

THE EFFECT OF FLIGHT OPERATION COMMERCIAL AND TECHNICAL DELAY ON ON-TIME PERFORMANCE OF PT GARUDA INDONESIA

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ABSTRACT

PT Garuda Indonesia is a state-owned enterprise that run business in commercial air transport industry. The purpose of this paper was to examine the effect of delay Flight Operation, Commercial, and Technical On On-time Performance. To obtain that purpose, writer used analysis method of Classic Assumption Test (Multicollinearity, Autocorrelation, Heteroscedasticity, Linearity), Simple Linear and Multivariate Linear regression, correlation coefficient, coefficient of determination, and hypothesis test. The analysis shown that all independent variable is obtained BLUE criteria and could be used as good estimator for next discussion. Multivariate regression equation is $Y = 98,481 - 0,039X_1 - 0,016X_2 - 0,006X_3$ means that every increase of X_1 (Flight Operation delay), X_2 (Commercial delay), and X_3 (Technical delay) will impact to the change of Y variable (On-time Performance) at the level of 0,039, 0,016, and 0,006 unit of count and at 98,481 intercept point. Correlation coefficient (r) at 0,846 represent strong correlation between variables. Coefficient of determination at 71,6%. From the hypothesis test, it shown that $F \text{ result } (26,910) > F \text{ Table } (2,90)$, means that H_0 is rejected and H_1 is accepted, means there is a correlation between X_1 , X_2 , and X_3 toward Y variable (On-time Performance) simultantly in PT Garuda Indonesia year 2014-2016.

Keywords: flight operation, commercial, technical, delay, on-time performance.

INTRODUCTION

PT Garuda Indonesia as flag carrier and the biggest airline in Indonesia is still improving its performance in order to win the market and customer satisfaction. As the growth of commercial air transport users is increasing, Garuda also expands its fleets and network, as the result, the number of scheduled flight is also increasing. "Safe and secure" philosophy must be familiar in daily

activities, means that every working aspect must be conducted intentionally to keep everything safe and secure, moreover in operational aspect. To run and maintain operation properly especially aircraft operation, company must perform technical maintenance activities. International Air Transport Association in IATA Reference Manual (2016) defines aircraft maintenance as the performance of task that required to ensure the continuing airworthiness of an

aircraft. For long term, maintenance activities may give huge advantage for the company in safety, security, cost, reputation, and win market competition. On the other hand, when the company is struggling to keep the maintenance performance, some problems may occur, like aircraft defect and non-scheduled maintenance. Those problems must be mitigated in order to prevent higher negative impact, such as the increase of technical delay. In airline activities, flight operation is the main wheel of the company to run in daily basis and generate revenues and profits. The flight operation itself consists of hundreds of work activities and checklist that must be done. Some examples of problems that may occur in flight operation are late arrival of flight from previous station that caused delay domino effect, late of flight document completion, cabin crew late onboard due to transport, and several other aspects. If we look back at the main purpose of company to grow, create revenue and profit, we have to consider the commercial side. When the commercial side such as commercial publicity or passenger convenience, like VIP movement, waiting for ground meals, or waiting loading passenger/cargo from another flight. The point is commercial aspect—as what explained above—must not be left aside, it has to be anticipated in order to make them not negatively contribute to business. And as the number of flight served by company is increasing, the problem that occurred in technical, commercial, and flight operation activities become more important to be handled than before. In 2013 Garuda served 168.674 scheduled flight, in 2014 served 194.338 flights, in 2015 served 206.675 flight, and in 2016 served 217.772 flight. Consecutively, the growth was 13,21% in 2014, 6,01% in 2015, and 5,03% in 2016. We can see that the growth is continuously showing positive rate, and it's believed that in the future the growth is promising a good

