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Study of Increasing Apron Facilities of Husein Sastranegara Airport Bandung

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Abstract Husein Sastranegara International Airport is an airport located in Bandung, West Java, Indonesia. In addition to serving the community, the airport is also one of the military air force bases. Increased economic growth after the monetary crisis and the emergence of many Low-Cost Airline (LCA) will trigger an increase in air transport movements at Husein Sastranegara airport, which in the next stage returns the movement pattern to the pattern of movements before the 1997 crisis, namely patterns that are in line with regional economic growth Bandung Raya (Bandung City and Regency, Sumedang Regency and Cimahi City). It is believed that the current airport facilities will not be able to accommodate requests during peak hours in the future, so it needs evaluation and analysis of facility requirements and facility development planning up to the year of development limits.

Keywords Airport, Evaluation, Facility Development

1. Introduction

The airport is a vital means of transportation for inter-island and inter-country relations in Bandung. Husein Sastranegara International Airport is an airport located in Bandung, West Java, Indonesia. In addition to serving the community, the airport is also one of the military air force base. If viewed on a map, the public airport will be seen in the south west and military in the south east left. On the north side of the runway, the hangars owned by PT. Dirgantara Indonesia can be seen.

Increased economic growth after the monetary crisis and the emergence of many Low-Cost Airline (LCA) will trigger an increase in air transport movements at Husein Sastranegara airport. It is believed that the current airport facilities will not be able to accommodate requests during peak hours in the future, so that it needs an analysis of facility requirements and facility development planning up to the year of development limits.

2. Apron

An apron is a defined area intended to accommodate aircraft for purposes of loading and unloading passengers, mail or cargo, fuelling and parking or maintenance. The apron is generally paved but may occasionally be unpaved; for example, in some instances, a turf parking apron may be adequate for small aircraft.[1][3]

3. Methodology

The process of completing this research can be explained as follows:

1. Identify Apron
2. Data Collection: Primary and Secondary Data
3. Evaluation of Existing Apron: geometric and capacity of the existing apron
4. Analysis of Traffic Forecast Air Transport
5. Evaluation of Future Apron Performance: geometric conditions of aprons and future apron capacity.
6. Results of Evaluation of Existing and Future Apron Performance
7. Analysis and Discussion
8. Conclusions and suggestion

4. Analysis and Discussion

4.1. Analysis of Air Transport Traffic Forecasting

The Apron of Husein Sastranegara Airport has dimensions of ± 36890 m^2 with details ± 9750 m^2 for rigid pavement and ± 27140 m^2 for flexible pavement. This Apron has 8 parking stands, can accommodate 8 aircraft with Boeing B737-500 or 7 Airbus A320 aircraft types. The apron configuration used by Husein Sastranegara Airport uses a linear / frontal concept system (front row of the arrival gate).

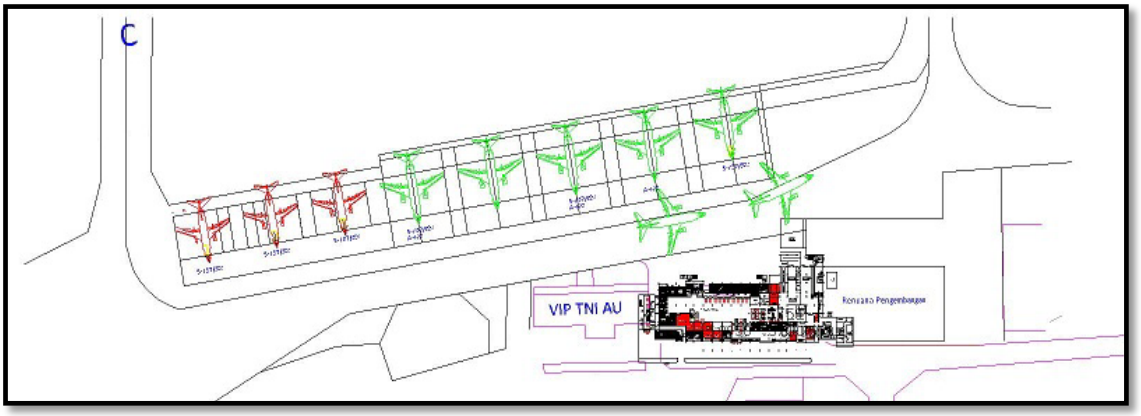

Figure 1. Apron configuration and parking type

The primary and secondary data that have been obtained are added with parameters that have been determined and analyzed, to be evaluated and analyzed to obtain the upcoming apron performance according to the planned year.

