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**KULLIYAH OF INFORMATION & COMMUNICATION TECHNOLOGY**

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**INFO 4311 DATA WAREHOUSING**  
**SEMESTER 1, 2024/2025**  
**SECTION 01, GROUP A**

**GROUP PROJECT:**  
**DESIGN OF A STAR SCHEMA DATA WAREHOUSE**  
**Aviation Accident (2021 - 2023)**

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## 1.0 BUSINESS PROCESS

### Airline Safety Monitoring:

Tracking and analyzing airplane accidents to improve airline safety and operational efficiency. This process will leverage insights from the accident data to identify trends, reduce future accidents, and enhance resource allocation for safety protocols.

## 2.0 KEY PERFORMANCE INDICATOR(s)

1. **Total Number of Accidents:** Count of accidents over a time period.
2. **Fatality Rate:** Number of fatalities divided by total people aboard.
3. **Accidents by Aircraft Type:** Count of accidents grouped by aircraft type.
4. **Accidents by Operator:** Identify operators with the highest accident rates.
5. **Accidents by Location:** Identify high-risk areas.

## 3.0 DIMENSIONAL MODEL

Data Warehouse Bus Matrix

Business Process	Fact Table	Granularity	Facts	Date	Aircraft	Operator	Location	Accident Summary
Airline Safety Monitoring	PlaneAccidentFacts	One record per accident	AccidentCount, Fatalities, Aboard, Ground	X	X	X	X	X

## **Fact Table:**

- Fact Table Name : PlaneAccidentFacts
- Grain : One record per accident.
- Facts :
  - AccidentCount (Derived: always 1 per record).
  - Fatalities (Sum of fatalities in the accident).
  - Aboard (Total people aboard).
  - Ground (Number of ground casualties).

## **Dimension Tables:**

1. Date Dimension:
  - Helps analyze trends over time.
  - Columns: DateKey, FullDate, Year, Month, Day, Weekday.
2. Aircraft Dimension:
  - Details about the aircraft involved.
  - Columns: AircraftKey, AC\_Type, Registration, Construction\_no\_line\_no.
3. Operator Dimension:
  - Information about operators.
  - Columns: OperatorKey, OperatorName.
4. Location Dimension:
  - Details about the location of the accident.
  - Columns: LocationKey, LocationName.
5. Accident Summary Dimension:
  - Provides qualitative information about accidents.
  - Columns: SummaryKey, SummaryText.

## **4.0 BENEFITS**

The dimensional model and KPIs would:

**1. Identify Trends:**

- Track high-risk areas, operators, and aircraft types.
- Analyze seasonal trends in accidents to improve scheduling and maintenance.

**2. Improve Safety Protocols:**

- Use fatality and ground casualty data to identify factors leading to severe accidents.
- Enhance operator safety training programs based on high-accident operators.

**3. Optimize Resources:**

- Focus resources on high-risk aircraft types, routes, and operators.

**4. Facilitate Decision-Making:**

- Provide insights for policymakers and regulatory authorities to enforce stricter safety measures.

## 5.0 DETAILED DIMENSIONAL DESIGN

### Plane Accident Dimensional Modelling

#### 5.1 DIMENSION TABLES

##### DimAircraft

Table Name	DimAircraft														
Table Type	Dimension														
Table Description	Provides details about the aircraft involved in events.														
Column Name	Description	Unknown Member	Example Values	SCD Type	ETL Rule	Data Type	Size	Key	FK To	Null	Default Value	Source System	Source Table	Source Field Name	Source Data Type
AircraftKey	Surrogate primary key for the aircraft	-1	1	Auto-generated sequential key	int			PK		N		Derived	Derived		
AC_Type	Type of the aircraft	-1	Boeing 737-524	Extract from source field	varchar				N			Plane Accidents Dataset	Plane Accidents Dataset	AC Type	Text
Registration	Aircraft registration number	-1	PK-CLC	Extract from source field	varchar				N			Plane Accidents Dataset	Plane Accidents Dataset	Registration	Text
Construction_no_line_no	Aircraft construction and line number	-1	27323/2616	Extract from source field	varchar				N			Plane Accidents Dataset	Plane Accidents Dataset	Construction no /line no	Text

