COMP 4304 - PROJECT FINAL

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Dear client,

To address the overarching objective of enhancing the safety of Canadian air space, we have taken a deeper dive into the data and identified four key areas where efforts should be focused to improve the safety of Canadian air space.

Our initial analyses enabled us to pinpoint three subdivisions of the data set. We believe it has the potential to reveal crucial information for impactful insights. We set out to:

1. Discover the cause of incidents for De Havilland Series 8 model planes, as it contributed to 92% of incidents from De Havilland's 15% share of commercial incidents.

2. Determine the prevalent categories of incidents that occur with Boeing airplanes, given that they are the leading providers of passenger planes for extended travel.

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In the first **exploratory** visualization (Fig. 1), we looked at data on commercial incidents and discovered that De Havilland aircraft accounted for 15% of incidents. More particularly, we noticed that of the over 1000 incidents that occurred using this manufacturer's planes, the DHC-8 series models stood out as they were involved in 92% of incidents.

In the second **interactive explanatory** plot (*Fig. 2*), we delved deeper to find the major causes of incidents for the DHC-8 series models. For this, we made an interactive pie chart widget to display the causes of non-emergency incidents for each plane model. Through these visualisations, we were able to identify "engine" and "smoke/fire" as the leading causes of incidents on all models except the DHC-8-200 model, which had no non-emergency incidents, and a considerable amount of mechanical failures on the DHC-8-400 in the form of "Unable to perform" and "Difficult to control." These plots encourage an emphasis on proper checks for engine reliability for the DHC-8 series models, especially with regard to overheating of component parts and proper attention to mechanical issues that may be linked to difficulty in controlling the aircraft.

In the third plot (Fig. 3), - **Derived Data Visualization (explanatory)**, we jump in to explore the fact that the aircraft responsible for the largest number of flight incidents is BOEING (contributing a whole 12.23%)). On the X axis, we have extracted the year from the 'date' column. We converted the date from a string object to a date time object using the 'to_datetime()' function and hence derived the year so we could look at the yearly incidents

that took place for aircraft make: BOEING across 1998-2022. The figure displays the top 5 incident types (excluding Emergency/Priority) using data filtered for BOEING aircraft. We come to the conclusion that “engine”, “smoke/fire” and "difficult to control" seem to be reducing in number over time. Another interesting deduction is that "unable to perform" is increasing.

The fourth **exploratory** diagram (Fig. 4) illustrates multiple donut charts that depict the top four incidents, based on region, that occurred in the past twenty-five years for commercial planes. For this particular plot, we have excluded the incident type - Emergency/Priority as it is an event that is ungovernable and unpredictable. We also restricted the operation type strictly to commercial flights. We created this plot trying to explore more about the different incidents across Canada. As we can see from the plot, Quebec and Central have had the most pilot error/Weather issues. It is indeed because of the extreme weather conditions in Canada. We also notice that the Western region has the most engine issues.

