A MAGAZINE FOR AIRLINE EXECUTIVES 2006 Issue No. 1

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Measuring Revenue Management Performance

Airlines can get the most from their revenue management program by ensuring it is implemented effectively and processes are in place to validate its performance.

By Ben Vinod | *Ascend* Contributor

A successful revenue management program is the culmination of process, people and technology that are effectively harnessed to maximize revenues. Measuring performance of the revenue management process during its evolution from inception to steady state is probably the single most important task to ensure the process is indeed contributing to the success and adding to the bottom line.

The introduction of a revenue management process at an airline generates incremental revenues. This is achieved with overbooking controls, discount fare mix controls, origin-and-destination controls and control of group passengers. However, the feat of revenue management is contingent on people, process and technology coming together, and the value generated can vary significantly by airline. There is a strong business case for investing in revenue management, and airlines should examine all stages of the evolution of revenue management from inception through "go live" and steady state.

Today, most of the top 50 carriers around the world have already made an investment in revenue management. However, several carriers in the top 300 are still contemplating investing in the practice. Broadly speaking, there are three stages in the evolution of revenue management within an airline:

- Investment and the chief executive officer buy in,
- Go-live validation and monitoring key performance indicators,
- Steady-state operations and continuous demand management.

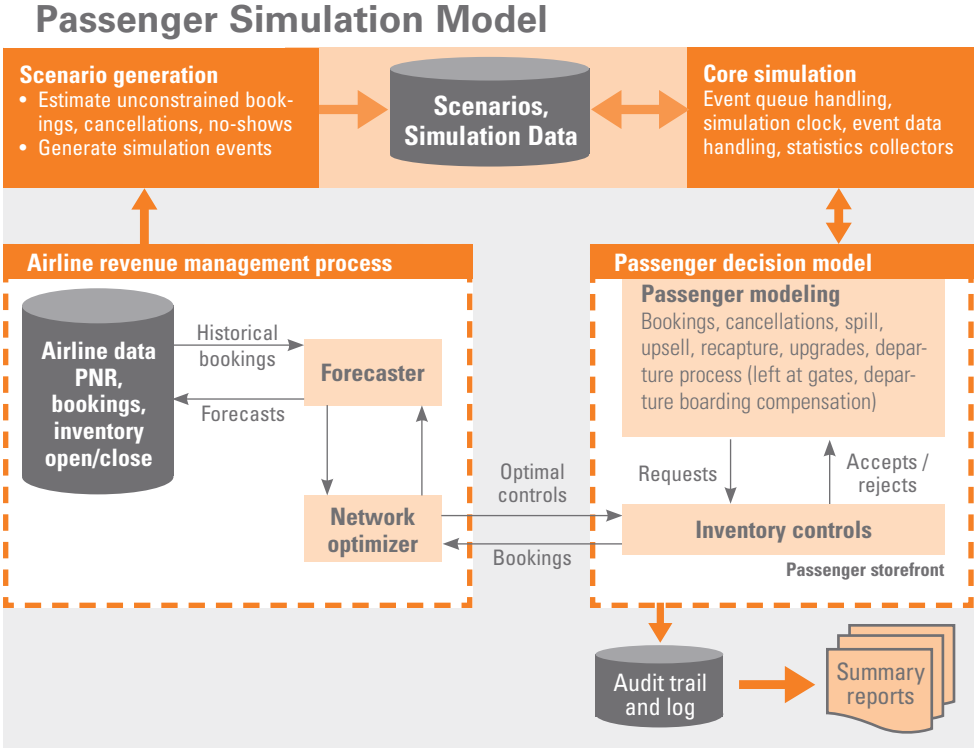
It begins with a tentative decision to invest in revenue management followed by the validation exercise and commitment to make it work. The second step constitutes the "go live" and subsequent validation of revenue-management-influenced performance. The third stage is essentially getting the most out of revenue management in a steady-state operating environment.

Investment and the CEO buy-in

Investing in revenue management requires commitment from senior management to adopt the processes across the airline. Many chief executive officers have a keen interest in revenue management given the competitive advantage and impact on the bottom line. Without this commitment, revenue goals cannot be achieved. There are several complex decisions that need to be made to add revenue to the bottom line, and without CEO commitment to revenue management, this can never be accomplished.

Key challenges that cannot be overcome without a commitment toward revenue management include:

- How to accurately forecast products and services,
- How to allocate capacity to derive the optimal mix,
- How to minimize spoilage,
- How to retain market share without risking revenue dilution,



An effective simulation model requires three components — the airline's revenue management process, a simulation environment and the passenger decision model. By using this model, an airline can demonstrate the return on its investment in a revenue management program.