Forecasting is intended to calculate the possibility of increasing the number of passengers and the number of aircraft in the future with various parameters used to support forecasting as accurately as possible.

The model used in forecasting is the Trend Analysis model in the form of a Linear Regression method (straight line curve). This model is examined based on data on the movement of passengers, baggage and cargo against the Constant GRDP in year of 2000 and population growth. The results of linear regression analysis between GRDP and population with passengers, baggage and cargo are shown in table 1 and table 2 below.

Table 1. Results of Regression Analysis (GRDP)

	Equation	R^2	R
Passenger	y = 29.47x – 29492	0.695	0.834
Baggage	y = 320.75x - 4347229.99	0.900	0.951
Cargo	y = 44.36x – 57124	0.850	0.922

Table 2. Results of Regression Analysis (Population)

	Equation	R^2	r
Passenger	y =1.54x – 3,150,125.07	0.470	0.686
Baggage	y = 18.42x – 39,200,511.37	0.740	0.860
Cargo	y = 2.68x – 5,709,390.38	0.770	0.877

The results of the analysis using the Trend Analysis Model in the form of a linear regression method show that the correlation value of the regression of passengers, baggage and cargo against GRDP has the strongest correlation value compared to population growth, because the correlation values obtained are greater. Since the results of the regression analysis between GRDP and passengers, baggage and cargo are better than population, the regression equation used for forecasting uses a regression equation between GRDP with passengers, baggage and cargo. The regression equation that obtained will be used as a multiplier for the forecast of passengers, baggage and cargo. This forecasting is done with the following assumptions:

- Normal Conditions: Growth in GRDP of Bandung City uses the average growth value of the period 2003 - 2010, which is 8.00%.
- Optimistic Conditions: Growth in GRDP of Bandung City uses the maximum growth value for the period 2003 - 2010, which is 8.45%.

Table 3. Forecasting Passengers in Normal and Optimistic Conditions

Year	PDRB		Passenger	
	Normal	Optimistic	Normal	Optimistic
2012	36,974.60	37,278.61	1,060,150	1,069,109
2013	39,934.13	40,427.66	1,147,367	1,161,911
2014	43,130.55	43,842.72	1,241,565	1,262,553
2015	46,582.82	47,546.27	1,343,304	1,371,696
2016	50,311.41	51,562.66	1,453,185	1,490,060
2017	54,338.46	55,918.33	1,571,862	1,618,421
2018	58,687.83	60,641.94	1,700,038	1,757,626
2019	63,385.34	65,764.57	1,838,474	1,908,590
2020	68,458.84	71,319.92	1,987,990	2,072,306
2021	73,938.44	77,344.55	2,149,474	2,249,852
2022	79,856.65	83,878.11	2,323,883	2,442,396
2023	86,248.55	90,963.57	2,512,253	2,651,204
2024	93,152.08	98,647.57	2,715,700	2,877,652
2025	100,608.19	106,980.66	2,935,431	3,123,228
2026	108,661.10	116,017.68	3,172,751	3,389,549
2027	117,358.58	125,818.08	3,429,065	3,678,367