Recorded presentation -> COMP 4304 video presentation

Fig. 1

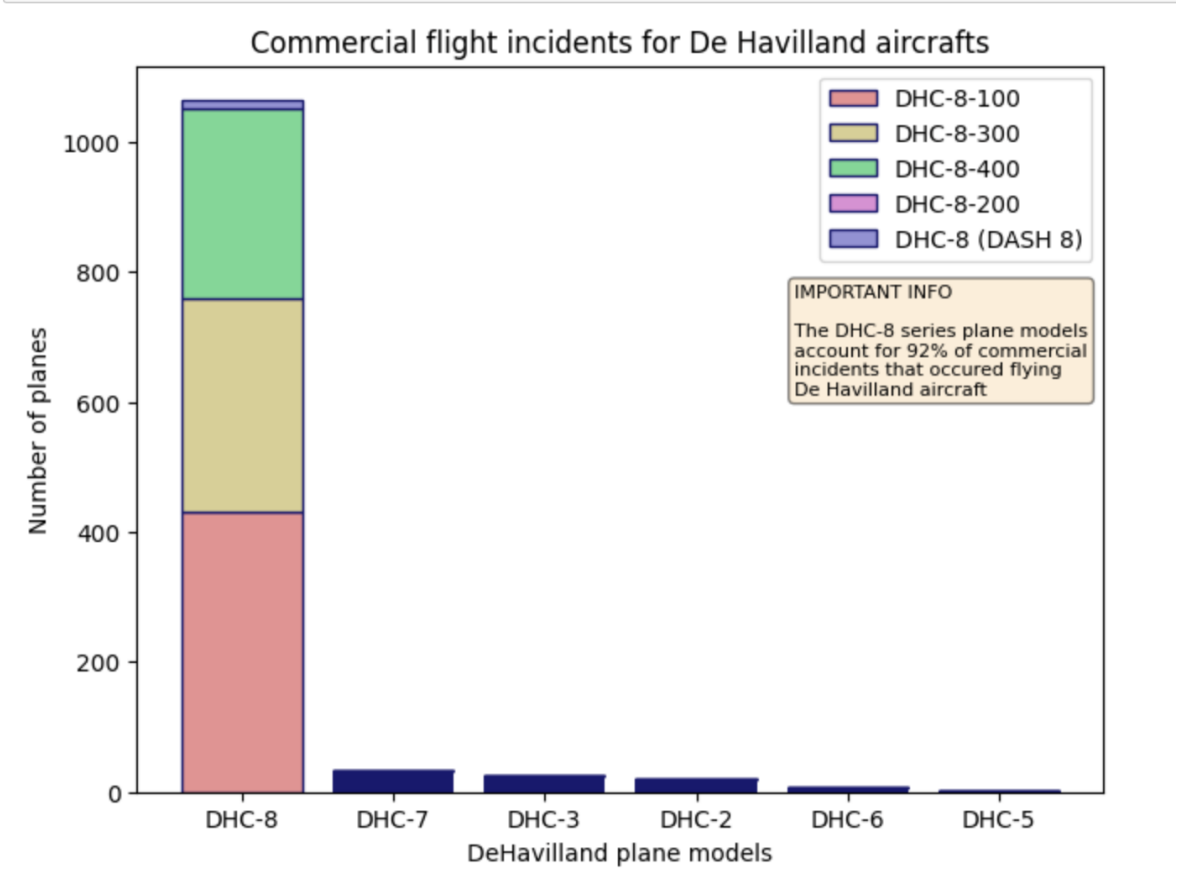


Fig. 2

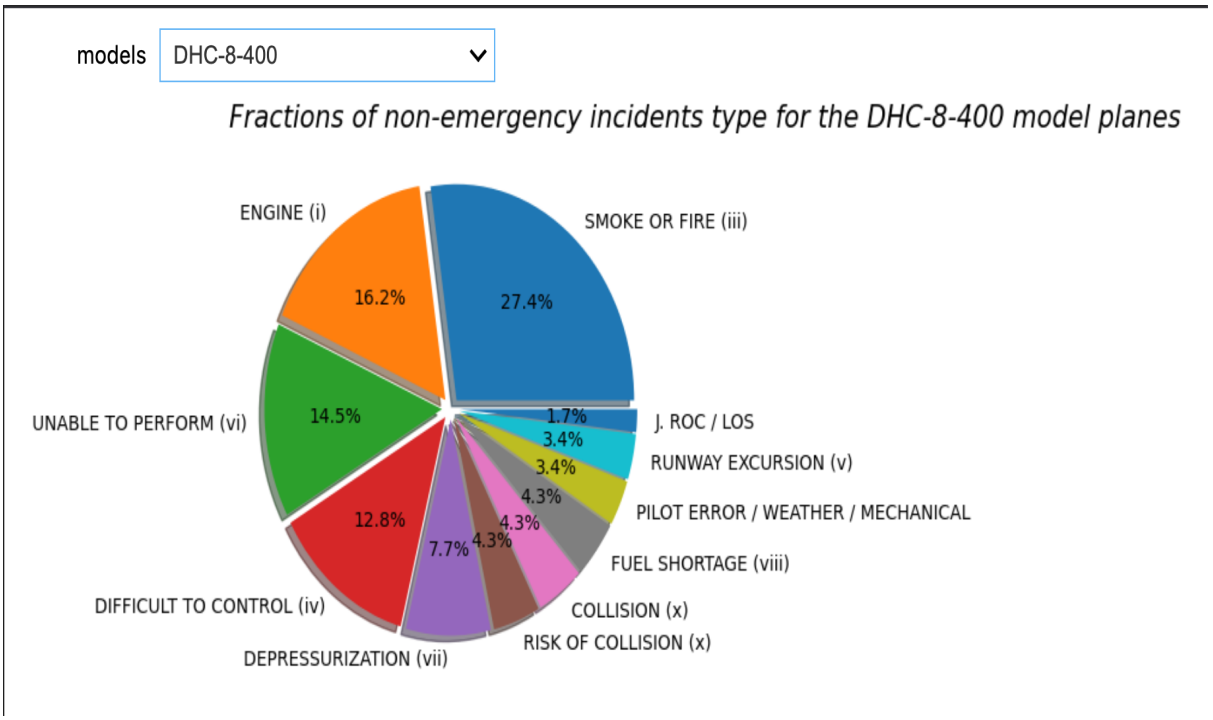

models
DHC-8-400
Fractions of non-emergency incidents type for the DHC-8-400 model planes
ENGINE (i)
SMOKE OR FIRE (iii)
16.2%
27.4%
UNABLE TO PERFORM (vi)
14.5%
1.7%
J. ROC / LOS
3.4%
RUNWAY EXCURSION (v)
3.4%
4.3%
PILOT ERROR / WEATHER / MECHANICAL
12.8%
4.3%
FUEL SHORTAGE (viii)
7.7%
4.3%
DIFFICULT TO CONTROL (iv)
COLLISION (x)
RISK OF COLLISION (x)
DEPRESSURIZATION (vii)