Revenue Management Transition and Performance Measurement

The three stages in the evolution of revenue management within an airline lead to the development of an optimal program that delivers the most value.

- How to maintain an acceptable quality of service to retain customers,
- How to adjust capacity to match demand to supply for optimal performance.

The first stage involves the justification process by modeling business requirements and constraints that are specific to the operating route structure and characteristics of the airline. Developing a simulation model consists of three core components — simulation environment, airline revenue management process and passenger decision model.

An important consideration for simulation is to use actual passenger name record data augmented with spilled passengers based on historic open/close information by booking class from the reservations inventory system. This approach to simulating passenger behavior is a departure from the traditional Monte Carlo simulation technique. Also, the passenger modeling module should replicate the specific inventory control structure that will be supported in the airline's reservations system.

The output of the simulation model will include all the pertinent performance indicators such as network revenue, revenue per available seat miles, revenue per revenue passenger miles, load factor, spoilage and over sales. The incremental revenue statistics from the proposed environment compared to the baseline (current environment) will demonstrate the payback on investment.

The simulation model is also required to understand what enhancements in the future provide maximum return on investment and can be used for extensive "what-if" analysis. Airlines have the option to develop a simulation model on their own or become part of a consortium with companies, such as the *Sabre Holdings*™ business, that provide unrestricted access to a sophisticated simulation framework.

Overcoming the CEO hurdle does not end with the simulation analysis. In fact, it is simply the beginning. The next step would be to identify the vendor of choice, establish an organizational structure with the right people and skill sets for the organization, and establish the revenue management playbook based on a detailed business process reengineering exercise.

"Go-Live" Validation and Monitoring key Performance Indicators

There are two broad categories of performance measures that can be tracked after going live with revenue management — pre-departure statistics and post-departure statistics. Monitoring performance measures over time serves two purposes. First, it is used as a yardstick to compare month-over-month and year-over-year measures. Second, it detects weaknesses in the revenue management process and identifies corrective actions that need to be taken quickly.

Post-Departure Standard Measures

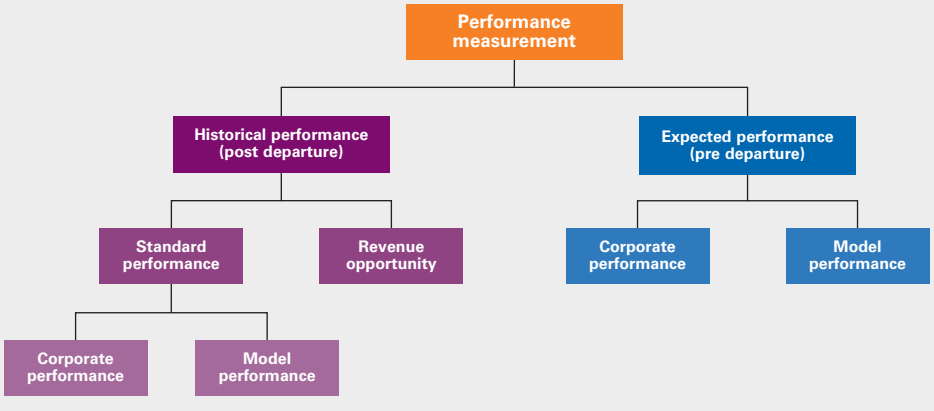
The historical performance of a flight is calculated after flight departure. Post-departure performance metrics can be broadly classified as standard performance measures and revenue opportunity measures.

Post-Departure Revenue Opportunity Measures

The revenue opportunity model represents the second broad category of post-departure performance measurement. It determines the incremental revenue earned as a percentage of the maximum revenue opportunity available through perfect revenue management. Increases in revenue opportunity measures over time demonstrate the improvements in the revenue management process. This approach can estimate revenue management performance at the flight or network level of detail by determining both the potential for revenue gain through revenue management and the proportion of the revenue potential that was actually achieved.