Table 4. Forecasting Baggage and Cargo in Normal and Optimistic Conditions

Year	PDRB		Baggage		Cargo	
	Normal	Optimistic	Normal	Optimistic	Normal	Optimistic
2012	36,974.60	37,278.61	7,510,525	7,608,022	1,583,069	1,596,555
2013	39,934.13	40,427.66	8,459,647	8,617,922	1,714,354	1,736,247
2014	43,130.55	43,842.72	9,484,738	9,713,132	1,856,147	1,887,739
2015	46,582.82	47,546.27	10,591,880	10,900,858	2,009,290	2,052,028
2016	50,311.41	51,562.66	11,787,641	12,188,915	2,174,690	2,230,196
2017	54,338.46	55,918.33	13,079,113	13,585,779	2,353,330	2,423,413
2018	58,687.83	60,641.94	14,473,957	15,100,640	2,546,268	2,632,952
2019	63,385.34	65,764.57	15,980,447	16,743,467	2,754,650	2,860,192
2020	68,458.84	71,319.92	17,607,521	18,525,069	2,979,710	3,106,628
2021	73,938.44	77,344.55	19,364,829	20,457,168	3,222,785	3,373,880
2022	79,856.65	83,878.11	21,262,796	22,552,479	3,485,317	3,663,709
2023	86,248.55	90,963.57	23,312,681	24,824,788	3,768,862	3,978,020
2024	93,152.08	98,647.57	25,526,644	27,289,046	4,075,102	4,318,882
2025	100,608.19	106,980.66	27,917,816	29,961,468	4,405,855	4,688,538
2026	108,661.10	116,017.68	30,500,384	32,859,639	4,763,082	5,089,420
2027	117,358.58	125,818.08	33,289,667	36,002,628	5,148,903	5,524,166

Potential flight routes are analyzed from the consideration of the existing routes at Husein Sastranegara Airport, that is the flight schedule for January 2012.

Table 5. Flight route

Routes	Aircraft movements in a week	% Route
Bandung-Medan	10	11.91%
Bandung-Surabaya-Denpasar	7	6.12%
Bandung-Bandar Lampung-Palembang	6	2.60%
Bandung-Semarang	7	3.03%
Bandung-Jogja (MA-60)	5	2.17%
Bandung-Jogja (ATR-72)	7	3.59%
Bandung-Halim Perdana Kusuma	7	3.03%
Bandung-Denpasar	11	13.11%
Bandung-Surabaya (B-735)	3	2.62%
Bandung-Surabaya (B-732)	7	5.36%
Bandung-Singapura	18	21.45%
Bandung-Kuala Lumpur	21	25.02%

With the consideration of the above and the development of travel by air transportation, it is planned that service routes in optimistic conditions are as follows. The estimated distribution of passengers and flight routes is shown in Table 6.

Table 6. Passenger Distribution and Flight Routes (Optimistic)

Route	Number of Passenger (1 way)			
	2012	2017	2022	2027
Bandung-Medan	63,666	96,378	146,307	220,880
Bandung-Surabaya- Denpasar	32,682	49,474	75,104	113,385
Bandung-Bandar Lampung-Palembang	13,891	21,028	31,922	48,192
Bandung-Semarang	16,206	24,533	37,242	56,224
Bandung-Jogja (MA-60)	11,576	17,523	26,601	40,160
Bandung-Jogja (ATR-72)	19,177	29,030	44,070	66,532
Bandung-Halim Perdana Kusuma	16,206	24,533	37,242	56,224
Bandung-Denpasar	70,033	106,016	160,937	242,968
Bandung-Surabaya (B-735)	14,007	21,203	32,188	48,594
Bandung-Surabaya (B-732)	28,631	43,341	65,794	99,329
Bandung-Singapura	114,599	173,480	263,352	397,583
Bandung-Kuala Lumpur	133,698	202,394	307,244	463,847

Table 7. Annual Aircraft Forecasting

Aircraft types	Number of aircraft (year)			
	2012	2017	2022	2027
A-320	4,992	7,956	11,648	16,640
ATR-72	364	364	728	728
B-732	364	364	364	364
B-735	520	520	884	1,404
MA-60	1,300	1,300	2,340	3,328

The conditions used in annual aircraft forecasting are optimistic conditions. The type of aircraft used is an aircraft that operates at the airport (January 2012) and is assumed to have no additional or reduced routes. The assumption of the proportion of aircraft use is based on the analysis of the flight routes that have been calculated previously.