rate. In line with the increase that was explained before, it also has impact to higher possibilities of frequency of disruption appeared in flight operation areas, one of the results is delay. The flight delays will impact the operating costs of airlines and the image itself. Niehues et al. (2001) revealed that delay will cost typically range from 0,6% to 2,9% on operating revenue. Historical data shows that controllable delay factors contribute 33% of Garuda's total delay, which means that there is still a room for improvement. Therefore, Garuda Indonesia which wants to be able to compete globally with other domestic airlines should be able to provide quality service to passengers and reduce delay, supported by achieving high on time performance. On-time performance is essential for customers when choosing which airline to fly, so it is a key competitive dimension in the airline industry. It also becomes one of key performances indicator in an airline industry and such an important service differentiator especially for high-yield customer. Garuda has already planned to achieve 85% on-time flight this year, back in 2014 the company already reached 88,79% on-time flight, and experienced slight decline to level 88,00% in 2015, and rose to 89,59% in 2016. In scheduled flight side, it increased 13,21% in 2014, 6,4% in 2015 and 5,03% in 2016. (Garuda Indonesia, 2017) Flight on-time performance should further be improved continuously, and it may not be achieved if the factors affecting are not managed well. What is the level of Flight Operations delay in PT Garuda Indonesia? What is the level of Commercial aspect delay in PT Garuda Indonesia? What is the level of Technical aspect delay in PT Garuda Indonesia? How is the on-time performance of PT Garuda Indonesia in 2014-2016? How is the effect in simple linear and multivariate linear of Flight Operation, Commercial, and Technical delay on on-time performance PT Garuda Indonesia in 2014-2016? How to

increase flight on-time performance of PT Garuda Indonesia in the future

LITERATURE REVIEW

In general views of transportation, Salim (2010:6) defines transportation as a movement activity of goods and passenger from some place to another place. Two main things are movement, and physically moved the position of commodity and passenger to another place. And Nasution (2010) says transportation maybe defined as movement of goods and passenger from origin to destination. Bowersox et al. (2002) explains that air transportation is the newest, but the least utilized mode of transportation. Significant advantage of air transport lies in the speed which a shipment can be transported coast-to-coast requires only few hours contrasted to days with other modes of transport. While costly, the speed of air transport allows other aspects of logistics such as field warehousing and inventory to be reduced or eliminated. And Coyle et al. (2011) explains that travelling by air is a common form of transportation for long-distance passenger and freight travel, and the only reasonable alternative when time is of the essence. Wu (2010) defines "on-time" departure/arrival is a flight which departs/arrives less than 15 minutes after the scheduled departure/arrival time (off/on block time at a gate) shown in the published timetable of an airline or equivalently the time shown in the Computerized Reservation System (CRS). Shaw (2007) argued that planning to ensure high standard of punctuality (which close related topics to on-time performance) is the central product issue for all airlines. An important trade-off is need to be made by the airline, by managing many aspects, includes fleet planning, investment in technology, maintenance, time table completion, and schedule planning. Indonesian Aviation Law Number 1 Year 2009, article 1 point 31 explains delay as circumstances

where there is a difference of time between scheduled departure or arrival and the actual time of departure or arrival. Furthermore, Indonesian Transportation Minister Decree number 89 Year 2015 breaks down in more detail about the delay category based on length of delay, also compensation quantity for each category. In national regulation point of view, Indonesian Aviation Law Number 1 Year 2009, article 110 point (2) regulate that Flight Operation are as shall be determined and confirmed by the Minister, at least, with the consideration of: national spatial planning, economic growth, and equilibrium of national flight network and routes. Wu (2010) defines Flight Operation of ten refers to management to flights when airborne. These operations are carried out by cockpit crew and are facilitated by air traffic controllers in various sectors. In recent talks, Flight Operations is not just 'flight operation', but the holistic planning and controlling that support it is also considered as important matters to be handled. Transportation and Logistic Popular Dictionary (2012) explains Flight Operation consists of Crew Administration, Enroute Redispatch, Post flight Activities, and Monitoring & En-route Flight Assistance. All items listed above are related each other, and should be executed by following all regulation applied. Shaw (2007) explains that schedules planning as one unseparated part of Flight Operation is where the most significant trade-off has to be made if an airline is to achieve a good punctuality performance, and it is closely related to the aircraft utilization and cost-related discussions. Indonesia's Civil Aviation Safety Regulation (CASR) 121.6 (c) explains that this kind of operation is requiring high responsibilities for operating an airline's fleet safely and efficiently. It schedules the aircraft and flight crews and it develops and administers all policies and procedures necessary to maintain safety and meet all CASR operating requirements. CASR subpart

