The Impact of Flight Operation Load During Pre-Covid, During Covid, and Post-Covid in Asia Aeronautical Training Academy (AATA)

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Abstract

The Covid-19 pandemic that has been spreading in the world has been affecting all types of the industry starting from its emergence and the aviation industry is one of the hardest-hit industries by the pandemic. One of the type of organizations in the aviation industry that is also affected by the pandemic and all of the restriction that has been imposed in the world to contain the spreading of the pandemic is the flight training organization. This study was conducted to study how Covid-19 has affected the AFTO in Malaysia, specifically in AATA. This study will analyze the flight usage, the fuel consumption, the fuel cost and the impact of the flight training from the data of the flight training which was obtained from FlightLogger.com and the fuel price which was obtained from index mundi.com. The data was collected starting from November 2019 to May 2022 where it was divided into three different periods which are pre-Covid, during Covid, and post-Covid. In conclusion, the highest number of flight usage was in April 2022, which is the post-Covid period, however, the highest amount of fuel consumption was in April 2021, which has the second-highest number of flight usage. The fuel cost analysis has discovered that the highest fuel cost was in April 2022 which has the second-highest fuel price. The aircraft emission was lower in the Covid period than in the post-Covid period, which means that air quality in the Covid period is higher.

1. Introduction

The Covid-19 pandemic which was first detected in Wuhan, China has forced countries all over the world to face various challenges in all aspect whether it be political, economic, social and many others [1]. Among any other industries, aviation was one of the hardest-hit industries by the pandemic [2] as it thrives on travelling and travelling was one of the bans that was imposed all over the world in order to contain the spreading of Covid-19 pandemic. The air traffic has declined dramatically that almost 7.5 million flights are cancelled at that time, and it was predicted that it will cost airline a loss of $372 billions of worldwide revenue [3].

In terms of flying academies worldwide, they have been forced to halt their operation for a certain period of time causing the piloting students to halt their flight training [4]. In Malaysia itself, flying academies and flying clubs were forced to stop their operation as Movement Control Order (MCO) and total lockdown was enforced in the whole country in an effort to control the spread of the Covid-19 pandemic. The Minister of Transport, Tan Seri Wee Ka Siong has said that the aviation industry in Malaysia is projected to lose RM 13 billion in year 2020 with RM 10.9 billion from Malaysian-based airlines and another RM 2.1 billion from the airport operators [5].

This has forced the airlines to retrench 10% of their employee and scaling down their company as a drastic measure to save the company[5].

Now, as Malaysia has started to enter the post-Covid period many of the restriction has been loosened up and the flight school has finally resumed their normal operation and the piloting students have resumed their flight training. However, their momentum was still lacking when compared to before the pandemic start [6]. This study has been done as although the study that involves AFTO is deemed to be unimportant now, it may not be the case in the future. This study may also help piloting students who wants to know on the performance of AATA.

The aim of this study is to obtain specific data on how does Covid-19 affects the Approve Flight Training Organization (AFTO) in Malaysia, specifically in AATA. The objectives of this study are:

- To study the performance of the aircraft used in AATA for flight training.
- To collect the flight data and schedule of flight training during pre-Covid, Covid, and post-Covid.
- To analyze the impact of flight operation during pre-Covid, Covid and post-Covid.

The duration of this study is from November 2019 until February 2020 for the pre-Covid period, from March 2020 until September 2021 for the Covid period, and from October 2021 until May 2022 for the post-Covid period. The type of the aircraft that was chosen for this study was the Diamond aircraft.

2. Methodology

In this study, the data was obtained from the FlightLogger website [7] which is the website that contains all information on flight training and scheduling in AATA. The steps below are taken in order to achieve the aim and objectives of the study.

2.1 Familiarizing with FlightLogger

The first step that was done in this study is to familiarize with how to navigate the website to obtain the data. The flight training data was on the booking page and the familiarization with this website will make it easier to obtain the past data without messing up other data on the website. This step will save the time to search for a certain date to obtain the flight data that was needed.

2.2 Capturing the Data

The next step that was done after familiarizing with the FlightLogger website was to capture the flight training data. The data captured were transferred into a table to make it easier for the future calculation of the analysis. The three aircraft in AATA that have been chosen for this study are 9M-MIN, 9M-KEN, and 9M-DUA. The data that were captured are the number of flights and the total hour of flight. The data was divided into three different periods, the pre-Covid period, the Covid period, and the post-Covid period. The data was then further sorted into different types of aircraft and months. Figure 1 below shows the example of how the data was sorted into a table.

