

## หนังสืออ้างอิง

การบินพลเรือน, กรม. 2518 กรมการบินพลเรือน กองทัพอากาศ เอกสาร  
สำหรับ นทน. รร. สธ. ทหารและคณะ. พระนคร.

อุทิศ แก้วโอภาส. 2516. "การสร้างโมเดลทางสถิติเพื่อการวิเคราะห์ความ-  
หนาแน่นของการจราจรทางอากาศ ณ ท่าอากาศยานกรุงเทพ ฯ  
(On the Construction of Some Statistical Model for  
Analysing, Air Traffic Density at Donmuang Airport.)"  
วิทยานิพนธ์ ปริญญาโท สาขาวิชาคณิตศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย.  
(อัดสำเนา)

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ภาคผนวก

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ผลลัพธ์การจำลองผลระบบที่ใช้ในปัจจุบัน

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10 REM WANG 2200 ; RTAF ACADEMY
20 REM QUEUE AT BANGKOK INTERNATIONAL AIRPORT
30 REM WITH ONE RUNWAY
40 REM BY PAYOONGSAK RUAYRUEN
50 A1, E, N, Q, S1, T, W1=0
60 L=7.44/60:M=5.68:D=1.96
70 GOSUB 500
80 A1=A1+A
90 IF A1>4200THEN 300
100 N=N+1
110 S1=S1+S
120 IF A1>=TTHEN 180
130 Q=Q+1
140 W=T-A1
150 W1=W1+W
160 T=T+S
170 GOTO 70
180 T=A1+S
190 E=E+1
200 GOTO 70
300 PRINT "TOTAL AIRCRAFTS SERVICED=";N
310 PRINT "NUMBER OF AIRCRAFTS THAT DO NOT WAIT";E/N
320 PRINT "NUMBER OF AIRCRAFTS THAT HAVE TO WAIT=";Q
330 PRINT "MEAN ARRIVAL RATE=";N/70
340 PRINT "AVERAGE SERVICE TIME FOR ANY AIRCRAFT=";S1/N
350 PRINT "TOTAL WAITING TIME OF ALL AIRCRAFTS=";W1
360 PRINT "AVERAGE WAITING TIME FOR ANY AIRCRAFT=";W1/N
370 PRINT "PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING=";E/N
380 END
500 REM ---SUBROUTINE FOR INTERARRIVAL TIME & SERVICE TIME
510 A=(-1/L)*LOG(RND(1))
520 K=0
530 FOR I=1TO 12
540 K=K+RND(2)
550 NEXT I
560 S=D*(K-6.0)+M
570 RETURN
580 END
```

TOTAL AIRCRAFTS SERVICED= 517  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 163  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 354  
MEAN ARRIVAL RATE= 7.385714285714  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.773129917205  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3092.916622529  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 5.982430604505  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3152804642166

TOTAL AIRCRAFTS SERVICED= 528  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 134  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 394  
MEAN ARRIVAL RATE= 7.542857142857  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.870637670708  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 4440.509958423  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 8.410056739438  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2537878787879

TOTAL AIRCRAFTS SERVICED= 520  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 167  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 353  
MEAN ARRIVAL RATE= 7.428571428571  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.544574446352  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3228.384234329  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.208431219844  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3211538461538

TOTAL AIRCRAFTS SERVICED= 530  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 139  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 391  
MEAN ARRIVAL RATE= 7.571428571429  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.772911251991  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 4236.196813437  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 7.992824176296  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2622641509434

TOTAL AIRCRAFTS SERVICED= 524  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 141  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 383  
 MEAN ARRIVAL RATE= 7.485714285714  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.687562615076  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 4934.682265362  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 9.417332567485  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2690839694656

TOTAL AIRCRAFTS SERVICED= 517  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 154  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 363  
 MEAN ARRIVAL RATE= 7.385714285714  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.605031394074  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 3180.564309456  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.151961913841  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2978723404255

TOTAL AIRCRAFTS SERVICED= 513  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 151  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 362  
 MEAN ARRIVAL RATE= 7.328571428571  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.662287455581  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 4909.992645978  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 8.401545118865  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2943469785575

TOTAL AIRCRAFTS SERVICED= 520  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 154  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 366  
 MEAN ARRIVAL RATE= 7.428571428571  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.700757773056  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 3846.186559684  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 7.396512614777  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2961538461538

TOTAL AIRCRAFTS SERVICED= 518  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 152  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 366  
MEAN ARRIVAL RATE= 7.4  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.751095273569  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3250.74814013  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.275575560097  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2934362934363

TOTAL AIRCRAFTS SERVICED= 530  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 142  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 388  