T regulates numerous aspect about Flight Operation, several of them are: airplane security, operations schedule, flight crew member duties restriction, inspection of flight, evacuation, medical treatment, and many others. Afsar et.al (2009) found that one of the major objectives of an airline company is to minimize aircraft related operating costs. In a highly competitive environment, maintenance related costs are particularly important, these cost represent 10 to 20 percent of aircraft related operating cost depending on factors such as aircraft type and age or flight segment length. Therefore, maintenance may be concluded as one of major area that need to be maintained in order to contribute to achieve best result in holistic company performance. Previous Research is the research results of other researcher that are considered relevant to the is to be analyzed, both the substance, variables, methods, or object. From the previous research, there are several that showed that multiple regression is a better way to analyze and calculate the relationship between more than 2 variables. In otherside, there are also research that showed delay contribution based on IATA AHM 730 Delay Code is related to the On time Performance. Fitriyana (2016) finds that the impact and relation between technical delay contribution and On-time Performance is 5,29% (r^2), and it is not significant because of there are many more factors that may contribute to the On-time Performance. She picks the Technical delay contribution from IATA AHM 730 delay code Technical. While this research is combining Technical, Flight Operation, and Commercial delay contribution. Theo Arischandra (2014) tried to use another factor that not listed in the IATA AHM 730 as the X factor, it was Air Traffic in the Soekarno-Hatta airport specifically. The result showed us that the Air Traffic factor is not significantly correlated to the On-time Performance, because there are many factors that is not

included in his paper, such as Weather, Technical, Station Handling, and many other factors.

RESEARCH METHODS

Research conducted in Operation Control Centre of PT Garuda Indonesia Soekarno-Hatta International Airport. Data collection by Field Research, Observation, Interview, Library Research. The type of data that used on this research is quantitative and qualitative data. Data Analysis Method using Multivariate Regression Correlation, Multicollinearity test, Heteroscedasticity test, Gujarati & Porter (2008:380) using Absolute Regression Residual to be the Y factor, while the X factor is still same as first calculation. And the result and decision may be detected from the significance of the regression model. If all factor showing significance more than standard error or α (usually 5% or 0,05). In equation model, either Multivariate or Simple Linear Regression, there will be some result of calculation that need to be translated into some meanings which contained along with the numbers. The similarities will be in translation of Basic different between Multivariate and Simple calculation is used of t -test for Simple Regression and f -test for Multivariate regression (Supranto, 2009). Based on Gujarati & Porter (2008), the coefficient of determination or r^2 (two-variable case) or R^2 (multiple regression) is a summary measure that tells how well the sample regression line fits the data. Broadly speaking, a test of significance is a procedure by which sample results are used to verify the truth or falsity of a null hypothesis.

RESULTS AND DISCUSSION

A. Flight Operation delay analysis of PT Garuda Indonesia

This Flight Operation delay code mostly discussed about operation control, planning, and scheduling, also transport of

crew from their home base. From the table above, we may look that the most contributing month in the mid-year school holiday in June-July and end-year of Christmas and New Year event in December-January. Also from the table, we may see that Flight Operation delay decreased year by year, -8,27% in 2015 and -13,20% in 2016. It may be caused by the increasing performance of department that controls the Flight Operation delay code matters. Although, it still needs to be continued in the future time. Flight Operation delay consists of several delay codes related to the Flight Operation, such as late arrival from previous station due to Flight Operation (delay code 60), late of crew transportation from their home to the airport (delay code 01, 02), crew shortage (delay code 64, 67), operational and additional security request (delay code 62, 69), crew rotation and operational control (delay code 94, 96), flight plan late completion (delay code 61), late crew boarding (delay code 63, 66), and crew special request (delay code 65, 68). From the table above, it can be seen that delay code 60 (late arrival from previous station due to Flight Operation) is the most contributor for the Flight Operation delay, next is delay code 61 (flight plan late completion or change off light documentation) in the second rank, and delay code 02 (cabin crew late due to transport) in the third rank. If we analyze, delay code 60 is the result of delay domino effect from the previous flight that already delayed, we can eliminate it if we pull down another delay and by coordinating with other departments to minimize delay effect. For delay code 61 caused by the change of flight planning and need of new flight doc according to the new plan, and it takes time and causes flight delay. For delay code 02, here we may see that