##### DimDate

Table Name :	DimDate														
Table Type :	Dimension														
Table Description	Standard Date Dimension														
Column Name	Description	Unknown Member	Example Values	SCD Type	ETL Rule	Data Type	Size	Key	FK To	Null	Default Value	Source System	Source Table	Source Field Name	Source Data Type
DateKey	Surrogate primary key YYYYMMDD	-1	20210109	Convert Date in datetime to int of format YYYYMMDD	int			PK		N		Derived	Derived	Date	DateTime
FullDate	Full date (business key)	-1	9/1/2021	Use Date as-is	datetime				N			Derived	Derived	Date	DateTime
Year	Year of the date	0	2021	Use function Year to extract Year	int				N			Derived	Derived	Date	DateTime
Month	Month of the date	0	1	Use function Month to extract Month	int				N			Derived	Derived	Date	DateTime
Day	Day part of the date	0	9	Use function Day to extract Day	int				N			Derived	Derived	Date	DateTime

## DimLocation

Table Descriptio Details of Location															
Column Name	Description	Unknown Member	Example Values	ETL Rule	Target							Source			
					Data Type	Size	Key	FK To	Null	Default Value	Source System	Source Table	Source Field Name	Source Data Type	
LocationKey	Surrogate primary key for location	-1	1	Auto-generated sequential key	int		PK		N		Derived				
LocationName	Name of the location	-1	Near Jakarta, Indonesia	Extract from source field	nvarchar	50			N		Plane Accidents Dataset	2021 Plane Accident, 2022 Plane Accident, 2023 Plane Accident	Location	nvarchar	

## DimOperator

Table Description Details of operator															
Column Name	Description	Unknown Member	Example Values	ETL Rule	Target							Source			
					Data Type	Size	Key	FK To	Null	Default Value	Source System	Source Table	Source Field Name	Source Data Type	
OperatorKey	Surrogate primary key for operator	-1	1	Auto-generated sequential key	int		PK		N		Derived				
OperatorName	Name of the operator	-1	Sriwijaya Air	Extract from source field	nvarchar	50			N		Plane Accidents Dataset	2021 Plane Accident, 2022 Plane Accident, 2023 Plane Accident	Operator	nvarchar	

## DimSummary

Table Description Accident Summary															
Column Name	Description	Unknown Member	Example Values	ETL Rule	Target							Source			
					Data Type	Size	Key	FK To	Null	Default Value	Source System	Source Table	Source Field Name	Source Data Type	
SummaryKey	Surrogate primary key for summary	-1	1	Auto-generated sequential key	int		PK		N		Derived				
SummaryText	Text of the summary	-1	One of the engines on the aircraft failed 10 minutes after takeoff. When the plane turned back, the second engine failed.	Extract from source field	nvarchar	700			N		Plane Accidents Dataset	2021 Plane Accident, 2022 Plane Accident, 2023 Plane Accident	Summary	nvarchar	

## 5.2 FACT TABLE

### PlaneAccidentFacts

Target											Source				
Column Name	Description	Unknown Member	Example Values	SCD Type	ETL Rule	Data Type	Size	Key	FK To	Null	Default Value	Source System	Source Table	Source Field Name	Source Data Type
AccidentKey	Surrogate primary key for each accident	-1	1		Auto-generated	int		PK		N		Derived			
DateKey	FK to DimDate	-1	20210109		Surrogate key pipeline lookup for dimension key lookup using	datetime		FK	DimDate.DateKey	N		DW	DimDate	DateKey	datetime
AircraftKey	FK to DimAircraft	-1	1		Surrogate key pipeline lookup for dimension key lookup using	int		FK	DimAircraft.AircraftKey	N		DW	DimAircraft	AircraftKey	int
LocationKey	FK to DimLocation	-1	1		Surrogate key pipeline lookup for dimension key lookup using	int		FK	DimLocation.LocationKey	N		DW	DimLocation	LocationKey	int
OperatorKey	FK to DimOperator	-1	1		Surrogate key pipeline lookup for dimension key lookup using	int		FK	DimOperator.OperatorKey	N		DW	DimOperator	OperatorKey	int
SummaryKey	FK to DimSummary	-1	1		Surrogate key pipeline lookup for dimension key lookup using	int		FK	DimSummary.SummaryKey	N		DW	DimSummary	SummaryKey	int
AccidentCount	Always 1 (Represent an accident)	-1	1		Hardcoded	int				N	1	Derived			
Fatalities	Total fatalities in an accident	-1	62		Extract from source field as it is	int				Y		Plane Accidents Dataset	2021 Plane Accident, 2022 Plane Accident, 2023 Plane	Fatalities	int
Aboard	Total aboard in an accident	-1	62		Extract from source field as it is	int				Y		Plane Accidents Dataset	2022 Plane Accident, 2022 Plane Accident, 2023 Plane	Aboard	int
Ground	Total ground in accident	-1	0		Extract from source field as it is	int				Y		Plane Accidents Dataset	2023 Plane Accident, 2022 Plane Accident, 2023 Plane Accident	Ground	int

## 5.3 DESIGN OF A STAR SCHEMA