MEAN ARRIVAL RATE= 7.571428571429  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.571428571429  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3667.240030632  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.919320812513  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2679245283019

TOTAL AIRCRAFTS SERVICED= 519  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 164  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 355  
MEAN ARRIVAL RATE= 7.414285714286  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.573009307123  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3583.65005993  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.90491341027  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3159922928709

TOTAL AIRCRAFTS SERVICED= 513  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 156  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 357  
MEAN ARRIVAL RATE= 7.328571428571  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.758170889314  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3750.507074506  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 7.310929969797  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3040935672515



TOTAL AIRCRAFTS SERVICED= 525  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 154  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 371  
MEAN ARRIVAL RATE= 7.5  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.609970209154  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3591.758539975  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.841444838048  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .29333333333333

TOTAL AIRCRAFTS SERVICED= 516  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 168  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 348  
MEAN ARRIVAL RATE= 7.371428571429  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.590009005465  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3494.153312127  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.771614945983  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3255813953488

TOTAL AIRCRAFTS SERVICED= 521  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 162  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 359  
MEAN ARRIVAL RATE= 7.442857142857  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.602360330221  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3719.624682918  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 7.139394784871  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3109404990403

TOTAL AIRCRAFTS SERVICED= 523  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 161  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 362  
MEAN ARRIVAL RATE= 7.471428571429  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.73316503484  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3169.532032309  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.060290692751  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3078393881453

TOTAL AIRCRAFTS SERVICED= 526  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 141  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 385  
MEAN ARRIVAL RATE= 7.514285714286  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.781198612726  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3939.216790594  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 7.489005305312  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2680608365019

TOTAL AIRCRAFTS SERVICED= 524  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 139  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 385  
MEAN ARRIVAL RATE= 7.485714285714  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.775722616832  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3353.745238995  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 6.400277173655  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2652671755725

TOTAL AIRCRAFTS SERVICED= 520  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 155  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 365  
MEAN ARRIVAL RATE= 7.428571428571  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.897304924037  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 4378.559879287  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 8.420307460167  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .2980769230769

TOTAL AIRCRAFTS SERVICED= 510  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 153  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 357  
MEAN ARRIVAL RATE= 7.285714285714  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.743862043004  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 3923.619938466  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 7.693372428365  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .3

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ผลลัพธ์การจำลองผลระบบที่เสนอแนะ

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10 REM WANG 2200 ; RTAF ACADEMY
20 REM QUEUE AT BANGKOK INTERNATIONAL AIRPORT WITH TWO RUNWAYS
30 REM BY PUYOONGSAK RUAYRUEN
40 A1, S1, N, Q, E, W1, T1, T2=0
50 L=7.44/60:M=5.68:D=1.96
60 GOSUB 500
70 A1=A1+A
80 IF A1>4200THEN 400
90 N=N+1
100 S1=S1+S
110 IF A1>=T1THEN 180
120 IF A1>=T2THEN 210
130 Q=Q+1
140 IF T1>T2THEN 230
150 T1=T1+S
160 W=T1-A1
170 GOTO 250
180 T1=A1+S
190 E=E+1
200 GOTO 60
210 T2=A1+S
220 GOTO 190
230 T2=T2+S
240 W=T2-A1
250 W1=W1+W
260 GOTO 60
400 PRINT "TOTAL AIRCRAFTS SERVICED=";N
410 PRINT "NUMBER OF AIRCRAFTS THAT DO NOT WAIT=";E
420 PRINT "NUMBER OF AIRCRAFTS THAT HAVE TO WAIT=";Q
430 PRINT "MEAN ARRIVAL RATE=";N/70
440 PRINT "AVERAGE SERVICE TIME FOR ANY AIRCRAFT=";S1/N
450 PRINT "TOTAL WAITING TIME OF ALL AIRCRAFTS=";W1
460 PRINT "AVERAGE WAITING TIME FOR ANY AIRCRAFT=";W1/N
470 PRINT "PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING=";E/N
480 END
500 REM ---SUBROUTINE FOR INTERARRIVAL TIME & SERVICE TIME
510 A=(-1/L)*LOG(RND(1))
520 K=0
530 FOR I=1TO 12
540 K=K+RND(2)
550 NEXT I
560 S=D*(K-6.0)+M
570 RETURN
580 END
```

