

**TURKISH
AVIATION
ACADEMY**



Assignment 3: Route Fleet Assignment ***Michael D. Wittman***

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Strategic Planning
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Assignment 3: Fleet Assignment

- **Turkish Airlines (hypothetical) flight TK62 operates non-stop daily from Istanbul (IST) to Kuala Lumpur (KUL), departing at 1840.**
- **During last summer's peak months (June-August), this flight was operated with an Airbus A330-300 aircraft, configured with 28 J-class (Business) and 261 Y-class (Economy) seats.**
- **THY observed the following loads over 90 operations of TK62 during the schedule period Jun.-Aug. 2015:**

	J Cabin	Y Cabin
Seating Capacity	28	261
Average Load (Pax)	22.7	232.9
Std. Dev. of Load	7.5	78.1

Assignment Structure

- **During the fleet assignment process, THY needs to make a decision as to which specific aircraft type should be assigned to this IST-KUL flight for the 2016 peak June-August schedule period.**
- **We assume that the demand levels and distributions of summer 2015 will once again be valid for summer 2016.**
- **You are provided with the following pieces of information:**
 - **Table of relevant aircraft and market characteristics**
 - **Boeing Spill Table ($k=0.35$)**

Aircraft and Market Data

- The following data is provided to you:

Aircraft and Market Data

AIRCRAFT COSTS

TYPE	J SEATS	Y SEATS	FOC(\$/HR)
A330-200	22	228	\$6450
A330-300	28	261	\$7300
B777-300ER	28	309	\$7740

FLIGHT LEG DATA

	KILOMETRES	BLOCK TIME
IST-KUL	8380	10.6 hours

NET REVENUE PER PAX*

J-CABIN	Y-CABIN
\$675	\$310

- Note that we are trying to decide which of three aircraft (A330-200, A330-300, B777-300ER) to assign to the IST-KUL route.

Question 1: Demand and Spill Factors

- Use the Boeing "Spill Table" to estimate the demand factor and the spill factor for the J and Y cabins of TK62, *given* the observed average loads and an assumed coefficient of variation of unconstrained demand equal to $k=0.35$, and enter these values into the spreadsheet.
 - The spreadsheet will compute mean unconstrained demand and standard deviation of unconstrained demand for you.
- Then, compute the average spill per flight and spill rate (percent of unconstrained demand spilled) for both the J and Y cabins.

Worksheet Structure

- Enter in the correct demand factor and spill factor into rows 1 and 2 below, and rows 3 and 4 will be automatically computed.
- You will need to provide the formulas for rows 5 and 6!

	J CABIN	Y CABIN	
<u>OBSERVED</u>			
SEATING CAPACITY	28	261	
MEAN LOAD	22.7	232.9	
STD DEVIATION (LOAD)	7.5	78.1	
AVERAGE LOAD FACTOR	81.1%	89.2%	
<u>ESTIMATED</u>			
ASSUMED K-FACTOR	0.35	0.35	
1 DEMAND FACTOR			←
2 SPILL FACTOR			←
3 UNCONSTRAINED DEM	0.0	0.0	
4 STD DEV OF UNC DEM	0.0	0.0	
5 AVE SPILL PER FLT			←
6 SPILL RATE			←

Recall: Spill Table for K=0.35

DF and SF given LOAD FACTOR					
LF	DF	SF	LF	DF	SF
.700	.716	.016	.705	.722	.017
.710	.729	.019	.715	.735	.020
.720	.742	.022	.725	.749	.024
.730	.755	.025	.735	.762	.027
.740	.769	.029	.745	.776	.031
.750	.784	.034	.755	.791	.036
.760	.799	.039	.765	.806	.041
.770	.814	.044	.775	.822	.047
.780	.830	.050	.785	.839	.054
.790	.847	.057	.795	.856	.061
.800	.865	.065	.805	.874	.069
.810	.884	.074	.815	.894	.079
.820	.904	.084	.825	.914	.089
.830	.925	.095	.835	.936	.101
.840	.948	.108	.845	.960	.115
.850	.972	.122	.855	.985	.130
.860	.999	.139	.865	1.013	.148
.870	1.028	.158	.875	1.043	.168
.880	1.060	.180	.885	1.077	.192
.890	1.095	.205	.895	1.115	.220

- Assuming underlying demand has $K=0.35$
- Then, 0.850 observed average load factor translates to 0.972 demand factor and 0.122 spill factor
- Load factor = demand factor – spill factor

Source: Boeing

Question 2: Spill Modeling

- **Use the flight leg spill modeling approach (and the Boeing Spill Table provided) to determine which aircraft type would have the highest contribution to profit for the June-August 2016 schedule period.**
- **That is, assuming the mean unconstrained demand that you estimated in (A), use the Boeing Spill Table ($k=0.35$) to estimate:**
 - Average load factor
 - Average load
 - Expected spill per flight for each cabin under each alternative aircraft.
- **Note: the spreadsheet will compute the demand factors and profitability for you.**

Worksheet Structure (2)

- **Fill in the correct load factors from the Boeing Spill Table to see the effects on loads, profit, and margin**

AIRCRAFT	J CAP	DEMAND FACTOR	LOAD FACTOR	SPILL FACTOR	SPILL	AVG J PAX LOAD
A330-200		22	0.000		0.000	0.00
A330-300		28	0.000		0.000	0.00
B777-300ER		28	0.000		0.000	0.00

Y CAP	DEMAND FACTOR	LOAD FACTOR	SPILL	AVG Y PAX LOAD
228	0.000		0.00	0.00
261	0.000		0.00	0.00
309	0.000		0.00	0.00

REVENUE	FLT COST	OPERATING PROFIT	OPERATING MARGIN
\$0	\$68,370	(\$68,370)	0.0%
\$0	\$77,380	(\$77,380)	0.0%
\$0	\$82,044	(\$82,044)	0.0%

Question 3: Recommendation

- **Based on your analysis in (B), which one aircraft type do you think Turkish should use for this flight leg in summer 2016?**
- **What additional considerations (including aircraft rotations, crew requirements, scheduling issues, network impacts, operations) would have to be incorporated into the decision as to which aircraft type Turkish should assign to this leg?**
- **In other words, which other factors does the spill model not take into account?**

Questions? Have fun!