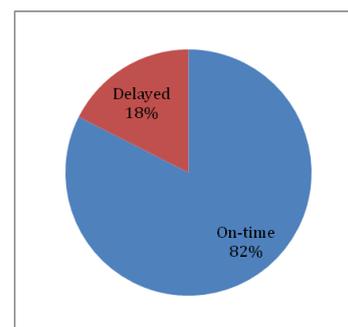

Chart - 2: On-time performance for flights: Jan-Dec, 2015

Of the 1,18,763 flights that flew all round the year, Chart 2 displays the distribution of on-time and delayed flights in percentage. Further, the delayed flights which sum up to 20,826 have various reasons for the delay, which are displayed in Chart 3 in percentage.
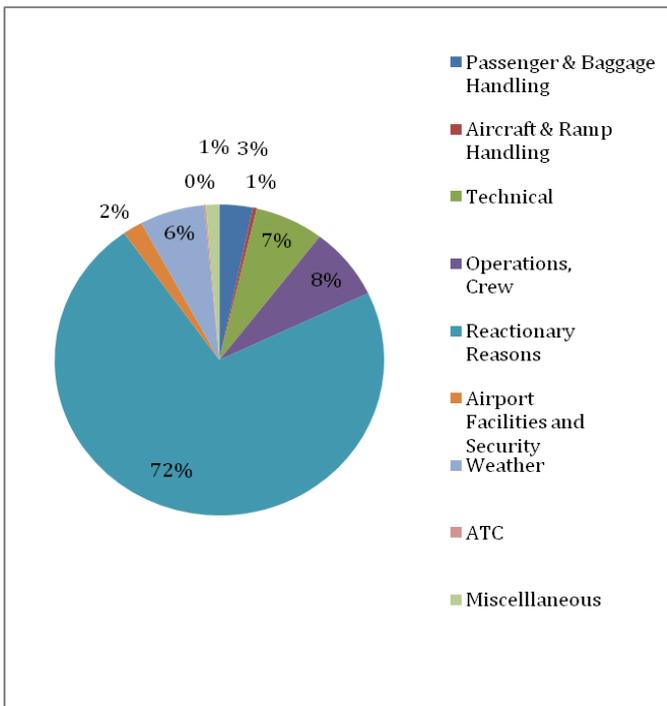
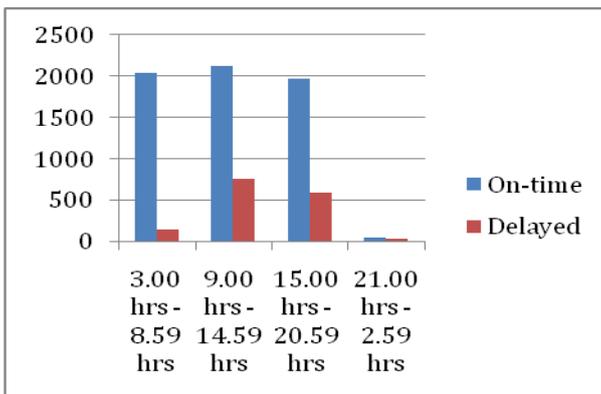**Chart - 3**: Major causes for delayed flights: Jan-Dec, 2015

Chart - 4: On-time and delayed flights comparison for different periods during the day - Nov 2015
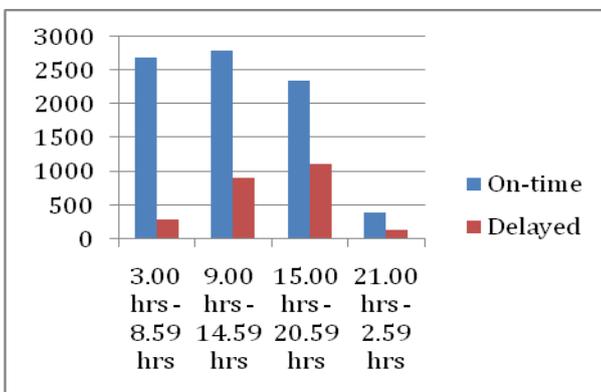

Chart - 5: On-time and delayed flights comparison for different periods during the day - Dec 2015

Charts 4 and 5 display the on-time performance for different time periods during the day for the months Nov 2015 and Dec 2015 respectively. It determines that, in the 1st slot, 3.00 hrs to 8.59 hrs, even though the number of departures is high, the delay percentage is comparatively less than the other 3 slots. Slots 2 and 3 have a similar and increased number of delays. On the other hand, the last slot, 21.00 hrs to 2.59 hrs has the maximum delay percentage even though the number of departures is extremely low.

2. DEALING WITH DELAYS:

Considering the causes of delays mentioned in Chart 3, amongst the ones with high possibilities, we will further discuss how delays due to Weather and Reactionary reasons can be worked upon using Big Data.

2.1 Weather and Big Data

The most common and traditional method used to track weather conditions is the usage of Weather Satellites which include information on cloud cover, storm location, temperature and heat balance in the earth's atmosphere[3].

The large amounts of weather related data that are collected by these satellites over the years can be analyzed for further weather predictions. These analyses combined with current satellite data will yield more accurate results about the weather, thus enabling airlines to take appropriate measures well in advance.

Consider an example where a passenger who wants to travel from Mumbai to Chennai has booked a seat on the flight whose route originates at Delhi and goes up to Chennai, via Mumbai. Unfortunately, the weather at Indira Gandhi International Airport, Delhi is not very favourable for the flight to depart on time, due to which passengers boarding from Mumbai will also be affected. In such cases, if there are predictions of the weather well in advance, airlines may be able to inform passengers boarding from Mumbai about the possible delay and may also be able to offer them a seat on an alternate flight.

2.2 Reactionary Reasons

Some of the reactionary reasons such as awaiting load of passengers from another flight, awaiting crew from another flight and late arrival of aircraft from another flight may also be due weather conditions in another destination. In such cases, these circumstances may also be manageable due to Big Data's help in determining bad weather.

In the cases while awaiting load of passengers from another flight, these passengers may be transferred to a flight that is scheduled later, provided there are seats available. Similarly, when awaiting crew from another flight, if it is known well beforehand about a delay due to the weather, arrangements can be made for another crew. However, in cases of late arrival of aircraft from another flight, making arrangements for another aircraft could be too expensive for airlines.

3. CONCLUSIONS

Big data and the airline industry have a long way to go. Many other analyses, other than those mentioned in this paper may prove efficient to manage delays. However, this paper does not talk about the cost associated with these approaches to manage delays. Before accepting an approach, airlines need to measure the cost associated with it so as to meet revenue targets. United Airlines has already been following an approach to collect and analyze data that helps customers to track their bags, provides personalized offers to customers, flight upgrade offers, etc[4].

REFERENCES

[1] www.newdelhiairport.in – On-time performance data for the year 2015.

[2] www.wikipedia.org – IATA Delay Codes.

[3] www.infoplease.com - Weather Satellite.

[4] www.fortune.com - Big data and airline industry.

[5] Dr Andrew Cook (PrincipalResearch Fellow), Graham Tanner (Research Fellow), "The challenge of managing airline delay costs".