CARMEN SYSTEMS
RESOURCES IN BALANCE

Carmen Crew Pairing

Airlines

Crew pairing is the process of combining flights into patterns (pairings, trips or crew rotations), starting and ending at a crew base. These patterns are later combined into crew rosters or lines.

Maximizing productivity while achieving stability

The process

Define scope

Read the timetable. Decide which fleet to plan, which other carrier deadheads to allow and which crew positions to cover.

Select

Use the graphic user interface to select the flights to be planned. It is possible to use standard daily or weekly solutions, as well as creating dated solutions from scratch. When applying a pairing solution to a new timetable, information about cancelled flights, amended flight times and new flights will be updated automatically.

Solve

It is possible to build pairings interactively or use the pairing optimizer. During both manual and automatic pairing construction, legality controls are always carried out. Using the optimizer it is possible to create pairings with a minimal total crew cost, robust connections – with minimum of critical crew changes – and satisfactory crew quality. The pairing optimizer handles sophisticated aspects of crew pairing construction, such as synchronizing cockpit and cabin pairings, other airline deadheads, ground transports, variable crew needs and multiple crew bases, coupled with corresponding daily base constraints.

Evaluate

While the optimizer is running the user can always monitor the continuously improved solutions via the graphic user interface. It is easy to analyze and edit pairings created by the optimizer. A wide range of analysis reports are available to make the analysis of the pairing solutions more effective.

Communicate

When the solution is ready, the pairings are sent to the roster system, and reports are generated for preliminary hotel reservations, crew ticket reservations and meal load orders.

Making it possible to meet the desired trade-off between costs, stability and quality

Integrated with

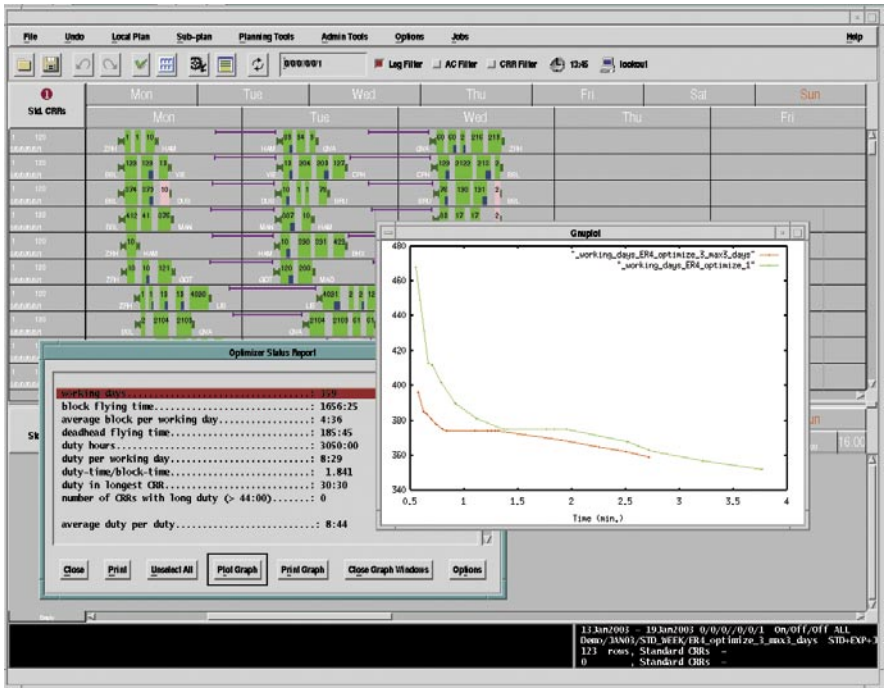
Carmen Crew Rostering to receive detailed information about resource bottlenecks.

Carmen day of operation systems to synchronize pairing properties with real operations.

Carmen Tail Assignment to create fleet connections that are also effective in the crew planning process.

Product content

- Pairing optimization
- Graphic pairing editor
- Carmen Rave (rule and quality modelling language)
- Reports (Carmen Rave Publisher)
- Regular new releases
- Standard support (office hours support and regular Installation Quality visits)



Comparing how required duty days varies between two optimization scenarios.

Options

- Carmen Timetable Manager (general flight timetable database)
- Bid-line generator and editor
- Extended support

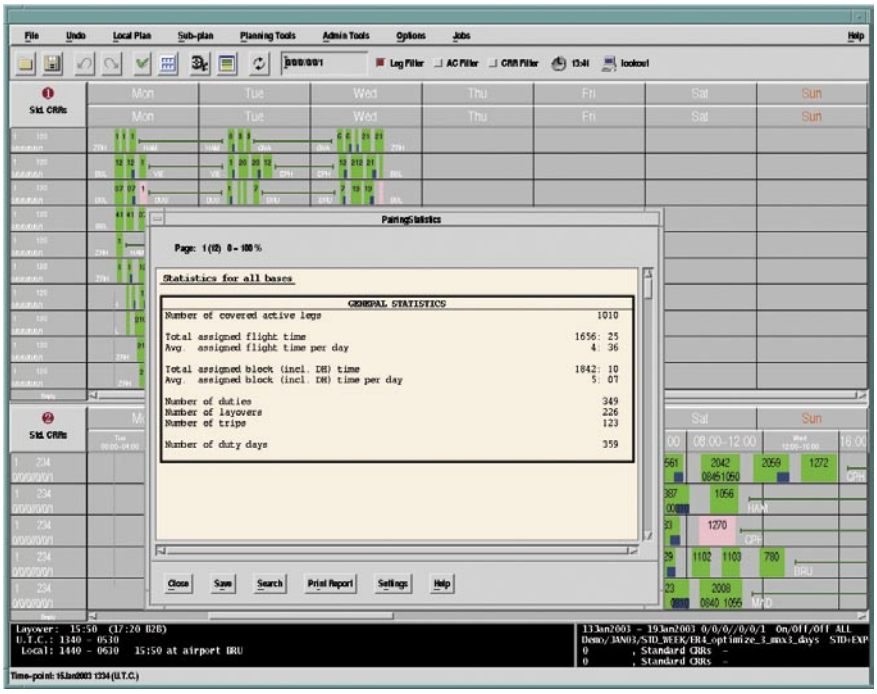
Technical information

Time schedule format:
SSIM, TPTS

Data storage:
Files (Oracle database is optional)