TOTAL AIRCRAFTS SERVICED= 526  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 432  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 94  
 MEAN ARRIVAL RATE= 7.514285714286  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.719388526646  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 754.9417071725  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.435250393864  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8212927756654



TOTAL AIRCRAFTS SERVICED= 516  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 431  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 85  
 MEAN ARRIVAL RATE= 7.371428571429  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.676299775078  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 687.7093531089  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.332770064165  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8352713178295

TOTAL AIRCRAFTS SERVICED= 527  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 422  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 105  
 MEAN ARRIVAL RATE= 7.528571428571  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.777602384224  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 967.0658992733  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.835039657065  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8007590132827

TOTAL AIRCRAFTS SERVICED= 525  
 NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 439  
 NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 86  
 MEAN ARRIVAL RATE= 7.5  
 AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.719994164682  
 TOTAL WAITING TIME OF ALL AIRCRAFTS= 698.8485595853  
 AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.331140113496  
 PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8409961685824

TOTAL AIRCRAFTS SERVICED= 515  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 428  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 87  
MEAN ARRIVAL RATE= 7.357142857143  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.648106277066  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 793.3723701873  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.54052887415  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .831067961165

TOTAL AIRCRAFTS SERVICED= 522  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 403  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 119  
MEAN ARRIVAL RATE= 7.457142857143  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.65464725301  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 1061.02496972  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 2.032614884521  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .772030651341

TOTAL AIRCRAFTS SERVICED= 530  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 422  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 108  
MEAN ARRIVAL RATE= 7.571428571429  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.6031975354  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 880.2565827786  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.660861476941  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .7962264150943

TOTAL AIRCRAFTS SERVICED= 514  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 423  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 91  
MEAN ARRIVAL RATE= 7.342857142857  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.61911342466  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 741.1642398564  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.441953879098  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8229571984436



TOTAL AIRCRAFTS SERVICED= 521  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 432  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 89  
MEAN ARRIVAL RATE= 7.442857142857  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.691616880964  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 808.9744646352  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.552734097188  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8291746641075

TOTAL AIRCRAFTS SERVICED= 527  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 407  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 120  
MEAN ARRIVAL RATE= 7.528571428571  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.700147734461  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 1029.553378591  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.953611724082  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .7722960151803

TOTAL AIRCRAFTS SERVICED= 517  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 434  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 83  
MEAN ARRIVAL RATE= 7.385714285714  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.773129917205  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 739.6092109249  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.430578744536  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8394584139265

TOTAL AIRCRAFTS SERVICED= 528  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 436  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 92  
MEAN ARRIVAL RATE= 7.542857142857  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.760905627157  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 770.9011510421  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.460040058792  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8257575757576

TOTAL AIRCRAFTS SERVICED= 516  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 429  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 87  
MEAN ARRIVAL RATE= 7.371428571429  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.653243050019  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 703.4993779772  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.363370887553  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8313953488372

TOTAL AIRCRAFTS SERVICED= 517  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 421  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 96  
MEAN ARRIVAL RATE= 7.385714285714  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.83618820524  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 804.3257540553  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.555755810552  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8143133462282

TOTAL AIRCRAFTS SERVICED= 522  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 452  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 70  
MEAN ARRIVAL RATE= 7.457142857143  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.687876888456  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 578.3147096027  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.107882580446  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8659003831418

TOTAL AIRCRAFTS SERVICED= 526  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 428  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 98  
MEAN ARRIVAL RATE= 7.514285714286  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.888404137897  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 905.4949915198  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.721473367908  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8136882129278



TOTAL AIRCRAFTS SERVICED= 511  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 429  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 82  
MEAN ARRIVAL RATE= 7.3  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.631684429994  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 733.9225493724  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.436247650435  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .839530332681