Fig 1 *Example of tables for 9M-DUA, a DA42 NG series*

2.3 Data Trending

When all of the data has been obtained, an analysis will be done based on the data that has been obtained. However, there is no written analysis done but a prediction will be made based on the data that has been obtained. The prediction will be on the future data and also the trend of it, whether it will increase or decrease. The prediction is solely for the post-Covid period as the data for the pre-Covid and Covid periods have been obtained.

2.4 Data Analysis

After studying the data trending above, four comprehensive analyses will be made based on the derivation of the data obtained from the flight training. The analyses done in this study are aircraft usage analysis, fuel consumption analysis, fuel cost analysis, and impact of flight training analysis.

2.4.1 Aircraft Usage

The data for this analysis that was obtained from FlightLogger website was placed into a table and then transferred to a graph. This is to make it easier to show the trend of the aircraft usage in the three different periods. Then, a comprehensive analysis for all three different periods will be made based on the data that was obtained. Fig. 2 below is the steps taken in this analysis.
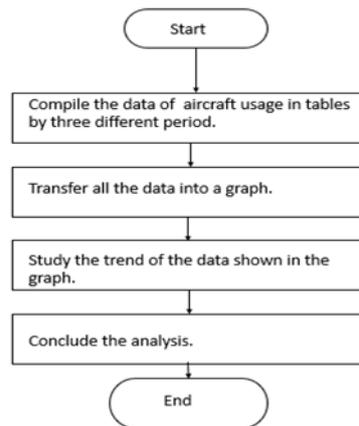

Fig. 2 *Steps taken in aircraft usage analysis*

2.4.2 Fuel Consumption

In this analysis, the data from the aircraft usage was calculated in order to obtain the amount of fuel that was consumed by the aircrafts. The aircrafts used in AATA is the two types of Diamond aircraft, DA 40 NG and DA 42 NG. The calculation to obtain the amount of fuel consumption is done using the equation:

$$Amount\ of\ fuel\ (l) = Total\ hour\ of\ flight\ (hour) \times Fuel\ consumption\ \left(\frac{l}{hour}\right) \tag{1}$$

The data for the fuel consumption was obtained from the general specification of the Diamond aircrafts as shown in Table 1 and Table 2 below. The data of the calculation then were placed into a table and then transferred into a graph for the analysis. The steps taken in this analysis are as shown in Fig. 3 below.

Table 1 *Specification of DA40 NG [8]*

Specification	Value
Length	8.06 m
Height	1.97 m
Wingspan	11.63 m
Empty weight	900 kg
Max. **take-off** mass	1310 kg
Max. speed	285 km/h TAS
Stall speed	107 km/h CAS
Rate of climb	3.5 m/s
Max. operating altitude	5000 m
Range at 60%	1741 km
Fuel consumption	19.5 l/h

Table 2 *Specification of DA42 NG [9]*

Specification	Value
Length	8.56 m
Height	2.49 m
Wingspan	13.55 m
Empty weight	1410 kg
Max. **take-off** mass	1999 kg
Max. speed	365 km/h
Stall speed	113 km/h
Rate of climb	7.9 m/s
Max operating altitude	5486 m
Range at 60%	2250 km
Fuel consumption at 60%	39.4 l/h

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                    ┌─────────┐
                    │  Start  │
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        ┌────────────────────────────────────┐
        │  Collect the data of total flight hour.  │
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        │  Calculate the fuel consumed by using the equation (1).  │
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        │  Record the data and transfer it into a graph.  │
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        │            Analyze the data.            │
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        │          Conclude the analysis.          │
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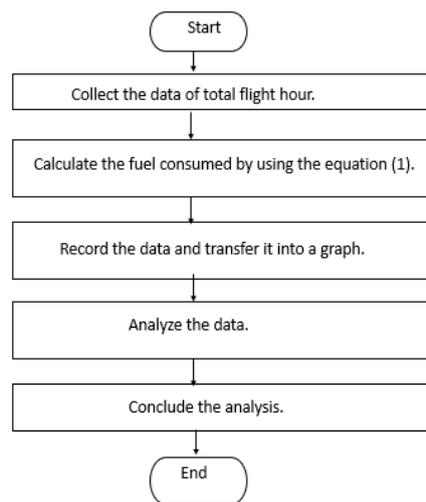**Fig. 3** *Steps taken in fuel consumption analysis*