transportation from crew's home becomes a problem that needs to be eliminated in the future by imposing new regulation that requires new recruits to have home not more than 25 km (or less) distance from the airport.

B. Commercial delay analysis of PT Garuda Indonesia

Commercial delay code talks about reasons related to commercial and service to passenger, such as customer relationship in handling passenger, connection time to other flight such as alliance/partnership flight, and over sales/overbooking. Same with Flight Operation delay we may see that the most contributing month is in the mid-year school holiday in June-July or end-year of Christmas and New Year event in December-January. Also from the table, we may see that Commercial delay increased year by year, 29,29% in 2015, and 26,05% in 2016. It means that Commercial delay needs to be supervised in a tougher level, in order to decrease its contribution to the total delay. From the table, we may see that delay code 16 (commercial publicity, passenger convenience, VIP) became the highest contributor to the Commercial delay, followed by delay code 60 (late arrival from previous station due to Commercial), and delay code 91 (load connection, waiting load from another flight) in third rank contributor.

If we analyze, delay code 16 is caused by VIP movement, press activity (commercial publicity), and ground meals/personal item missing. We have to be adaptable with VIP movement that noted as an undeniable condition, we have to build communication to VIP protocol or Military in order to have better preparation when VIP is on movement. Delay code 30 is the result of delay domino effect from the previous flight that already delayed, we can eliminate it if we

pull down another delay and by coordinating to other department to minimize delay effect. Delay code 91 is relatively caused by connection problem that we have to wait load (passenger/cargo) from another flight.

C. Technical delay analysis of PT Garuda Indonesia

Technical reason usually talks about aircraft defect, spare part, maintenance equipment, and any other aspects that related to maintenance itself. Everything that related to maintenance in Garuda Indonesia is handled by GMF AeroAsia, one subsidiary of Garuda Indonesia. Below will be outlined the Commercial delay of PT Garuda Indonesia 2014-2016:

Technical delay decreased year by year, -19,65% in 2015 and -25,37% in 2016. It maybe caused by the increased performance of Technic department and GMF AeroAsia that in touch with the Technical delay code matters. But it still needs to be improved in the near future. Delay code 60 (late arrival from previous station due to Technical) is ranked 1 in contributor of Technical delay. Next is delay code 41 (aircraft defect) in the next place. And delay code 43 (non-scheduled maintenance) in the third rank. If we analyze, delay code 40 is the result of delay domino effect from the previous flight that already delayed, we can eliminate it if we pull down another delay and by coordinating to other department to minimize delay effect. For delay code 41 is aircraft that found has a trouble when preflight check, it needs to be repaired before it may operate again. Delay code 43 is caused by aircraft that needs maintenance but out of its schedule, in example it needs some part replacement, or other condition that it needs to be repaired.

D. On-time Performance analysis of PT Garuda Indonesia

When discussing On-time Performance, there are many topics to be considered. Several of them are what contribute to fluctuation of On-time Performance, what is On-time Performance itself, and how to make it even better in the future. Garuda Indonesia particularly also refers to IATA standard

1. IATA Delay code

International Air Transport Association develop basic standard of codes that shall be used to express the reason of delay, diversion, or other irregularities in aircraft movement. And this standardization of codes used for this purpose is essential for commonality in the system, uniform agency handling, exchange of information, statistical comparison and management analysis. **(IATA Airport Handling Manual AHM730, 2017)**

But in the recent practice, airline may have modified and develop the codes to fulfill their need in handling such problem, but shall not be off from the basic guidance from IATA. Garuda Indonesia also develop their codes that basically same to IATA AHM730, contain of 8 groups; Airport Facility, Flight Operations, Commercial, Technical, System, Weather, Station Handling, and Others.