Output:
Standard text based transfer format.
Plug-in for client specific formats available as options.
PDF and ASCII reports

Platform:
Unix server,
Unix / Windows clients



An analysis report for one scenario delivered from the pairing optimizer.

Basic functionality

All Carmen products share certain basic components: an optimizer, a modelling language for legality, costs and quality (Carmen Rave), a report generator (Carmen Rave Publisher) and full customization abilities of system details.

Optimization

The optimizer makes it possible to rapidly test many different scenarios, and control important solution properties (e.g. minimizing costs for hotels, per diem and passive travel, limiting the use of crew changes, distributing production correctly to different bases and creating multi-base pairings to increase solution robustness). Coupled with Carmen Rave the optimizer makes it possible to set up and meet the desired trade-off between costs, stability and quality.

Carmen Rave

The Rave language handles legality as well as quality and cost aspects. The use varies from adding new quality control parameters and carrying out minor simulations, to rewriting and evaluating entire agreements. Our clients appreciate the short lead times for introducing changes to the system. But an even more important aspect is that Rave allows changes to be made by the client. Because new rules or quality constraints can be tested within a few hours, this puts the client in direct control of an ever-changing operation.

Report generator

The report generator enables reports to be added at any time (e.g. cost statistics, stability statistics and hotel bookings). Reports can be displayed on screen or on paper. The report generator also creates text data files that can be used to interface surrounding systems.

Customization

With Rave, the client can constantly change quality, legality and cost aspects. The report generator makes it possible to add new reports. Colours and objects in the graphic user interface can also be customized to visualize a solution's most important features.

Questions & Answers

What savings can Carmen Crew Pairing deliver?

Of course the amount saved depends on how effective the user's current process is. Initial savings at our clients typically range from 3% to 15%. The savings can be obtained by reducing the crew costs or by increasing the crew productivity. It is also possible to reduce direct costs (e.g. hotels, passive travel and per diem). Savings can be obtained for both short-haul and long-haul operations.

In addition to this there is also a second saving phase. When planners become skilled in controlling the system, it is possible to fully exploit the simulation potential, e.g. in agreement negotiations, or when providing the commercial department with feedback about a change request. This phase is harder to measure, since it is about avoiding cost increases from a new and expensive agreement or from not being able to meet promised delivery capacity. Based on feedback from clients we estimate that the savings from the simulation potential are comparable to the initial savings.

What problem size can Carmen Crew Pairing handle in one optimization run?

We can handle challenges from the largest airlines in the world. We already assist some of the largest carriers with their optimized planning. A wide variety of planning concepts are supported, including daily and weekly solutions and dated solutions from scratch. Our clients currently solve up to 25,000 dated flights, directly from scratch. Daily solutions with 1,500 flights are not a problem. Mixed short-haul and long-haul operations for large cabin population are also planned by our existing clients.

Can Carmen Crew Pairing handle complex, or even multiple, agreements?

Yes, Rave makes it possible to handle any agreement structure. We currently handle clients with many different union agreements in the same fleet. We also have clients where each individual crew member can choose between different agreements.

Can Carmen Crew Pairing obtain proper crew quality?

In our experience the definition of crew quality varies a lot between operators. During implementation, Carmen's staff works closely with expert planners (and sometimes with crew union representatives) to define exactly what crew quality means for the client. The crew quality criteria are then modelled in the Carmen Rave language.

Since most of the quality criteria are not stated on paper, but are rather a result of company culture, this process requires a lot of communication with the airline's experts. As a result, the airline's management receives documentation exactly of how the quality policy really is applied. After implementation the modelling of the quality criteria is taken over by the airline, ensuring that quality criteria always match the company's policy.

How does Carmen Crew Pairing deal with solution robustness?

There is a wide range of tools to ensure that the proper robustness can be achieved. The detailed robustness criteria are modelled in Rave. The optimization tools also support concepts such as base distribution (moving production between bases to match real crew availability), base variants (ensuring that a certain percentage of the pairings can be easily moved between bases), crew synchronization (keeping different crew categories together during the entire duty or during critical connections) and many more means for achieving solution stability. It is also possible to let Carmen Crew Pairing feed a fleet product, such as Carmen Tail Assignment, with suggestions on critical crew connections that must be respected.

How does Carmen Crew Pairing deal with changes (new aircraft type, changed agreements, new bases, changes in surrounding systems, etc)?

All our systems are designed to handle real changes and support what-if scenarios. The access to Rave and the Carmen Rave Publisher makes it easy to change bases, fleet structure, union agreements and quality or stability criteria. The flexible design of the graphic user interface also makes it easy to change interfaces to surrounding systems or to modify the planning process itself.

If you have any questions about Carmen Crew Pairing, please contact us at carmen@carmensystems.com.

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