The example of the calculation done in this step is shown below:

$$Fuel\ consumed\ (l) = 2.4\ (hours) \times 19.5(\frac{l}{hour})$$
$$= 46.8\ litres$$

2.4.3 Fuel Cost

The analysis of fuel cost was done after obtaining the data from the previous analysis which is the fuel consumption analysis. The equation that is used in this analysis is as follows:

$$Fuel\ cost\ (RM) = The\ amount\ of\ fuel\ used\ (l) \times The\ price\ of\ the\ fuel\ per\ litre\ \left(\frac{RM}{l}\right) \tag{2}$$

The fuel price data was obtained from index mundi.com [10] where the price of Jet A1 fuel, which is the type of fuel that Diamond aircraft used can be found. The data calculated was then placed into a table and a graph in order for the trend of the data to be seen clearly to create an analysis. Fig. 4 below shows the steps in the fuel cost analysis.
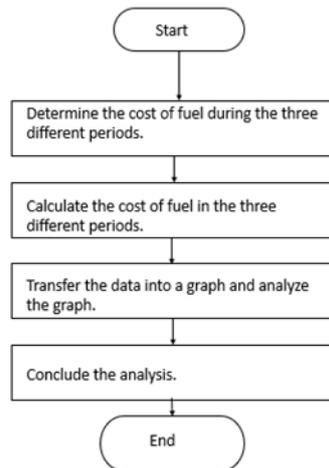
Fig. 4 *Steps taken in fuel cost analysis*

The example of calculation in this analysis is as shown below:

$$Fuel\ cost(RM) = 39.4\ (litres) \times 2.0\ (\frac{RM}{litres})$$
$$= RM\ 78.80$$

2.4.4 Impact of Flight Training

In this analysis, the study was done by comparing the data frequency of scheduling for the flight training between the three different periods. From the scheduling data, the impact of Covid-19 on the operation of AATA can be seen clearly as the frequency of the flight training can represent the situation in a flight academy itself.

The economic situation of AATA can also be inferred from the frequency of flight training as the cost analysis also depends on the frequency of the flight training. The aircraft emission can also be inferred theoretically by the frequency of the flight training done in the three different periods. This is because the quality of air can be predicted based on the aircraft emissions which were inferred from the frequency of aircraft usage.