2. Airport Facility delay of PT Garuda Indonesia

Belobaba, Odoni, and Barnhart (2009, p.343) explained that airport and its facility consist of (a) the "airside" (or "airfield") which include the runways, taxiways, aprons, aircraft

maintenance areas, and air traffic control facilities and equipment, as well as the land that surrounds all of these; and (b) the “landside”, i.e., the complex of passenger buildings, cargo terminals and other supporting buildings (e.g., airport administration, utility plants, catering facilities, etc.), ground access facilities (curbside, access roads, automobile parking areas and buildings, railroad stations, etc.), and any additional non-aviation facilities (e.g., hotels, office buildings, shopping areas, etc.) that may be located within an airport’s boundaries. Airport Facility delay grew in 2015 and 2016 at the rate of 8,36% and 9,96 consecutively. And if we see month by month, the highest number relatively come in December, where Christmas and New Year holiday is held.

3. Weather delay of PT Garuda Indonesia
Clausen et al. as cited by Castro, Rocha, and Oliveira (2014, p.1) described that unpredictable event—such as bad weather—might change completely that operation plan and, consequently, revenue objectives behind it.

In line with the argument above, Garuda Indonesia also categorized Weather as “outside company control”, which means that Garuda cannot do anything to change, manage, or control it. The main focus to handle this kind of problem is to maintain recovery plan to avoid domino effect caused by the weather.

This section is provided to accommodate delay that caused by weather in departure station (delay code 71), weather in destination station (delay code 72), weather en-route or alternate (delay code 73), de-icing or aircraft removal of ice and/or

snow (delay code 75), removal of snow and/or ice in other than aircraft (delay code 76), ground handling impaired by adverse weather conditions (delay code 77).

Weather delay decreased in 2015 and 2016 at the rate of -66,16% and -11,16% consecutively. And if we look at 2014 data, they were contrastly higher than other month in 2015 and 2015

because in 2014 there were many weather disaster, one of the most is volcano eruption that caused aircraft cannot fly as regulated by government.

4. Station Handling delay of PT Garuda Indonesia
Garuda Indonesia develops Station Handling delay code basically in according to IATA Delay Code and improved by Company needs itself.
Station Handling delay may have grouped in check-in (delay code 11, 12, 13), boarding (delay code 15), baggage handling (delay code 18), cargo and mail handling (delay code 21, 22, 23, 24, 26, 27, 29, 38), Weight and Balance (delay code 32, 33, 34, 39), cleaning (delay code 35), documents (delay code 31), refueling (delay code 36), and catering (delay code 17, 37). Station Handling delay decreased - 2,68% in 2015 and grew 0,84% in 2016. And if we see month by month, the highest number relatively occurs in December, where Christmas and New Year holiday are held.
5. System delay of PT Garuda Indonesia
Abdelghany (2010, p.129)

argued that finding an accurate optimized system requires a large number of calculations with sophisticated algorithms. Some commercial air carriers have implemented their own internal flight planning systems, while other air carriers use the services of external planners (for example, SITA, Jeppesen, and Lufthansa Systems). Though aviation regulations vary by country, most require a licensed flight dispatcher or flight operation officer to carry out flight planning for airlines. Nowadays, the importance of system and technology is mostly undoubtable. Not exception for airline, they are very depended on system. This section is provided to accommodate delay that caused by departure control system (delay code 55), cargo preparation/documentation by system (delay code 56), flight plans by computer (delay code 57), other automation system format (delay code 58).

System delay is decreased - 46,54% in 2015 and grew 6,84% in 2016.

