Recurring Defect Clustering
10th Montreal Industrial Problem-Solving Workshop

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First flight from Vancouver to Seattle

September 1, 1937
First airline to install alcohol de-icing nozzles
1943

First trans-Atlantic flight, Montreal to Prestwick
TCA’s
3 millionth
passenger
Installation of anti-skid brakes

1950s
First female pilot, Captain Judy Cameron

1977

2015
1988

Privatization of Air Canada
First carrier to make its European flights non-smoking

1990s

Debut of self-service kiosks
2000s

Merger with Canadian Airlines

Hostile takeover bid

SARS

9-11
Celebrating over 80 years
2020 – Covid 19
Unprecedented in Aviation history
Also 2020…

The Rise of Artificial Intelligence
A Road to Recovery
Recurring Defect Clustering

The problem we are here to solve
Context – what does recurring mean?

• To no surprise to yourself, aviation is a highly regulated industry. We literally fly thousands of tons of metal through the sky with tens of thousands of tons of jet fuel...

• Transport Canada (TC) regulates that we must track recurring defects for safety purposes, meaning defects that after they are resolved, recur again within a given time horizon.
  – The TC requirement at a minimum is to track 3 defects that recur within 15 flight segments.

• The actions we take thereafter identifying recurring defects is we change our maintenance program requirements to address these findings to prevent them from recurring in the future.
Context – What are defects?

• At any Airline we are mandated to have a maintenance program to upkeep the airworthiness of all our Aircraft.
  – Maintenance programs and limitations are defined by the original aircraft manufacturers and by our Engineers. It basically tells us when to replace parts and do inspections on various different parts of the aircraft.

• The reality though is that at times things break on an aircraft before the maintenance program requirement is due to be addressed.
  – We call these ‘Defects’ and have a process to support the tracking of all occurrences.
  – The degree of accuracy in the report though varies based on the reporter's level of technical proficiency.

• Defects can be classified in 2 high level categories as Minimum Equipment List (MEL) and non-MEL, then sub divided further.
The Problem

• Classification of these defects at a detailed level is an extremely manual process.

• While MEL’s provide unique identifiers to cluster defects, Non-MEL’s do not have consistent unique identifiers (ie ATA codes).

• In addition, abbreviations and acronyms are widely used when describing the defects being reported.

• Therefore data mining in the traditional sense, doesn’t work very effectively, and as a result we are forced to do a lot of manual work to identify and comply to the requirements set forth by TC.
Desired Solution

• Air Canada Maintenance wishes to detect recurring defects automatically that meets and exceeds Transport Canada requirements for both MEL and Non-MEL defects.

• For this workshop, the goal will be to automatically detect recurring intervals of 3 defects in 30 days (level 1), 4 in 40 days (level 2) and 5 in 50 days (level 3).

• The desired solution would leverage natural language processing (NLP), to cluster defects based on their description and other attributes to be provided that are the same in nature for the same aircraft given the above recurrent alert levels.

• Additionally, Air Canada desires to re-label reports with ATA Chapter/Section labels in a more exact way, to sanitize our dataset.
Questions?