3. Results

3.1 Aircraft Usage

The data of the aircraft usage was arranged into a table as shown in Appendix A. The trend shown in Figure 5 below shows that the aircraft usage shows an overall increasing trend of aircraft usage starting from September 2020 until May 2021 where the total flight dropped because the total lockdown was enforced in Malaysia. The total flight starts to increase again starting October 2021 until May 2022 as Malaysia enters the post-Covid period. For the pre-Covid period, the total flights were almost negligible as the flight training has not yet started as AATA has only recently started. Thus, the data from the pre-Covid period is not considered in the analysis. From March 2020 until August 2020, there has been no flight at all as Malaysia is under MCO.
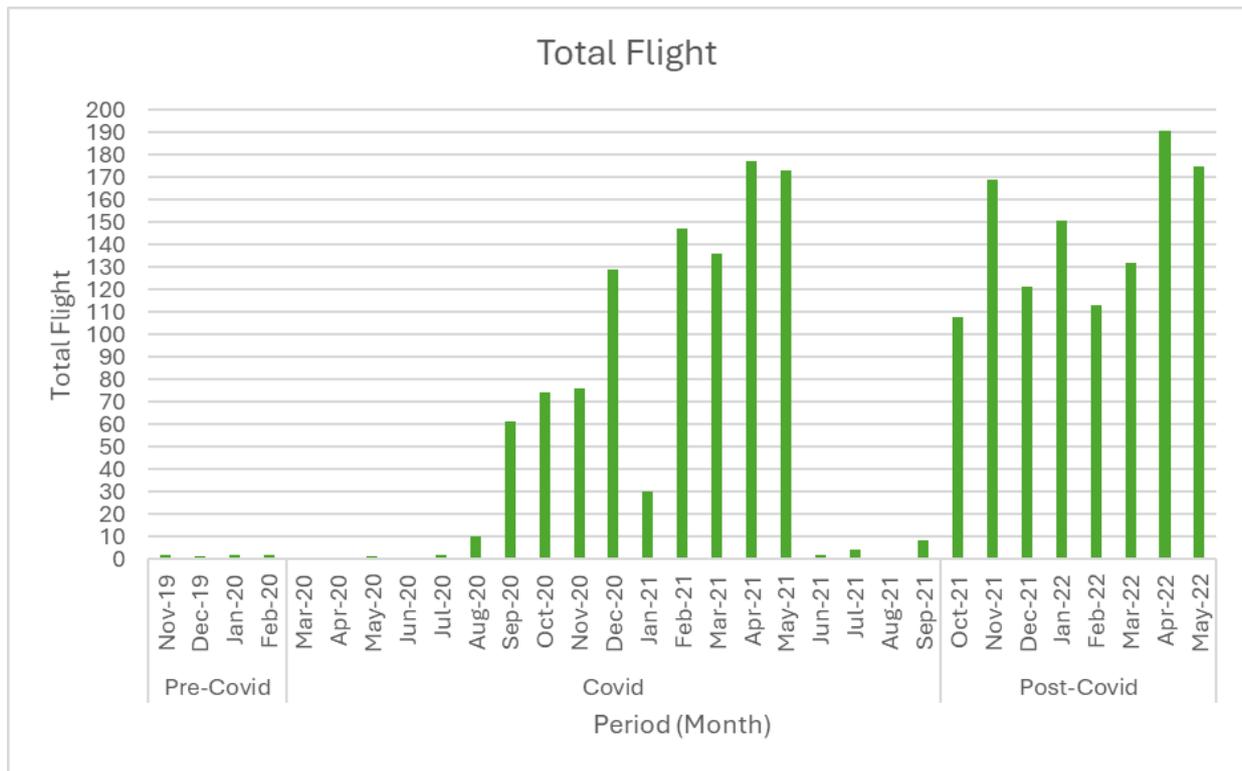
Fig. 5 *Total flight of all three aircraft in three different periods*

3.2 Fuel Consumption

As the amount of fuel consumption is dependent on the number of flights in that period, it can be seen from Fig. 6 below that when the total flight is high, the amount of fuel consumed is also high. The calculation for this analysis is as shown above in the example of calculation for fuel consumption. The highest amount of fuel consumed was from April 2021 when the total flight was 177 flights. The second-highest amount of fuel consumed was in April 2022 where 5410.47 litres of fuel were consumed with 191 flights in total. The reason for the high fuel consumption despite having a lower number of flight usage can be attributed to the fact that it has a higher cumulative amount of time-of-flight training.
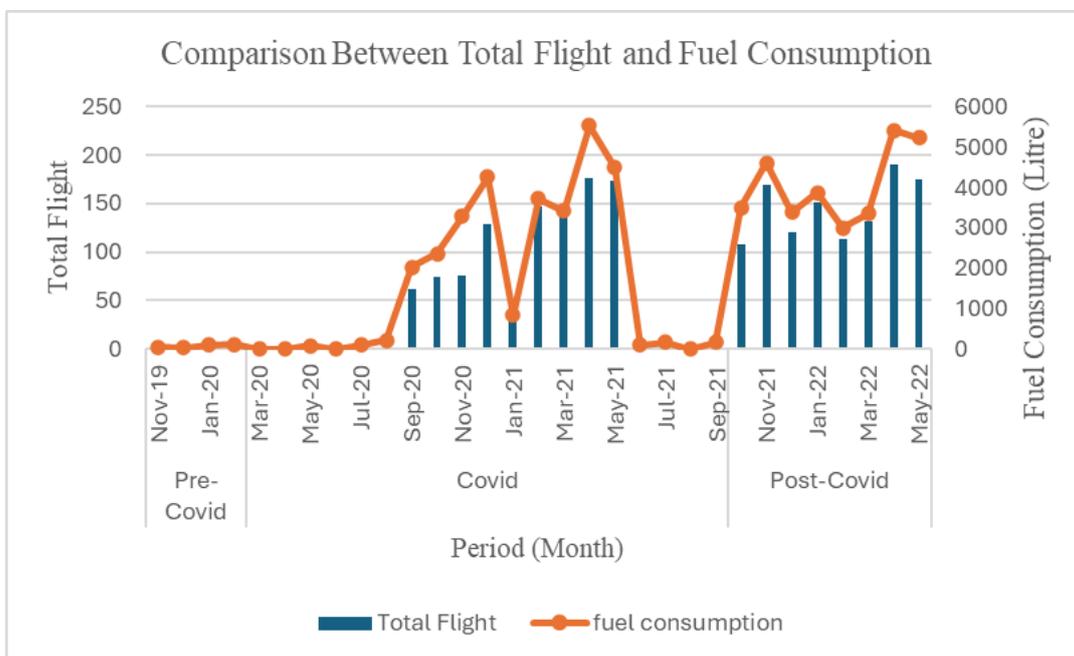