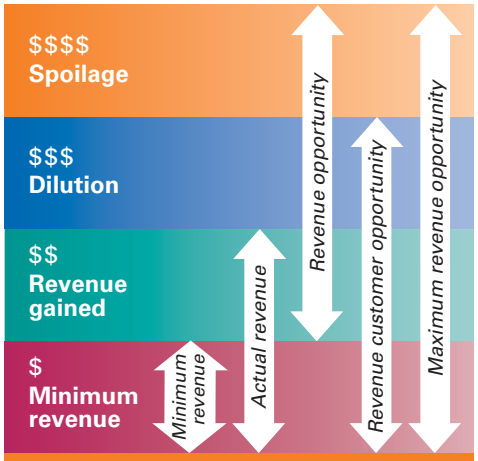
The potential for revenue gain may change over time as external factors change. However, the proportion achieved will correlate with revenue management performance. Thus, the model provides a consistent mea-

Components of Performance Measurement



Pre-departure statistics and post-departure statistics can be used to monitor performance over time. Such measures can provide a basis of comparison and identify weaknesses in the revenue management processes that need correcting.

Components of Discount Allocation Revenue Opportunity



The total revenue opportunity can be divided into spoilage, dilution and revenue gained through the revenue management process.

Post-Departure Performance Measures

Corporate measures	Description
Load factor	The ratio of onboard traffic to available seats expressed as a percentage. An alternate definition is the ratio of revenue passenger miles to the available seat miles expressed as a percentage.
Yield	Passenger revenue per revenue passenger mile/kilometers.
Revenue per available seat miles/kilometers	This is considered the single most important measure and the ratio of passenger revenue to available seat miles/kilometers.
Market share	Represents an estimate of the proportion of total traffic in a market. Can be estimated from market information data tapes and passenger shopping data.
Oversale (denied boarding) rate	Calculated separately for voluntary and involuntary denied boardings. It is the ratio of number of denied boardings to the number of passengers boarded expressed in denied boardings per 10,000 passengers boarded.
Spoilage	Represents the number of empty seats on closed flights.
Spoilage rate	Ratio of number of spoiled seats to the number of passengers boarded expressed as a percentage.
Over-sale cost	Cost of customers who were denied boarding. Should be tracked by airport. Components of denied boarding costs are voucher costs, meals, ground transportation and goodwill. Expressed in unit of currency per person by airport.
Load factor on closed flights	This is the correction factor for incorrect overbooking. Measurement is based on open/close status throughout the flight by booking class and calculated as a weighted average by flight leg and base compartment.
Closing rate	Probability that demand for a booking class exceeds the available seats in the class.
Employee productivity ■ Average number of employees ■ Seat capacity per employee (seat miles/kilometers) ■ Passenger load per employees (ton miles/kilometers) ■ Revenue per employee	Standard measures of employee productivity and usually reported year over year. Productivity statistics are important since employee compensation constitutes a significant part of the operating costs.
Model measures	**Description**
Forecast errors	Errors associated with demand forecasting, cancellation rate forecasting, boarding rate forecasting. Common measures include mean absolute deviation, standard error, bias, weighted mean absolute percent error and mean squared error.

Pre-Departure Performance Measures

Corporate measures	Description
Booked load factor	The ratio of onboard traffic to available seats expressed as a percentage. An alternate definition is the ratio of revenue passenger miles to the available seat miles expressed as a percentage.
Expected load factor	The expected load factor of a flight at departure based on current bookings, forecast of remaining demand and inventory controls.
Expected revenue	Expected revenue of a flight at departure load based on current bookings, forecast of remaining demand and inventory controls.
Expected yield	Expected passenger revenue per revenue passenger mile/kilometers.
Expected revenue per available seat miles/kilometers	The ratio of expected passenger revenue to available seat miles/kilometers.
Spill rate by class	Ratio of spilled passengers to unconstrained demand to date for a future departure. This statistic must be computed by leg class or service class depending on inventory control method. If the spill rates are not ascending from the highest valued class to the lowest, it identifies a problem with how discount allocations are set.
Closing rate	Probability that demand for a booking class exceeds the available seats in the class (pre-departure closing rates).
Model measures	**Description**
Forecast errors	Errors associated with demand forecasting, cancellation rate forecasting by reading day interval. Common measures include mean absolute deviation, standard error, bias and mean squared error.

sure, which enables airlines to track relative performance over time. In addition, the model also provides a specific revenue benefit associated with revenue management. This capability enables airlines to quantify the benefits associated with performance improvements due to system or procedural changes or costs associated with poor performance. This measure can be applied across flight departures by time or geographic regions or system to measure aggregate performance.

Discount allocation spoilage represents empty seats that result from premature closure of discount classes in spite of excessive demand for a flight that is a direct result of over estimating show-up rates and/or demand for higher-valued booking classes. The revenue customer opportunity statistic is calculated from the optimal mix achievable up to the actual boarded count-by-flight leg, meaning that:

- Dilution equals actual revenue subtracted from revenue customer opportunity,
- Spoilage equals actual revenue plus dilution subtracted from maximum revenue opportunity.