The analysis shows that the annual aircraft that will be dominant in the future are Airbus A320 aircraft.

The forecast of the number of goods and post served by the airport is carried out at the generate level analysis method. The calculation of the need for freight transport aircraft is analyzed based on excess goods that can be transported by commercial passenger aircraft. The assumption used is the carrying capacity of commercial aircraft cargo is 10% of the maximum pay load.

Table 8. Commercial Aircraft Freight Capacity

Aircraft types	Capacity (Kg)
A-320	7250
B-735	5960
B-732	5720
MA-60	2180
ATR-72	2110

Table 9. Sharing of Passenger Aircraft

Year	Baggage and Cargo Projection (kg)	Sharing of Passenger Aircraft (kg)	Overload	Cargo aircraft
2012	4,602,289	31,403,320	(26,801,031)	-
2017	8,004,596	31,403,320	(23,398,724)	-
2022	13,108,094	31,403,320	(18,295,226)	-
2027	20,763,397	31,403,320	(10,639,923)	-

From table 9, it can be concluded that the need for cargo aircraft in the forecast year is not yet needed, because the sharing of commercial aircraft used is still able to carry goods and posts. This means that goods can still be served by passenger aircraft.

Calculation of peak hour passengers carried by Theoretical Methods. This forecasting aims to determine the distribution of passengers especially during peak hour in the future. Besides, this forecasting is used as data to determine the number of aircraft during peak hour. The summary of passenger peak hour forecast results can be seen in Table 10.

Table 10. Passenger Peak Hour (1 way)

Optimistic Conditions - Domestic				
Routes	**2012**	**2017**	**2022**	**2027**
Bandung-Medan	121	183	278	419
Bandung-Surabaya-Denpasar	124	188	285	430
Bandung-Bandar Lampung-Palembang	53	80	121	183
Bandung-Semarang	133	141	141	213
Bandung-Jogja	58	88	134	203
Bandung-Halim Perdana Kusuma	62	93	141	213
Bandung-Denpasar	133	201	305	461
Bandung-Surabaya	81	123	186	281
Optimistic Conditions - International				
Route	**2012**	**2017**	**2022**	**2027**
Bandung-Singapura	145	220	333	503
Bandung-Kuala Lumpur	169	256	389	587

Analysis of aircraft peak hour is carried out, that is the number of passengers during peak hour on aircraft operating at Husein Sastranegara Airport using theoretical methods. The limitation of analysis is the plan load factor of 70% -90%. The results of calculations using theoretical methods can be seen in Table 11.

Tabel 11. Aircraft Peak Hour (1 way)

Optimistic Conditions - Domestic					
Routes	**Aircraft Types**	**2012**	**2017**	**2022**	**2027**
Bandung – Medan	A 320	1	1	1	2
Bandung - Surabaya - Denpasar	B 735	1	1	2	3
Bandung - Medan - Palembang	MA 60	1	1	2	2
Bandung - Denpasar	A 320	1	1	2	2
Bandung - Semarang	MA 60	1	1	2	3
Bandung – Surabaya	B 735	1	1	1	1
Bandung – Surabaya	B 732	1	1	1	1
Bandung – Jogja	MA-60	1	1	1	1
Bandung – Jogja	ATR-72	1	1	1	1
Bandung - Halim Perdana Kusuma	MA-60	1	1	2	3
Optimistic Conditions - International					
Routes	**Aircraft Types**	**2012**	**2017**	**2022**	**2027**
Bandung - Singapura	A-320	1	1	2	2
Bandung - Kuala Lumpur	A-320	1	1	2	3

The results of the passenger peak hour analysis show that in 2012 until 2017, there was no increase in the number of aircraft during peak hour. While for the years 2022 and 2027, there has been an increase in the number of aircraft.[4]

4.2. Apron Analysis

From the results of forecasting analysis at peak hour, it was obtained recapitulation of the number of aircraft that existed at certain hours. Then the results of the recapitulation are entered into the assumed flight schedule and route. The results of the analysis will show the number of aircraft parked at certain hours. Analysis carried out for 2012, 2017, 2022 and 2027. So that we can know the needs of the apron area needed for each forecasting year.