Fig. 6 *Comparison between total flight and fuel consumption in three different periods*

3.3 Fuel Cost

The calculation of the fuel cost is very dependent on the amount of fuel consumed and the price of fuel. Hence, when the fuel price increases, the fuel cost will also increase. As shown in Fig. 7 below, the highest fuel cost is obtained from April 2022, which was RM 23,940.33 whereas the fuel price is RM 4.41. The second-highest fuel cost was in May 2022 which was RM 23,653.83 whereas the fuel price is RM 4.51. The lowest fuel price was RRM 0.70 which was the lowest fuel price due to the Covid. In April 2021, although it has the highest amount of fuel consumed, as the price of fuel at that month is only RM 1.82, it has a much lower fuel cost than in April 2022. From this, it can be seen that the fuel cost is higher in the post-Covid period compared to the Covid period as the fuel price continue to increase. It shows that AATA has spent more on fuel costs in the post-Covid period than the Covid period.
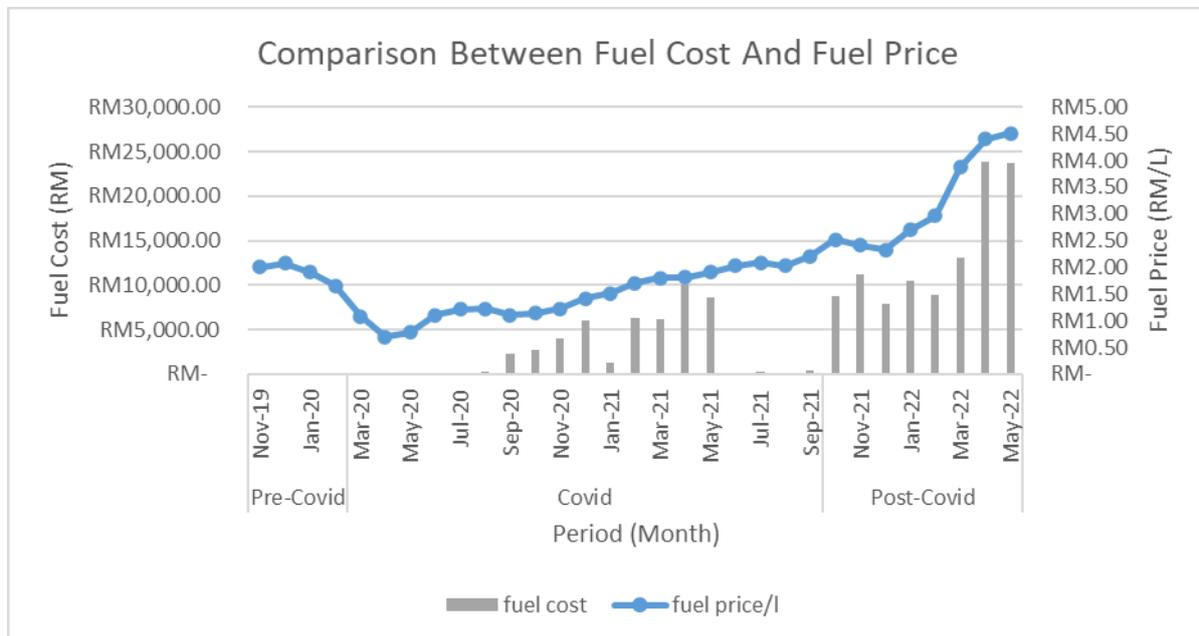

Fig. 7 *Comparison between fuel cost and fuel price in three different periods*

3.4 Impact of Flight Training

From the previous analyses done, it is clear that as the data from pre-Covid can be ignored as AATA has not yet started their flight training, the data compared was from the Covid period and the post-Covid period. In the Covid period, the aircraft scheduling has increased overall with the sudden drop that was caused by MCO and lockdown. From the aircraft usage analysis above, it was concluded that the amount of flight usage in the post-Covid period is higher than the Covid period. From this small conclusion, it was inferred that the aircraft emission in the Covid period was lower than the post-Covid period. This also means that the air quality is higher in the Covid period.