6. Miscellaneous delay of PT Garuda Indonesia

This section is provided to accommodate several delay codes that might not match with other category. We may look at delay code 99, which is described as a code that shall be used only when it is clear that a reason cannot be matched to another code that explained above. Miscellaneous delay is grew 47,09% in 2015 and decreased -31,26% in 2016.

7. Total Schedule of PT Garuda Indonesia

in 2014-2016

Garuda Indonesia is one airline that has most number of flight schedule in Indonesia. In 2014-2016 time period, its total schedule increased 6,39% and 5,30% consecutively (OCC Annual Report—PT Garuda Indonesia, 2014, 2015, 2016). total schedule is increasing year by year, 6,39% in 2015 and 5,30% in 2016. And if we see month by month, highest number relatively come in December, where Christmas and New Year holiday at, and in July-August when most of school in Indonesia is having mid-year holiday.

8. On-time Performance of PT Garuda Indonesia in 2014-2016

On-time performance is essential for customers when choosing which airline to fly, so it is a key competitive dimension in the airline industry.

It also become one of key performance indicator in airline industry and such an important service differentiator especially for high-yield customer.

In 2015 the On-time Performance percentage is decreased by 0,80 point, but increased by 1,56 point in 2016. PT Garuda Indonesia targeting 85% On-time Performance level this year, as usual in previous year, 2016, 2015, and 2014. In the other hand, if the company already achieved the target, why we have to still continue to improve Garuda's OT P? If we look into other airline in the region, name Cathay Pacific achieved just 64,7% and 72,1% on-time performance for 2015 and 2016 consecutively (Cathay Pacific Annual Report, 2016) and Japan

Airlines achieved 89,44% and 87,8% on-time performance for 2015 and 2016 consecutively. (**JAL Annual Report, 2015- 2016**). And Singapore Airline achieved 89,44% and 85,45% for 2015 and 2016 consecutively. (**On-time Performance Service, 2016**). All set their target in high standard.

It is kind of important to see by customer perspectives, that they will less happy with higher on-time performance but the duration of those delayed flight longer **rather than** other comparison that have lower on-time performance but shorter length of delay. Talking about achieving higher and higher on-time performance is kind of different things that refer to kaizen philosophy—continuous improvement, but it also important to mitigate and minimalize the delay and its domino effect, which will have resulted to higher customer satisfaction that related to the delay. That is why I believe that mitigating of such complicated delay and irregularities—as discussed in previous sub-chapter—is still need to be continued in the near future.

E. Simple Linear and Multivariate Linear analysis

1. Analysis between Flight Operation delay and On-time Performance

The R is 0,796 and R^2 is 0,633 (63,3%). Pearson Correlation coefficient is represented by R, which in this calculation is 0,796, means that correlation between Flight Operation delay (X1) toward On-time Performance is strong. And Determinant Coefficient is

represented by R^2 , which in this calculation is R^2 in 63,3% represent the of X1 factors toward fluctuation of Y factor is 63,3%, and the rest may be came from other factor.

The equation as: $Y = 95,427 - 0,047 X_1$

The equation represents that if the Flight Operation delay increases 1% then the On-time Performance will be decreased 0,047%. Same as if Flight Operation has no delay, the on time performance will be in 95,427%. Based on *t-test* decision rule, it seen that $t < -t_{\alpha, df}$, since this analysis using Left-tailed normal curve, therefore $H_{1,1}$ is accepted, which is there is a negative correlation between Flight Operation delay and flight on-time performance PT Garuda Indonesia.