From the results of the analysis of Husein Sastranegara airport traffic based on the assumption that the flight schedule is effective in January 2012 with an interval of every 30 minutes, it shows that during the operation of the airport in one day there is no maximum density at the apron. This is indicated by the accumulation of aircraft that do not exceed 4 aircraft in 1 hour. Even the highest aircraft accumulation occurred after the completion of airport operations. Staying aircraft/ RON (remain over night) at the airport for tomorrow's flight as much as 5 aircraft. This condition will be used as the basis for forecasting the capacity of the apron in terms of the number of parking stands needed, that is when the parking stand is used most.

The following is an analysis table of apron capacity based on flight schedules in terms of the number of stand parking per day in 1 week for 2012, 2017, 2022 and 2027.

Table 12. Analysis of Husein Sastranegara Airport Traffic in 1 Day

Time		In	Out	Accumulate	Volume
5:00	5:30				
5:30	6:00	5	1	4	5
6:00	6:30		1	3	5
6:30	7:00			3	5
7:00	7:30			3	5
7:30	8:00		2	1	5
8:00	8:30	1	1	1	6
8:30	9:00	1		2	7
9:00	9:30	1	1	2	8
9:30	10:00		1	1	8
10:00	10:30			1	8
10:30	11:00	1		2	9
11:00	11:30	1	1	2	10
11:30	12:00		1	1	10
12:00	12:30	1		2	11
12:30	13:00		1	1	11
13:00	13:30			1	11
13:30	14:00	2		3	13
14:00	14:30		1	2	13
14:30	15:00			2	13
15:00	15:30	2		4	15
15:30	16:00		1	3	15
16:00	16:30		1	2	15
16:30	17:00	2	1	3	17
17:00	17:30			3	17
17:30	18:00	1	1	3	18
18:00	18:30		1	2	18
18:30	19:00			2	18
19:00	19:30			2	18
19:30	20:00	1	1	2	19
20:00	20:30	1		3	20
20:30	21:00	1		4	21
21:00	21:30			4	21
21:30	22:00	1		5	22
22:00	22:30			5	22
	Total	22	17		

Table 13. Apron Capacity Analysis in 2012 and 2017

No.	Type A/C	Destination	ETA	Operation 1	2	3	4	5	6	7	Type A/C	Destination	ETA
DOMESTIC													
1	MA 60	HLP	8:35	1	1	1	1	1	1	1	A 320	MES	5:45
2	B 732	SUB	9:15	1	1	1	1	1	1	1	B 735	SUB-DPS	6:05
3	A 320	MES	10:45	1	1	1	1	1	1	1	A 320	DPS	7:30
4	A 320	DPS	11:25	1	-	1	-	1	-	1	MA 60	TKG-PLM	8:00
5	MA 60	SRG	12:10	1	-	1	-	1	-	1	MA 60	SRG	9:20
6	MA 60	TKG	13:50	1	-	1	1	-	1	1	B 732	SUB	9:35
7	ATR 72	JOG	14:00	1	1	-	1	1	1	1	MA 60	JOG	12:40
8	MA 60	JOG	15:30	1	-	1	-	1	1	1	ATR 72	JOG	14:25
9	MA 60	SRG	16:30	-	1	-	1	-	-	-	MA 60	HLP	16:10
10	B 735	DPS-SUB	17:55	1	1	1	1	1	1	1	A 320	DPS	17:00
11	A 320	MES	19:30	1	-	1	-	1	-	-	MA 60	HLP	17:00
12	A 320	DPS	20:55	1	1	1	1	-	1	1	B 735	SUB	18:30
13	B 735	SUB	21:40	-	-	1	-	1	-	1	A 320	MES	19:55
INTERNATIONAL													
1	A 320	KUL	8:00	1	1	1	1	1	1	1	A 320	SIN	7:30
2	A 320	SIN	11:05	1	1	-	1	-	1	1	A 320	KUL	8:30
3	A 320	SIN	11:30	1	1	-	1	1	-	1	A 320	SIN	11:15
4	A 320	SIN	15:15	1	1	1	1	1	1	1	A 320	KUL	12:00
5	A 320	KUL	16:35	1	1	1	1	1	1	1	A 320	SIN	12:25
6	A 320	SIN	16:50	-	1	1	1	1	-	1	A 320	KUL	15:45
7	A320	KUL	20:20	1	1	1	1	1	1	1	A 320	SIN	17:35
jumlah kedatangan/ hari				15	14	17	15	17	14	17			
jumlah pesawat *grounding*/ hari				2	4	4	4	4	2	4			