The revenue opportunity measures can be calculated by flight leg or flight number as well as at the network level of aggregation. To compute the measures for a flight number or network will require that a deterministic linear program be solved.

Pre-Departure Standard Measures

The pre-departure performance of a flight is monitored to take corrective actions when a flight's expected performance is in doubt. There are several key measures associated with corporate performance and model performance, including:

- Booked load factor,
- Expected load factor,
- Expected revenue,
- Expected yield,
- Expected revenue per available seat mile/ kilometer,
- Spill rate by class,
- Closing rate.

Isolating Revenue Management Performance

Isolating the performance of the airline revenue management process translates into determining the incremental revenues generated with optimal revenue management controls without considering other environmental influences.

Measuring the direct revenue benefit that can be attributed to revenue management is difficult to estimate since it is difficult to isolate the impact of revenue management controls from external factors. Typical external factors that impact revenue management performance include pricing actions, capacity changes, competitive activity, changes in the business climate and new low-cost entrants in the market.

Frequently, multivariate models are used to fit a response surface model to the significant variables that impact incremental revenues and, hence, isolate the revenue impact of revenue management controls. This approach has only met with limited success due to noise in the calibration process. A common approach is to normalize the fares and recalculate all the pertinent statistics to determine the benefits that can be attributed to revenue management.

Airlines operating in an origin-and-destination inventory control environment should store the total bid price and associated fare value of the reservations request on the passenger name record before ending the transaction in the reservations system. The total bid price is calculated at the time of sell for determining availability. Once this data is captured in the PNR, on a post-departure basis, the incremental contribution that can be attributed to the revenue management process can be determined.

Steady-State Operations and Continuous Demand Management

Revenue management serves a central role in an organization. When considering an investment in revenue management, an airline should evaluate the short- and long-term benefits. For a typical airline, most revenue management resources are focused on the short-term goal of maximizing revenue with a given schedule and fare structure. However, long-term revenue management planning often has significant positive financial impact as well. Long-term revenue management planning must consider the marketing plan encompassing flight schedules, fares, group and off-tariff sales practices, distribution methods, passenger handling policies, frequent flyer program, and advertising. Because so many functions are involved, long-term planning must be conducted at the corporate level.

Key performance indicators associated with revenue management should be tracked and monitored across organizational silos, given its relevance to the key stake holders. This end-to-end transparency horizontally (across organizational boundaries) and vertically (within an organizational hierarchy) should be leveraged by the CEO to enable zero latency in decision making.

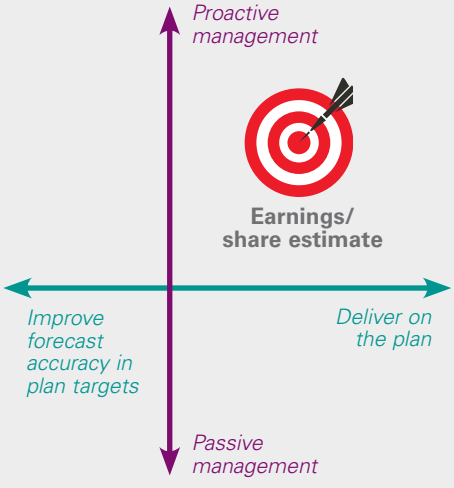
Business process integration across various functional areas — revenue management, capacity planning, marketing, operations, fleet planning, pricing, reservations, sales and distribution — is required for effective decision making. This entails the optimal use of revenue management data (both inputs and outputs) for effective decision making across the major functional areas in airline planning and operations.

As is most often the case, forecast accuracy is blamed for poor corporate performance. If forecasts were perfect, achieving the target performance measures would be a non issue. The typical symptoms indicate that forecasts

Impact of Revenue Management

Various functions within the airline can benefit from an effective revenue management process. Using revenue management data across the major functional areas of an airline can lead to improved decision making.

