

Dr. Christiane Schmidt

TNK051: Planning of Air Traffic

Homework Set 1, 2021

Solutions are due September 17, 2021, 10:00. **Please put your name on all pages!**

Question 1 (Dichotomy of Demand and Supply):

You are working for a large, international airline. In conversation with a representative of a large dairy company at a conference, said representative asks you to quantify demand and supply on the route Arlanda-Newark. He is surprised to hear that you cannot easily quantify the demand and supply, as he easily can for, for example, milk with 3,25% fat in Stockholm in January. Give the dairy representative a detailed explanation on dichotomy of demand and supply in the airline industry.

Question 2 (Planning of aircraft routes):

Timetable. A small Swedish airline focusing on domestic traffic has the timetable shown in Figure 1.

| Flightnr | Dep time | Arr time | Dep AP | Arr AP | E[Pax] | R |
|----------|----------|----------|--------|--------|--------|-----|
| 1 | 450 | 900 | A | L | 16 | 500 |
| 2 | 1000 | 1230 | A | G | 18 | 300 |
| 3 | 1020 | 1410 | A | L | 25 | 500 |
| 4 | 1810 | 2200 | A | L | 49 | 500 |
| 5 | 510 | 840 | L | G | 12 | 400 |
| 6 | 1030 | 1225 | L | U | 21 | 350 |
| 7 | 1510 | 1810 | L | G | 55 | 400 |
| 8 | 2020 | 2350 | L | A | 24 | 400 |
| 9 | 615 | 800 | U | A | 21 | 200 |
| 10 | 1545 | 1740 | U | A | 23 | 200 |
| 11 | 1745 | 1930 | U | L | 19 | 250 |
| 12 | 2000 | 2310 | U | G | 17 | 500 |
| 13 | 430 | 710 | G | A | 12 | 400 |
| 14 | 920 | 1250 | G | U | 24 | 500 |
| 15 | 1330 | 1640 | G | U | 53 | 500 |
| 16 | 1920 | 2250 | G | U | 11 | 500 |

Figure 1: Timetable

Dep AP = Departure airport
E[Pax] = Expected (forecasted) number of passenger
R = Expected mean revenue per passenger

The timetable is cyclic, with a cycle time of one day. This means that each flight in the table should be flown once each day (including weekends).

Fleet. The aircraft fleet consists of two types of aircraft, two Jetstream 31 (J31) and four Fokker 50 (F50). The F50 has a capacity for 50 passengers and requires 50 minutes from landing until it can start again (i.e. turn-around time). The J31 can take 18 passengers and needs 30 minutes of turn-around time. The airline approximates the operating cost as 1000 per hour in flight for the J31 and 1500 for the F50 aircraft.

Maintenance. The same rules for maintenance applies to both aircraft types. After a maximum of 30 hours in flight, a maintenance check has to be performed. This takes five hours. The maintenance base for the J31 is located at airport A, while the base for the F50 fleet is located at airport L.

Assignment. Your assignment is to create a feasible aircraft schedule for the next summer season (5 months, May-Sept). The objective is to maximize profit.

Write a simple report describing how you solved the problem, presenting your solution, and discussing advantages and disadvantages with the schedule.

Question 1 should be submitted individually, question 2 should be handled in groups and a short report should be submitted for both. The report should be both sent by email to christiane.schmidt@liu.se and uploaded to lisam no later than the due date.

It should be noted that the memo will be sent to URKUND (<http://www.urkund.com>), a plagiarism checker to ensure original content.

Assessment criteria for question 1:

- You should comply with the assignment and all relevant questions should be discussed.

- Background facts should be correct; content has to be objective and relevant and a red thread should run through the high quality text.
- Good structure, layout and outline; the text should be easy to read and written in good, understandable English.
- Sources should be relevant and sources must be stated clearly.

Evaluation criteria for question 2:

- Presentation of solution method
- Presentation of solution
- Discussion on simplifications, advantages and disadvantages with the solution
- Result: feasibility, profit. That is, your solution **must be feasible!**