Case Article

MotherLand Air: Using Experiential Learning to Teach Revenue Management Concepts

Richard Metters
Goizueta Business School, Emory University, Atlanta, Georgia 30322,
richard_metters@bus.emory.edu

Vicente Vargas
School of Business Administration, University of San Diego, San Diego, California 92110,
vavargas@sandiego.edu

Sherry Weaver
Haskayne School of Business, University of Calgary, Calgary, Alberta T2N 1N4, Canada,
sherry.weaver@haskayne.ucalgary.ca

The MotherLand Air case and game provide students with a first-hand experience in revenue management. The game is conducted in the classroom, and students, who have the opportunity to prepare in advance, work in teams. During the exercise, students make and revise pricing and protection-level decisions over a six-month, predeparture time horizon for two simulated flights. The case provides an introduction to nested reservation systems and overbooking and pricing polices.

Keywords: yield management; revenue management; experiential learning

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Introduction

When teaching revenue management (RM) to the MBA-student audience, Bell (2004, p. 22) argues that “the key to a successful experience is to focus on demonstrating the key ideas and concepts used by the RM firm.” MotherLand Air aspires to create this kind of experience.

MotherLand Air simulates the daily decisions made by an RM analyst. Student teams develop RM models, adapt the model results, and make decisions dynamically. An overall reason for having RM systems in any industry (especially the airline industry) is that lower-revenue customers tend to book earlier than higher-revenue customers. To maximize profit, the revenue manager often must turn down certain bookings now for the hope of higher revenue bookings in the future.

Pedagogical Goals

Use of this case and game supports students’ understanding of important principles and key ideas associated with RM. Specifically, the game supports the following learning objectives.

- Students analyze demand data, develop a nested reservation policy, and implement that policy in a dynamic environment.
- Students calculate an overbooking level under a nonlinear overbooking cost function.
- Students determine a pricing policy considering both demand elasticity and capacity.
- Students use analysis to argue for the adoption of their ideas.

A case study of a fictitious airline provides the basis for the game. Students must devise a dynamic plan for a nested yield management system. Students are given historical demand data, information about price elasticities, and the option to increase or decrease prices. The planning horizon begins six months prior to departure. Students set initial prices and protection levels, and, by implication, determine an overbooking level. Actual booking figures are given as the
planning horizon is consumed. At each epoch, students may revise prices and protection levels.

To do well, students must prepare carefully. It is recommended that this simulation be used after material on RM models is provided. Two weeks prior to the in-class simulation, the case study with historical data on forty previous flights is provided to the students. Unconstrained demand and no-show data are provided for two fare classes. Students use the data to determine the distribution of customer no-shows and to create demand profiles for each customer class. The former can be used to determine the optimal overbooking level. From the latter, models can be calibrated to determine capacity allocation. Students will typically use so-called “pickup” models such as those used at United, Delta, American Airlines, and elsewhere. These models estimate the number of seats that will be booked because of demand in the remaining time horizon based on the current state of demand and the historical data.¹

### Comparable Teaching Tools

There are a number of well designed cases and simulations for teaching RM. The two most similar to MotherLand Air are Popescu (2006) and Larson and Odoni (2008). Both allow students to interactively implement RM models in an airline context. Both are flexible and provide a high degree of complexity. Larson and Odoni (2008) allow for up to five different fare classes. The user can choose to use the expected marginal seat revenue (EMSR) heuristic or choose another. The Popescu (2006) and Larson and Odoni (2008) simulations allow users to develop and test heuristics over multiple flights, and thus enable comparison by statistical tests. The strength of the MotherLand Air case lies in its simplicity and in its implementation in the social environment of the classroom. Both friendly competition and the desire to do well in front of one’s peers provide for a memorable experience, particularly because the student team that eventually triumphs often trails in the standings until the final rounds of the game. The game is not intended to teach mathematical optimization or development of optimal policies. Rather, it is intended to teach fundamental principles and key concepts.

Readers interested in other teaching cases in RM are urged to consult Bell (2004); Phillips (2003); Netessine and Shumsky (2002); Yeoman and McMahon-Beattie (2004), a 16-chapter, edited volume of cases in RM, most from emerging areas for RM; and the other cases that are published in this special issue.

