GUROBI OPTIMIZATION

Automating and Optimizing Crew Planning, Scheduling, and Decision-Making

Assigning the right crew to the right locations and airplanes at the right times.

Regional Airlines

This small airline company, covering more than 30 cities, provides air service to hard-to-reach locations.

Industry: Transportation
Location: Europe
Use Cases: Customer Management, Resource Planning, Workforce (Allocation/Scheduling)

Results

- Automatically generate – in a matter of minutes – optimal crew rosters, pairings, and schedules on a daily basis
- Dynamically revise daily crew rosters, pairings, and schedules in real-time when disruptions or changes in the operating environment occur
- Create strategic crew plans – based on forecasted demand, budget, constraints, and other factors – and determine long-term capacity needs
- Make optimal strategic, tactical, and operational decisions on how to utilize the airline's crew

Navigating the unprecedented turbulence and headwinds in the aviation industry today is a difficult feat for airlines of all sizes.

Generally speaking, large-, medium-, and small-sized airlines all face similar challenges such as demand volatility, rising costs and complexity, and constant changes and disruptions in the operating environment. To rise above these challenges and realize sustainable profitability, airlines must strive to improve operational efficiency – but unfortunately, there's no one-size-fits-all software solution that can enable all airlines to achieve this.

Although mathematical optimization and other sophisticated AI tools are ubiquitous and used – particularly by larger players – across the airline industry, small- and medium-sized airlines have unique needs and processes, and require specialized solutions to boost performance and profitability throughout their end-to-end operations.

One operational area that is of critical importance (and significant complexity) for small- and medium-sized airlines is crew planning and scheduling.

Typically, larger airlines divide crew planning and scheduling into separate silos (including manpower planning, crew pairing, crew rostering, and crew tracking) and use a suite of software solutions to drive optimal planning, decision making, and operations in those areas.

These solutions, however, often do not meet the needs of small- and medium-sized airlines, who require a holistic planning solution to help them manage the deployment and maximize the utilization of their crew.

One small-sized airline was looking for such a solution. It has a fleet of 10 aircraft and a staff of over 100 pilots and more than 200 crew members and operates around 12,000 flights per year.

Previously, this airline was using manual planning tools and techniques to create its crew plans and schedules – a complicated, time-consuming process that was resulting in:

- Increased operating costs due to crew accommodation, positioning, and rotation

> "To remain profitable in today's complex and dynamic business environment, airlines need to be able to make quick and optimal decisions about how to use their limited resources, such as crew."

- Sub-par resource utilization, which can lead to flight delays
- Employee dissatisfaction due to the perception that crew assignments were not fair
- Reduced compliance with Flight and Duty Time Limitations (FTL) rules
- Protracted planning cycles and "key person risk" due to an over-reliance on a handful of individuals in the crew planning process
- Lack of operational agility in the face of changes and disruptions (due to weather conditions, maintenance issues, etc.)
- Lack of integration of crew plans and schedules with other operational areas

To address these issues and automate and optimize its crew planning, scheduling, and decision-making processes, the airline decided to invest in a mathematical optimization software solution.

The Solution: Automating and Optimizing the Crew Planning Process

The airline started its search for a new crew planning system by exploring various off-the-shelf software solutions in the market, but found that (as it is a mid-sized airline) none of these products (which are made for larger airlines) could provide the right fit for its business.

And so, in 2019, they developed an automated, holistic crew planning and scheduling optimization solution specifically for small- and medium-sized airlines.

The solution – which is powered by the Gurobi Optimizer, the world's fastest and most powerful mathematical optimization solver – went live in early 2020.

With the solution – which serves as the "autopilot to schedule air fleet and crew" – the airline has the capability to:

- Automatically generate – in a matter of minutes – optimal crew rosters, pairings, and schedules on a daily basis
- Dynamically revise daily crew rosters, pairings, and schedules in real-time when disruptions or changes in the operating environment occur
- Create strategic crew plans – based on forecasted demand, budget, constraints, and other factors – and determine long-term capacity needs
- Make optimal strategic, tactical, and operational decisions on how to utilize the airline's crew

The airline's CFO said, "The implementation of the crew planning solution has optimized and revolutionized our crew rostering, scheduling, and planning process. With the click of button, we can automatically generate optimal crew rosters, pairings, plans, and schedules – and then use those to drive optimal, data-driven decision-making on how to deploy our crew in the most efficient manner possible every day."

"We are also able to handle disruptions more effectively – as the solution is able to replan in real-time when we are experiencing disruptions and help us figure out the best way to reposition our crew," he added.

The Results: Maximizing Efficiency While Minimizing Costs

The solution now serves as the single source of truth for crew planning and scheduling within the airline, and key stakeholders across the their end-to-end operational network rely on the tool each and every day to deliver optimal crew plans and schedules.

With the solution, the airline is able to automatically create optimal crew rosters, pairings, schedules, and plans and make strategic, tactical, and operational decisions that enable the airline to:

- Maximize the operational efficiency of its crew
- Reduce operating costs for crew accommodation, positioning, and rotation
- Minimize flight delays and improve on-time performance – and thereby boost customer satisfaction
- Ensure the fairness of crew plans and schedules – and thereby improve employee satisfaction and retention
- Ensure compliance with FTL and other regulations (and avoid penalties for violating these regulations)

"With the solution, we can make sure that we always assign the right crew to the right locations and airplanes at the right times. Since the go-live of the solution, we've been able to achieve some significant improvements across numerous key areas including operational efficiency, on-time performance, cost reduction, customer and employee satisfaction, and regulatory compliance," the CFO commented.