2. Analysis between Commercial delay and On-time Performance

To observe whether there is a effect or not between X2 variable (Commercial delay) and Y variable (On-time Performance) writer use Simple Linear Regression, Pearson correlation coefficient, Determinant coefficient, and hypothesis test, also scatterplot diagram as complementary. the R is 0,576 and R^2 is 0,332 (33,2%). Pearson Correlation coefficient is represented by R, which in this calculation is 0,576, means that correlation between Commercial delay (X2) toward On-time Performance is strong. And Determinant Coefficient is represented by R^2 , which in this calculation is R^2 in 33,2% represent the of X2 factors toward fluctuation of Y factor is 33,2%, and the rest may be

came from other factor. the equation as: $Y = 93,232 - 0,025 X_2$

The equation represents that if the Commercial delay increases 1% then the On-time Performance will be decreased 0,025%. Same as if Commercial has no delay, the on time performance will be in 93,232%. t-table for 34 ($n-2 = 36-2 = 34$) sample is 1,69092. Based on *t-test* decision rule, it seen that $t < -t_{\alpha, df}$, since this analysis using Left-tailed normal curve, therefore $H_{1,2}$ is accepted, which is there is a negative correlation between Commercial delay and flight on-time performance PT Garuda Indonesia

3. Analysis between Technical delay and On-time Performance

To observe whether there is a effect or not between X_3 variable (Technical delay) and Y variable (On-time Performance) writer use Simple Linear Regression, Pearson correlation coefficient, Determinant coefficient, and hypothesis test, the R is 0,279 and R^2 is 0,078 (7,8%). Pearson Correlation coefficient is represented by R, which in this calculation is 0,279, means that correlation between Commercial delay (X_3) toward On-time Performance is relatively weak. And Determinant Coefficient is represented by R^2 , which in this calculation is R^2 in 7,8% represent the of X_3 factors toward fluctuation of Y factor is 7,8%, and the rest may be came from other factor.

Also from the table, we may develop the equation as: $Y = 92,095 - 0,014$

X_3 The equation represents that if the Technical delay increases 1% then the On-time

Performance will be decreased 0,014%. Same as if Technical has no delay, the on time performance will be in 92,095%. In other part of the table, we may see t-test result as -1,691. This number should be compared by the t-table in order to test our third hypothesis. t-table ($t_{\alpha, df}$) for 34 ($n-2 = 36-2 = 34$) sample is 1,69092. Based on *t-test* decision rule, it seen that $t < -t_{\alpha, df}$, since this analysis using Left-tailed normal curve, therefore $H_{1,3}$ is accepted, which is there is a relation between Technical delay and flight on-time performance PT Garuda Indonesia

4. Analysis of Flight Operation, Technical, and Commercial delay on On-time

Performance. Bodie, Kane, & Marcus (2009) implies multifactor model may provide better explanation in return in calculating several factor, compared with single-factor model. Firstly, there is a recommendation to going through several classic assumption test. We will do Multicollinearity test, Heteroscedasticity test, and Autocorrelation test as they all categorized as 'problem' that may occur in multivariate regression-correlation model. (Supranto, 2009:271) we see that all the Tolerance value is $>0,10$ and all VIF is $<10,00$. So we may conclude that there is no multicollinearity in all the independent variables data. Autocorrelation test For $k = 3$ (number of independent variables) and $n = 36$ (number of observations), the table value is dL: 1,295 and du: 1,654. Heteroscedasticity assumed as a disturbance appeared in the variance that not 'homo' (equal) 'scedasticity' (spread). So it the disturbance that make variance not

spread equally.all above 0,05 (5%), both in Park Test and Glejser Test. Therefore, we may conclude that there is no heteroscedasticity in the data.

In this multivariate calculation, writer also using SPSS 21 to obtain the result, and it is as shown below: From the table above, the equation may be concluded as: $Y = 98,481 - 0,039X_1 - 0,016X_2 - 0,006X_3$

If FLOPS delay increases 1% then the On-time Performance will be decreased 0,039%, same as if Flight Operation has no delay, the on time performance will remain in 98,481%. This statement is valid if other variables assumed in no change (ceteris paribus).

If Commercial delay increases 1% then the On-time Performance will be decreased 0,016%, same as if Flight Operation has no delay, the on time performance will remain in 98,481%. This statement is valid if other variables assumed in no change. If Technical delay increases 1% then the On-time Performance will be decreased 0,006%, same as if Flight Operation has no delay, the on time performance will remain in 98,481%. This statement is valid if other variables assumed in no change. Also from the table, we may see the R is 0,846 and R^2 is 0,716 (71,6%). Pearson Correlation coefficient is represented by R, which in this calculation is 0,846 means that correlation between variables X_1 , X_2 , X_3 and Y is strong.