Keterangan :

= *landing and take off*

= *landing and RON (remaining over night)*

Table 14. Apron Capacity Analysis in 2022

No.	Type A/C	Destination	ETA	Operation 1	2	3	4	5	6	7	Type A/C	Destination	ETA
DOMESTIC													
1	MA 60	HLP	8:35	1	1	1	1	1	1	1	A 320	MES	5:45
2	B 732	SUB	9:15	2	2	2	2	2	2	2	B 735	SUB-DPS	6:05
3	A 320	MES	10:45	2	-	2	-	2	-	2	A 320	DPS	7:30
4	A 320	DPS	11:25	2	-	2	2	2	2	2	MA 60	TKG-PLM	8:00
5	MA 60	SRG	12:10	2	2	2	2	2	2	2	MA 60	SRG	9:20
6	MA 60	TKG	13:50	1	1	1	1	-	1	1	B 732	SUB	9:35
7	ATR 72	JOG	14:00	1	-	1	-	1	1	1	MA 60	JOG	12:40
8	MA 60	JOG	15:30	1	1	1	1	-	1	1	ATR 72	JOG	14:25
9	MA 60	SRG	16:30	2	-	-	-	2	2	2	MA 60	HLP	16:10
10	B 735	DPS-SUB	17:55	2	2	2	2	2	2	2	A 320	DPS	17:00
11	A 320	MES	19:30	-	2	-	2	-	-	-	MA 60	HLP	17:00
12	A 320	DPS	20:55	-	-	1	-	1	-	1	B 735	SUB	18:30
13	B 735	SUB	21:40	1	-	1	-	1	-	-	A 320	MES	19:55
INTERNATIONAL													
1	A 320	KUL	8:00	-	2	-	2	-	2	-	A 320	SIN	7:30
2	A 320	SIN	11:05	2	2	2	2	2	-	2	A 320	KUL	8:30
3	A 320	SIN	11:30	2	2	2	2	-	2	2	A 320	SIN	11:15
4	A 320	SIN	15:15	2	2	2	2	2	2	2	A 320	KUL	12:00
5	A 320	KUL	16:35	-	2	-	2	-	-	2	A 320	SIN	12:25
6	A 320	SIN	16:50	2	2	2	2	2	2	2	A 320	KUL	15:45
7	A320	KUL	20:20	-	2	2	2	2	-	2	A 320	SIN	17:35
jumlah kedatangan/ hari				25	25	28	27	28	24	29			
jumlah pesawat grounding/ hari				5	4	8	4	8	4	7			

Keterangan :