TOTAL AIRCRAFTS SERVICED= 515  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 420  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 95  
MEAN ARRIVAL RATE= 7.357142857143  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.686592556087  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 748.9755322119  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.454321421771  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8219178082192

TOTAL AIRCRAFTS SERVICED= 529  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 427  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 102  
MEAN ARRIVAL RATE= 7.557142857143  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.701312154822  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 866.2034709767  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.637435672924  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8071833648393

TOTAL AIRCRAFTS SERVICED= 521  
NUMBER OF AIRCRAFTS THAT DO NOT WAIT= 426  
NUMBER OF AIRCRAFTS THAT HAVE TO WAIT= 95  
MEAN ARRIVAL RATE= 7.442857142857  
AVERAGE SERVICE TIME FOR ANY AIRCRAFT= 5.688170490758  
TOTAL WAITING TIME OF ALL AIRCRAFTS= 885.4070843832  
AVERAGE WAITING TIME FOR ANY AIRCRAFT= 1.699437781926  
PROBABILITY THAT AN AIRCRAFT CAN LAND WITHOUT WAITING= .8176583493282

## ผนวก ก

เงินรายได้ท่าอากาศยานกรุงเทพ ฯ ที่กองทัพอากาศเก็บนำส่งกระทรวงการคลัง  
 ในนามกระทรวงคมนาคม ประจำปีงบประมาณ 2507 - 2517

พ.ศ.	จำนวนเงิน (บาท)
2507	36,491,914.87
2508	40,985,298.60
2509	46,511,727.17
2510	57,022,464.14
2511	64,585,363.94
2512	75,542,879.85
2513	94,801,339.62
2514	103,961,584.56
2515	127,109,191.38
2516	149,676,515.18
2517	173,397,224.52

แผนภูมิ ๑

\*Percentage Points of the Chi-Square Distribution

v	$\alpha$							
	0.995	0.99	0.975	0.95	0.05	0.025	0.01	0.005
1	0.0 <sup>4</sup> 393	0.0 <sup>3</sup> 157	0.0 <sup>3</sup> 982	0.0 <sup>2</sup> 393	3.841	5.024	6.635	7.879
2	0.0100	0.0201	0.0506	0.103	5.991	7.378	9.210	10.597
3	0.0717	0.115	0.216	0.352	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	11.070	12.832	15.086	16.750
6	0.676	0.872	1.237	1.635	12.592	14.499	16.812	18.548
7	0.989	1.239	1.690	2.167	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	36.415	39.364	42.980	45.558
25	10.520	11.524	13.120	14.611	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	43.773	46.979	50.892	53.672

\*Abridged from Table 8 of Biometrika Tables for Statisticians, Vol. I, by permission of E.S. Pearson and the Biometrika Trustees.

## ผนวก จ

ข้อมูลเครื่องบินเข้ามาบริการ ณ ท่าอากาศยานกรุงเทพ ฯ  
ในช่วงเวลา 0800 น. - 1800 น. วันที่ 19 ม.ค. - 25 ม.ค. 19

เวลา \ วันที่	19	20	21	22	23	24	25	รวม 7วัน
0800-0900	1	2	4	3	6	1	5	22
0900-1000	3	5	10	11	8	7	7	51
1000-1100	8	6	13	12	4	6	5	54
1100-1200	9	14	18	17	11	5	5	79
1200-1300	9	8	9	8	5	3	8	50
1300-1400	6	8	6	7	8	4	7	46
1400-1500	6	8	10	8	9	5	9	55
1500-1600	10	12	11	10	10	3	2	58
1600-1700	6	7	9	6	12	5	5	50
1700-1800	9	10	8	8	8	10	12	65

## ประวัติการศึกษา

ชื่อ :: เรืออากาศโท พยุงศักดิ์ รวยรื่น

การศึกษา : สำเร็จการศึกษาชั้นปริญญาตรี วิทยาศาสตร์บัณฑิต (ทอ.)  
จากโรงเรียนนายเรืออากาศ คอนเมือง เมื่อปีการศึกษา  
2515

ตำแหน่งและสถานที่ทำงาน : ปัจจุบันปฏิบัติงานในหน้าที่อาจารย์ผู้ช่วยกองวิชา  
เทคนิค กองการศึกษา โรงเรียนนายเรือ-  
อากาศ คอนเมือง