And Determinant Coefficient is represented by R^2 , which in this calculation is R^2 in 71,6% represent the of X_1 , X_2 ,

X_3 factors toward fluctuation of Y factor is 7,8%, and the rest may be came from other factor that not included in this paper. It may come from Airport Facility, Weather, Station Handling, System, and other factors.

We also will test the multivariate hypothesis (fourth hypothesis) using F-test or Analysis of Variance (ANOVA) test. With degree of freedom 1 (df1) is 3, representing number of independent variable we analyze (FLOPS, Commercial, Technic). While df2 is 32, obtained from $n - k - 1 = 36 - 3 - 1 = 32$. If we look at the table, we will obtain F-table ($F_{\alpha}(m, n-k)$) as 2,90. It means that we have to accept H_a and reject H_0 , also represent that there is a correlation between X_1 , X_2 , and X_3 simultaneously toward Y. Above is the curve of the fourth hypothesis. From the curve we also have to accept $H_{1,4}$ and reject $H_{0,4}$, since $F > F_{\alpha}(m, n-k)$, that represent there is a negative correlation between X_1 , X_2 , and X_3 simultaneously and On-time Performance.

F. On-time Performance improvement program analysis

To obtain On-time Performance that higher than before, Garuda Indonesia must continue and improve integrated cross-department coordination in order to minimize delay that affected by various aspect. Here are several things that Garuda Indonesia need to do to improve On-time Performance:

- 1) Optimize aircraft and crew

control coordination in handling such irregularities and domino-effect from previous delay (concern to delay code “from previous flight” such as delay code 30, 40, and 60); 2) Continue training and development to personnel in related department; 3) Optimize preflight check especially in the first flight of the day to detect aircraft defect for faster recovery and prevent it causing delay domino effect to the next flight. (concern to Technical delay code 41 aircraft defect); 4) Change the limitation of crew home distance for the new recruitment, from their home to airport, now regulated as 30km to be 20km or lower, in order to reduce traffic congestion when transporting crew when they are about to do their schedule. (concern to Flight Operation delay code 01 and 02 of crew transportation) ; 5) Improve coordination in Ticketing and Reservation Centre in order to minimize delay caused by oversales also commercial publicity/passenger convenience. Also coordinate with protocoler and Military to anticipate VIP movement. (concern to Commercial delay code 14, 25 of oversales, and delay code 16 for VIP, passenger convenience, commercial publicity)

CONCLUSION

Flight Operation delay decreased year by year, -8,27% in 2015 and -13,20% in 2016. And from the analysis, it is found that delay from previous station, late flight plan,

and crew transport are the top contributors. Commercial delay increased year by year, 29,29% in 2015, and 26,05% in 2016. And from the analysis it is found that commercial publicity/press/VIP, delay from previous station, and load connection are the top contributors. Technical delay decreased year by year, -19,65% in 2015 and -25,37% in 2016. And from the analysis it is found that delay from previous station, aircraft defect, and non-scheduled maintenance are the top contributors.

Average of On-time Performance PT Garuda Indonesia in 2014 was 88,83%, in 2015 was 88,03%, and in 2016 was 89,59%. In 2015 it experienced slight decline of 0,80 point, but rebound 1,56 point in 2016. Flight On-time Performance in 2014, 2015, and 2016 all have achieved the target of 85%.

The Correlation between Flight Operation delay and On-time Performance in Simple Linear is strong at level of coefficient 0,796, Commercial delay and On-time Performance in Simple Linear is found strong at level of coefficient 0,576, and Technical delay and On-time Performance in Simple Linear is found not strong at level of coefficient 0,279. And correlation of Flight Operation, Commercial, and Technical delay simultaneously and Flight On-time Performance is found as strong, at the level of 0,846. All independent variables are fulfilled the BLUE criteria.

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