Fig. 3

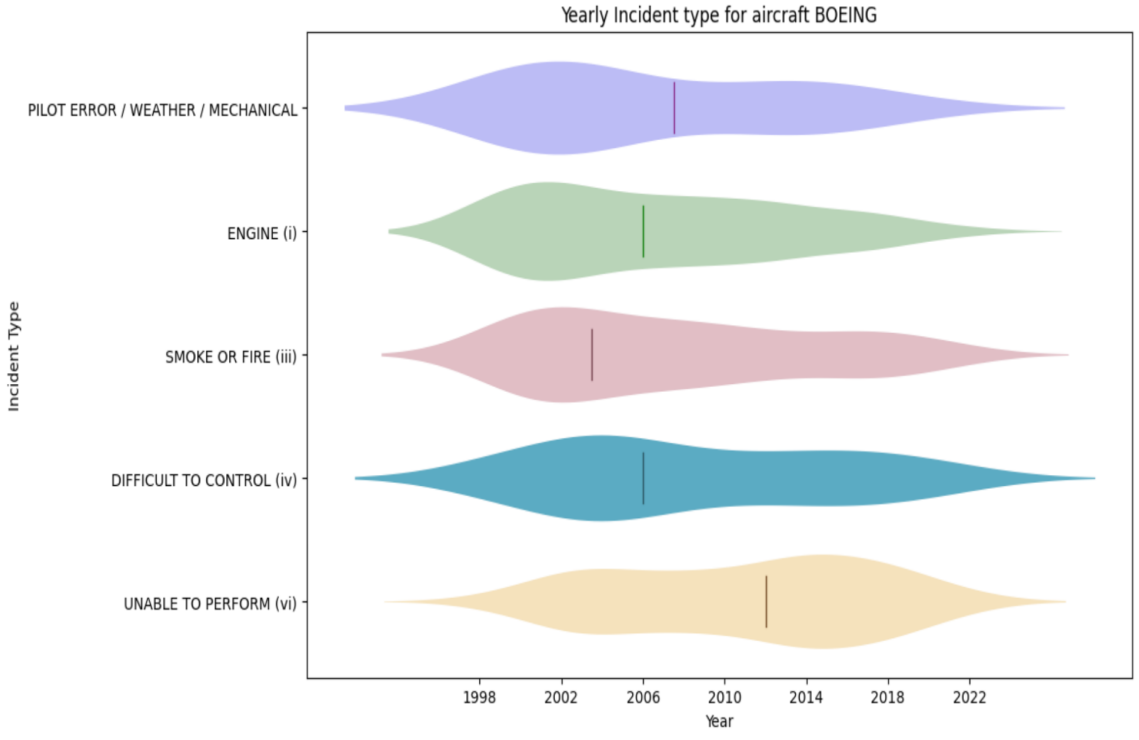
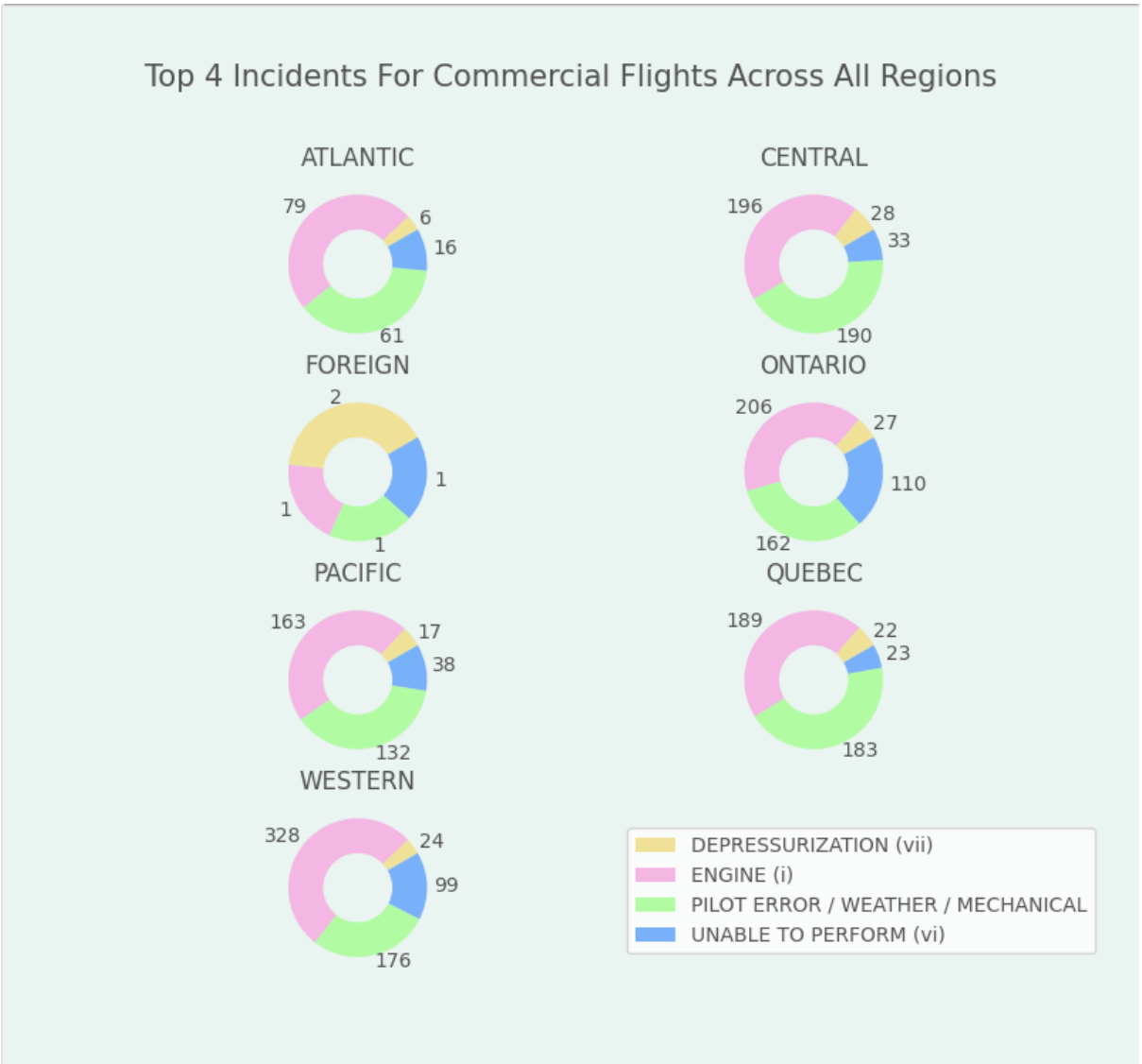

Yearly Incident type for aircraft BOEING
PILOT ERROR / WEATHER / MECHANICAL
ENGINE (i)
SMOKE OR FIRE (iii)
DIFFICULT TO CONTROL (iv)
UNABLE TO PERFORM (vi)
Incident Type
1998
2002
2006
2010
2014
2018
2022
Year

Fig. 4


Top 4 Incidents For Commercial Flights Across All Regions
ATLANTIC
79
6
16
61
CENTRAL
196
28
33
190
FOREIGN
2
1
1
1
ONTARIO
206
27
110
162
PACIFIC
163
17
38
132
QUEBEC
189
22
23
183
WESTERN
328
24
99
176
DEPRESSURIZATION (vii)
ENGINE (i)
PILOT ERROR / WEATHER / MECHANICAL
UNABLE TO PERFORM (vi)