Tutorial #3: Decision Aid Methodology
3rd May, 2011

THIS DATA IS CONFIDENTIAL!
PLEASE REMOVE IT AT THE END OF EACH LAB SESSION!

1. Hands on CrewLogic

Today's objective of this first part is to get familiar with CrewLogic, the different constraints for the Anonymous Crew Pairing and the Crew Rostering Problem and the way CrewLogic deals with them.

1. Start CrewLogic.

2. Under Crew Planning -> Planning Display, load the data of the first week of January, 2010 for both DH4 and EM9 aircraft types.

- How many flights are there? How many different flights are there (use the flight statistics of SchedulePlanner or TecPlanner)?
- How many different pairings are there (you have to count manually)?

3. Now, type Ctrl + L; a dialog box for selecting crew population opens. Load all CMD (flight commanders). How many of them are there?

4. Look a the individual schedules and comment what you see. If you compare to the first week of October 2009, what is the main difference between the crew schedules?

5. Load the data for the DH4 aircraft for February 1st, 2010 (this is the example of the course!). Also load the crew population of flight commanders (CMD) for DH4 aircraft.

6. First, create rotations manually. To do so, select the flights to be part of the rotation (hit Ctrl and click on all flights you want to be part of the rotation then drag-and-drop it into the Anonymous Crew Routes panel). A dialog box opens; click Check & Save - if no error message pops up, the rotation is created. Close the dialog box to see the result. Repeat the operation until all flights are part of a rotation.

7. What is the minimal number of rotations you require to cover the flights?

8. Now, try to assign the rotation containing flight 0121 (GVA-MXP starting at 06:00) to Crew member BKZ. What happens?

9. Try, again for BKZ, to create a ground activity of type “OFF” (right-click on the crew's schedule then New Ground Activity..., select the duty type, then hit Create and finally + Insert).

- What happens?
- Delete the ground activity and try again with the ground activity type “BUR” from 07:00.
- What happens? Why is it different from the previous step?

10. Try now to assign any of the created rotations to crew “EKU”. Explain what is different and why.

11. Try to assign any of the rotations to crew “OHE”. What happens?

- To see the crew's file, double-click on him (you can also load the file from Dictionary -> Crew Database).
- Browse through the different menus and identify where to find the medical check list.
- Until when is crew “OHE’ allowed to fly before performing a medical check?
- Add a medical check on January 30, 2010 (do not set it as “passed”). What changes?
- Try again to assign a rotation to crew “OHE” after the medical check appointment was created. What happens?

2. Anonymous Crew Pairing

In this part of the tutorial, we will go into some more details into the Anonymous Crew Pairing optimization algorithm.

1. Reload the flights of February 1st, 2010 for the DH4 fleet and make sure there is no pairing.

2. Run the Anonymous Crew Pairing algorithm under Optimizer -> Anonymous Crew Routes with the given parameters.

- How many pairings are generated?
- Is it optimal?
- Look at the optimizer parameters. Is the solution you generated at point 6 feasible w.r.t. the actual parameters?
- Does the algorithm generate the solution?
- Look at the optimizer parameters. Is your solution feasible with respect to the current parameter settings? Why?
- Re-run the algorithm with the set of parameters ensuring that your solution generated in point 6 is feasible.
- Is the solution generated? (it should not!)

3. We will now enter the debugging mode of CrewLogic to look more in details at what happens in the Branch& Bound algorithm.

- First of all, clear all existing pairings, ensure that all the parameters are as in the latest algorithm run and that there is no unsaved data.

- Go to C:\Program Files\APM_TRAINING\EXE and look for a file CrewLogic_*.LOG (where * is some number). If the file exists, open it, delete its content, save and close.

- In CrewLogic, hold keys Ctrl+Shift and click on the Baboo icon in the top-left corner of CrewLogic. The debug mode is activated!

- Run the Anonymous Crew Route algorithm and open the file CrewLogic_*.LOG: it should no longer be empty!

- What you see is the specification of all routes that were sent to the Branch&Bound algorithm. Routes having the symbol "(*)" in front are selected in the solution. The day an time of the rotation's begin/ends are displayed after "Route: #"; finally, the cost of a route is the number after the signs "# C:".

- What is the cost of the solution found by the algorithm?

- Look at all the generated routes. Describe what you see and what does not look as you would expect?

- Are the routes you generated in your solution present in the formulation (ignore for now the different days)?

- If yes, what is the cost of the corresponding solution (if there are several routes covering the same flights, select the one on the correct days)?

- If not, try to identify 3 routes in the solution that cover all the flights and compute its cost.

- What is the optimality gap (in %) between your solution and the one of the optimizer? Again, ignore the different days for this point.

4. Let us try to identify why some routes are not generated. To do so, create the rotation GVA-MXA-MRS-GVA-MRS-MXA-GVA manually.

    - Is it feasible according to CrewLogic?

    - Go to Dictionary -> Crew Rules Set and look at the selected rules set (it should be the STANDARD one). Is the rotation you just created feasible w.r.t. all the parameters?

    - What can you conclude from this?

5. Perform the same steps with changing, in the parameters, the Stop-over list from "§" to "GVA". What difference do you notice? Explain.

Note: This tutorial is a modified version of the one prepared by Dr. Niklaus Eggenberg for the "Decision Aid Methodology" course for Spring 2010 session.