= *landing and take off*

= *landing and RON (remaining over night)*

Table 15. Apron Capacity Analysis in 2027

No.	Type A/C	Destination	ETA	Operation							Type A/C	Destination	ETA
				1	2	3	4	5	6	7			
DOMESTIC													
1	MA 60	HLP	8:35	2	2	2	2	2	2	2	A 320	MES	5:45
2	B 732	SUB	9:15	3	3	3	3	3	3	3	B 735	SUB-DPS	6:05
3	A 320	MES	10:45	2	-	2	-	2	-	2	A 320	DPS	7:30
4	A 320	DPS	11:25	2	-	2	2	2	2	2	MA 60	TKG-PLM	8:00
5	MA 60	SRG	12:10	3	3	3	3	3	3	3	MA 60	SRG	9:20
6	MA 60	TKG	13:50	1	1	1	1	1	1	1	B 732	SUB	9:35
7	ATR 72	JOG	14:00	1	-	1	-	1	1	1	MA 60	JOG	12:40
8	MA 60	JOG	15:30	1	1	1	1	1	1	1	ATR 72	JOG	14:25
9	MA 60	SRG	16:30	3	-	3	-	3	3	3	MA 60	HLP	16:10
10	B 735	DPS-SUB	17:55	2	2	2	2	2	2	2	A 320	DPS	17:00
11	A 320	MES	19:30	-	3	-	3	-	-	-	MA 60	HLP	17:00
12	A 320	DPS	20:55	-	-	1	-	1	-	1	B 735	SUB	18:30
13	B 735	SUB	21:40	1	-	1	-	1	-	-	A 320	MES	19:55
INTERNATIONAL													
1	A 320	KUL	8:00	-	2	-	2	-	2	-	A 320	SIN	7:30
2	A 320	SIN	11:05	3	3	3	3	3	-	3	A 320	KUL	8:30
3	A 320	SIN	11:30	2	2	2	2	2	2	2	A 320	SIN	11:15
4	A 320	SIN	15:15	3	3	3	3	3	3	3	A 320	KUL	12:00
5	A 320	KUL	16:35	-	2	-	2	-	-	2	A 320	SIN	12:25
6	A 320	SIN	16:50	3	3	3	3	3	3	3	A 320	KUL	15:45
7	A320	KUL	20:20	-	2	2	2	2	-	2	A 320	SIN	17:35
jumlah kedatangan/ hari				32	32	35	34	35	31	36			
jumlah pesawat grounding/ hari				7	5	10	5	10	6	9			

Keterangan :

= *landing and take off*

= *landing and RON (remaining over night)*

Based on the table 15, the density of aircraft on the apron is indicated by the number of aircraft staying or RON (remain over night), which amounts to 10 aircraft in 1 day (analysis in 2027). Aircraft density at the apron occurs after the completion of airport operations, that is staying aircraft or RON (remain over night) for tomorrow's departure, as listed in the tables 13 to 15.

5. Conclusions and Suggestions

Based on the analysis and discussion at the apron of Husein Sastranegara Airport, it can be concluded as follows:

1. Apron capacity up to the planned year of 2022 can still serve especially staying aircraft or RON (remain over night). However, that year is the maximum capacity of the apron.
2. For the planned year of 2027, the apron cannot service all aircraft staying overnight, because the number of aircraft staying over exceeds the number of available parking stands.

Some suggestions that can be proposed as references in future studies and as a reference for PT. Angkasa Pura is [2]:

1. Making a Remote Apron or adding a parking stand

Because in the planned year 2022 the apron capacity has reached a maximum, it is necessary to make a Remote Apron or the addition of a parking stand. Its function is to anticipate the presence of staying aircraft or RON (remain over night) at Husein Sastranegara Airport. Alternatively, the Remote Apron location or parking stand can be placed in front of the hangar owned by PT. Dirgantara Indonesia.

2. Add signs (marking) to the apron, namely:
   - Service Road Marking

   Its function is to limit the service road area, which allows the movement of separate Ground Service Equipment (GSE) by aircraft.
   - Equipment Parking Area Marking

   Its function is to limit aircraft to areas designated as parking lots for aircraft ground service equipment or parking lots for Ground Service Equipment (GSE).
3. The addition of a mobile lounge for operational up and down passengers from the terminal to the aircraft, especially during rainy weather. This is necessary because the terminal distance and apron parking stand are quite far away.
4. Standard aircraft clearance requirements for buildings are in accordance with applicable regulations.
5. Construction of a hydrant fuel pump and ground electricity support to reduce ground service operations around the aircraft.

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