4. Conclusion

This study has been done to study how Covid-19 affects the AFTO in Malaysia, specifically AATA. Several analyses have been conducted to achieve the objectives of the study which were the aircraft usage analysis, fuel consumption analysis, fuel cost analysis, and analysis of the impact of flight training. In the process of completing the first objective, the first step was to identify the aspect of performance that will be studied and the analysis of fuel consumption was selected. In the analysis, it was concluded that the cumulative fuel consumption during the post-Covid period is higher than the Covid period.

In achieving the second objective, which was collecting the flight data and the schedule of flight training, it was achieved when the data of the number of flights and the duration of the flights were recorded. The analysis of flight usage, fuel cost, and the impact of flight training was done to achieve the third objective, which is to analyze the impact of flight operation during the three periods. In the flight usage analysis, the conclusion for this analysis is that the highest cumulative flight usage is in the post-Covid period.

Next, the conclusion that is achieved in the fuel cost analysis is that the highest fuel cost in AATA is in the post-Covid period as the highest fuel price is from this period. in the final analysis, which is the impact of flight training, it was found that the highest aircraft emissions are from the post-Covid period while the highest quality

of air is from the pre-Covid period. With all of the three objectives of the study achieved by the steps taken as shown, the aim of this study has been successfully completed.

Acknowledgement

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Engku Sofiah Engku Muhammad Azmi, Mohammad Fahmi Abdul Ghafir; **data collection:** Engku Sofiah Engku Muhammad Azmi; **analysis and interpretation of results:** Engku Sofiah Engku Muhammad Azmi, Mohammad Fahmi Abdul Ghafir; **draft manuscript preparation:** Engku Sofiah Engku Muhammad Azmi. All authors reviewed the results and approved the final version of the manuscript.

Appendix A: Data of the Analysis

Period	Month	Total Flight	Fuel Consumption	Fuel Cost (RM)	Fuel Price per litre (RM/l)
Pre-Covid	Nov-19	2	39.4	RM 78.80	RM 2.00
	Dec-19	1	21.67	RM 44.94	RM 2.07
	Jan-20	2	98.5	RM 188.42	RM 1.91
	Feb-20	2	102.44	RM 169.74	RM 1.66
Covid	Mar-20	0	0	RM 0	RM 1.08
	Apr-20	0	0	RM 0	RM 0.70
	May-20	1	82.74	RM 65.06	RM 0.79
	Jun-20	0	0	RM 0	RM 1.11
	Jul-20	2	90.62	RM 110.47	RM 1.22
	Aug-20	10	209.62	RM 257.74	RM 1.23
	Sep-20	61	2022.84	RM 2,231.00	RM 1.10
	Oct-20	74	2369.4	RM 2,719.50	RM 1.15
	Nov-20	76	3279.64	RM 4,041.14	RM 1.23
	Dec-20	129	4254.75	RM 6,039.72	RM 1.42
	Jan-21	30	825.07	RM 1,247.40	RM 1.51
	Feb-21	147	3728.16	RM 6,374.27	RM 1.71
	Mar-21	136	3414.48	RM 6,153.27	RM 1.80
	Apr-21	177	5542.44	RM 10,061.21	RM 1.82
	May-21	173	4491.81	RM 8,568.81	RM 1.91
	Jun-21	2	94.56	RM 191.61	RM 2.03
	Jul-21	4	167.01	RM 349.00	RM 2.09
	Aug-21	0	0	RM 0	RM 2.02
	Sep-21	8	165.7	RM 365.06	RM 2.20
Post-Covid	Oct-21	108	3499.8	RM 8,827.99	RM 2.52
	Nov-21	169	4612.32	RM 11,135.28	RM 2.41
	Dec-21	121	3378.09	RM 7,879.24	RM 2.33
	Jan-22	151	3877.58	RM 10,486.86	RM 2.70
	Feb-22	113	3002.97	RM 8,897.98	RM 2.96
	Mar-22	132	3358.04	RM 13,006.87	RM 3.87

	Apr-22	191	5410.47	RM	23,840.33	RM	4.41
	May-22	175	5239.51	RM	23,653.83	RM	4.51

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