¹ See accompanying Teaching Note for overbooking level calculation and example heuristic models.

### Teaching Effectiveness

Evidence for the teaching effectiveness of the game is anecdotal, based on the experience of colleagues who have used the case and the word-of-mouth demand deriving from its use. The case has been classroom-tested at a number of leading universities, including the University of Alberta, Babson College, the University of Calgary, Emory University, INSEAD, The Wharton School of the University of Pennsylvania, the University of Southern California, Southern Methodist University, Stanford University, and Vanderbilt University.

We have found the case to be effective on several different levels of learning. At the lowest level of rote learning, it provides an entertaining and enjoyable way for students to gain practice computing RM equations for overbooking, protection levels, and pricing in preparation for the game. During game play, more integrated learning occurs as students must reconcile their numbers while judging data uncertainty under time pressure. Finally, students engage in critical thinking. Coming into the game, most students see RM as a fairly dry subject with some obvious rules. After the game, when students have experienced the emotional difficulty of implementing those rules, they come to understand more of the complexity and richness of the subject.

The case and game are appropriate for use in graduate-level business courses in operations management and service operations management, or during an early session in a course on RM. Because the case and game are short and focused, they are also appropriate for use with sophisticated undergraduate students.

### Conducting the MotherLand Air Game

The case and game are best conducted with students in teams. The social component of proposing and arguing for good decisions is one of the teaching aspects of the case. Many students start with good strategies but lack the discipline to maintain them.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>List of Files Included with the MotherLand Air Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>File name</td>
<td>Description</td>
</tr>
<tr>
<td>MotherLand Air Case</td>
<td>Main case document distributed to students.</td>
</tr>
<tr>
<td>MotherLandAirStudents.xls</td>
<td>Unconstrained demand for 40 past flights, distributed to students.</td>
</tr>
<tr>
<td>MotherLandAir Teaching Note</td>
<td>Contains information for faculty, material for the debriefing session, and figures illustrating a pick-up model.</td>
</tr>
<tr>
<td>MotherLandAirInClass.xls</td>
<td>Provides the backbone of the in-class simulation.</td>
</tr>
<tr>
<td>MotherLandAirTN.xls</td>
<td>Provides supplementary analysis.</td>
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Note: Files can be found and downloaded from [http://ite.pubs.informs.org/](http://ite.pubs.informs.org/).
All that is needed to conduct the exercise is access to MS Excel and a projection source. Table 1 summarizes the supplementary files. The workbook “MotherLandAirInClass.xls” contains all of the templates necessary to run MotherLand Air. The workbook tracks student decisions and financial performance for up to twelve teams. Figure 1 shows a sample screenshot. The first tab contains complete instructions. The next two tabs control the two simulated flights. Play is advanced by decrementing the time index within either simulated flight sheet. Twelve tabs receive student decision inputs for running the simulation. The summary sheet provides round-by-round results of how each group is doing relative to the others. The worksheet in the final tab contains a blank sheet for student use during the simulation, and can be printed and photocopied for each group to use to record and report their decisions. A hidden workbook contains the raw demand data if the game is to be played in more than one section or if one desires to change the data from year to year. To view the hidden sheet, choose format-sheet-unhide from the Excel menu. The workbook “MotherLandAirTN.xls” provides copies of supporting analysis behind the two figures in the teaching note.

Limitations
The case is time intensive. Simulating two flights and debriefing can be expected to go beyond a single, 80-minute session. (The two flights are contrasted in the Teaching Note.) Time management is important; otherwise, it may only be possible to conduct one flight in the initial 80-minute session. An experiential exercise such as MotherLand Air cannot match the information density of a traditional lecture. The case makes a few, fundamental points that could be told in 10 minutes and forgotten in a day. Student learning and retention depend on the experience. We do not expect experiential learning to be within the comfort range for all faculty. The potential adopter has to weigh the amount of information conveyed against the depth of understanding achieved by students. On the other hand, such time investments may create experiences around which students can organize their knowledge in a meaningful way. (For a more thorough discussion of the specific teaching points made in the case and game, please refer to the Teaching Note.)

References

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2 Supplementary files can be found and downloaded from http://ite.pubs.informs.org/.