Forecast Accuracy vs. Proactive Management

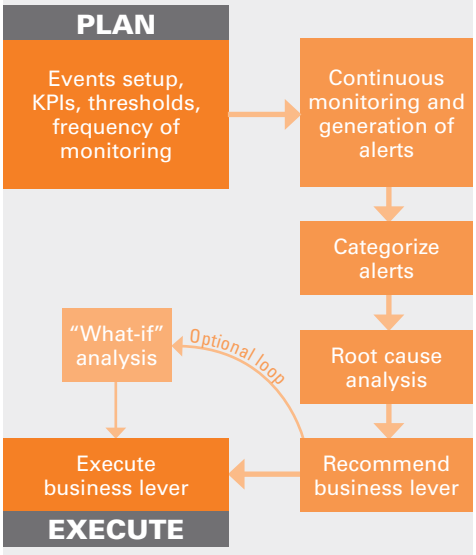


A combination of proactive management and improved forecast accuracy can help an airline make its plan, which means it would meet revenue and market share targets as well as achieve target customer service levels and cost targets.

may be accurate at a macro level (e.g. market), but not accurate at the itinerary class level where seat inventory is consumed. Frequently, situations may arise when too many discount seats have been sold, resulting in higher-valued passengers being spilled. As a direct consequence of these issues, there tends to be passing the blame among sales and revenue management and operations when plans are not met. What the functional silos fail to recognize is that the business environment is becoming too dynamic to just rely on forecasting accurately to drive performance.

Putting revenue management processes aside for a moment, ultimately, the most important issue is that an airline focuses on making the plan happen. The plan involves meeting revenue and market share targets for the current period, achieving target customer service levels to protect future revenues and achieving cost targets. A paradigm shift is required to manage demand continuously to effectively manage the business even if the forecasts are not accurate. Continuous demand management requires active monitoring of key performance indicators and proactively reviewing alerts to take the necessary corrective actions to ensure the plan can be achieved. This rapid sense-and-respond capability of continuous demand management addresses demand variability positively to ensure the plan's targets are met.

Events and Alerts Resolution



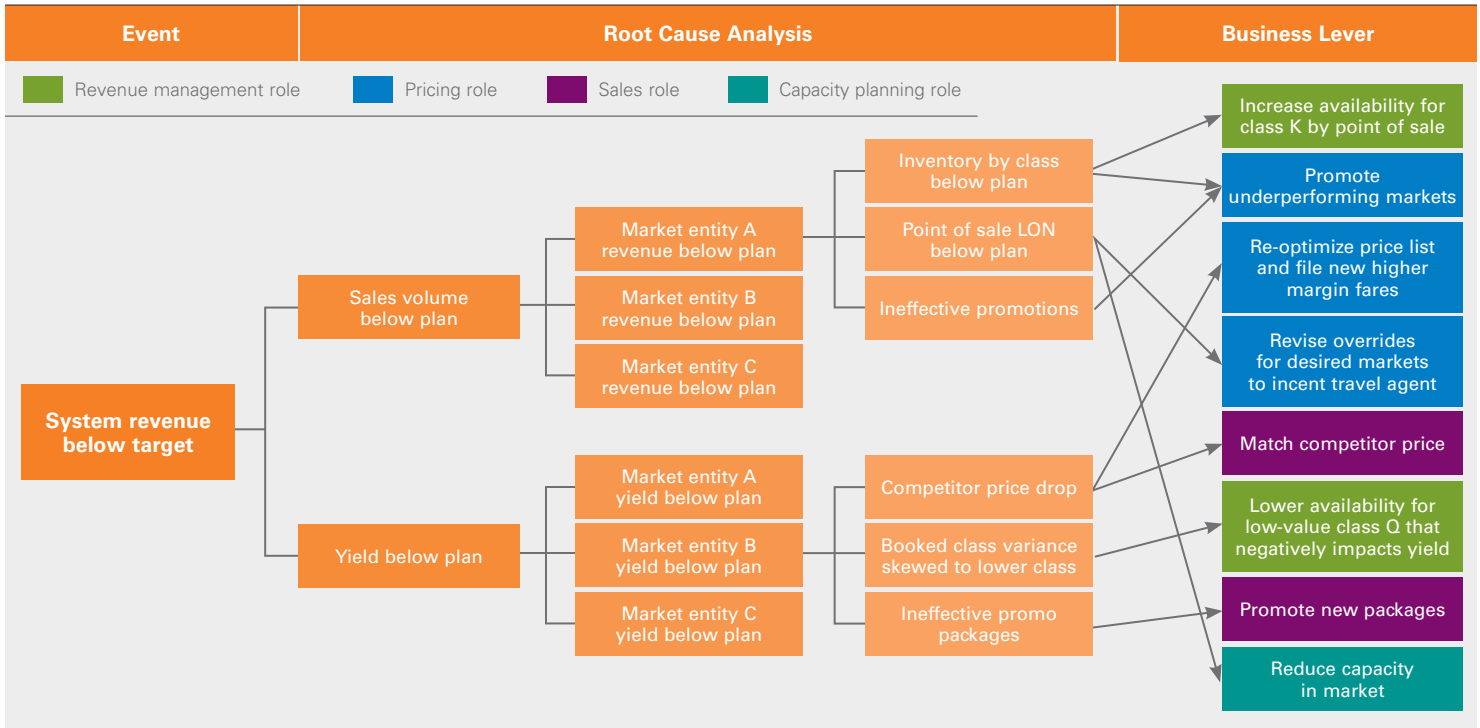
The management of events, which serves as a central nervous system, can be established and orchestrated for proactive decision making.

Based on the recognition that variability in a competitive environment is too high to consistently forecast accurately, how can revenue management performance measures be used proactively to make the plan happen consistently in spite of high variability in demand? An airline must embrace the paradigm of continuous demand management, which requires putting processes in place that account for variability and then proactively using all the business levers available to respond to make that plan happen. This is accomplished by proactively balancing current and future goals as well as revenue and costs by using all means available to take corrective action.

To address variability, latency should be overcome to ensure proactive management. Latency results because of slow propagation of information resulting in excessive cycle times for decision making.

Revenue management does not address the cost side of the equation, which is an anathema for most unprofitable airlines today. On the cost side of the equation, the same framework can be used to monitor and deliver

Alerts, Root Cause Analysis and Resolution



The root cause analysis framework of an event helps an airline understand what caused the deviation from the plan and the business lever (supply or demand) that should be invoked to take corrective action. A root cause analysis should be conducted on each KPI, such as system revenue. The activation of the business lever may lie in different organizations such as pricing, revenue management, sales or capacity planning. A similar decision tree will be required for all KPIs that need to be monitored to ensure consistency in decision making.

HIGHlight

To guarantee ROI, a commitment is required from all levels of management, starting with the CEO, to establish the revenue management process and define roles, responsibilities and accountability for actions taken.

on cost targets for the current period and also deliver on targets for efficiency improvements that drive lower costs in the future.

Event management is central to the orchestration of continuous demand management based on alerts generated from revenue management performance measures. The management of events serves as a central nervous system. This requires the definition of revenue management KPIs at distinct levels of aggregation, frequency of monitoring (by the minute, hour, day, week, etc.) and possible recourse for a corrective action by invoking a demand or supply lever. Events can be established and orchestrated for proactive decision making.

Demand levers include pricing actions, promotions, sales incentives and overrides. Supply levers include capacity changes, change frequency on markets served and entering new markets. Typically, the effects of invoking a demand lever can be realized immediately while supply levers are less agile, and the impacts will only be realized after a few weeks.

The payback from revenue management is usually realized within weeks and rarely exceeds a year. As a general rule, the larger the airline, the faster the payback on the initial investment. This is because the incremental costs of deploying a revenue management solution for a larger airline is much smaller than the magnitude of the incremental benefit. Even for airlines with as few as 50 to 75 departures per day, the return on investment can still be measured in weeks or months. However, the deployment of revenue management is not a panacea for generating incremental revenues and profitability. To guarantee ROI, a commitment is required from all levels of management, starting with the CEO, to establish the revenue management process and define roles, responsibilities and accountability for actions taken.

To get the most out of a revenue management program requires the continuous monitoring of pre-departure and post-departure measures to provide continuous feedback and take corrective actions. With its portfolio breadth, the *Sabre Airline Solutions*® business is working with several airlines, small and large, to establish processes to monitor the plan with standard reports for performance measurement. The ultimate challenge is to automate this framework to ensure consistent actions based on events.

Ultimately, in steady state, revenue management plays a key role to "make the plan happen" with the process of continuous demand management. Implementation of revenue management awareness enterprise wide is critical to ensure transparency across the organization and leverage key revenue management-related performance indicators to ensure that revenue plans are met by enabling zero latency in decision making.

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+count it up

1843
Year William S. Henson, a British inventor, patented plans for a steam-driven airplane that had many of the basic parts of a modern airplane.

1913
Year Igor I. Sikorsky, a Russian inventor, built and flew the first four-engine plane.

1958
Year the Boeing 707 began the first U.S. jet transport service between the United States and Europe.

1896
Year Samuel P. Langley of the United States flew a steam powered model plane.

1953
Year the first turboprop transport, the Vickers Viscount, began regular airline service.

1983
Year a Rockwell Sabreliner became the first plane to cross the Atlantic Ocean with a pilot guided only by a satellite navigation system.