

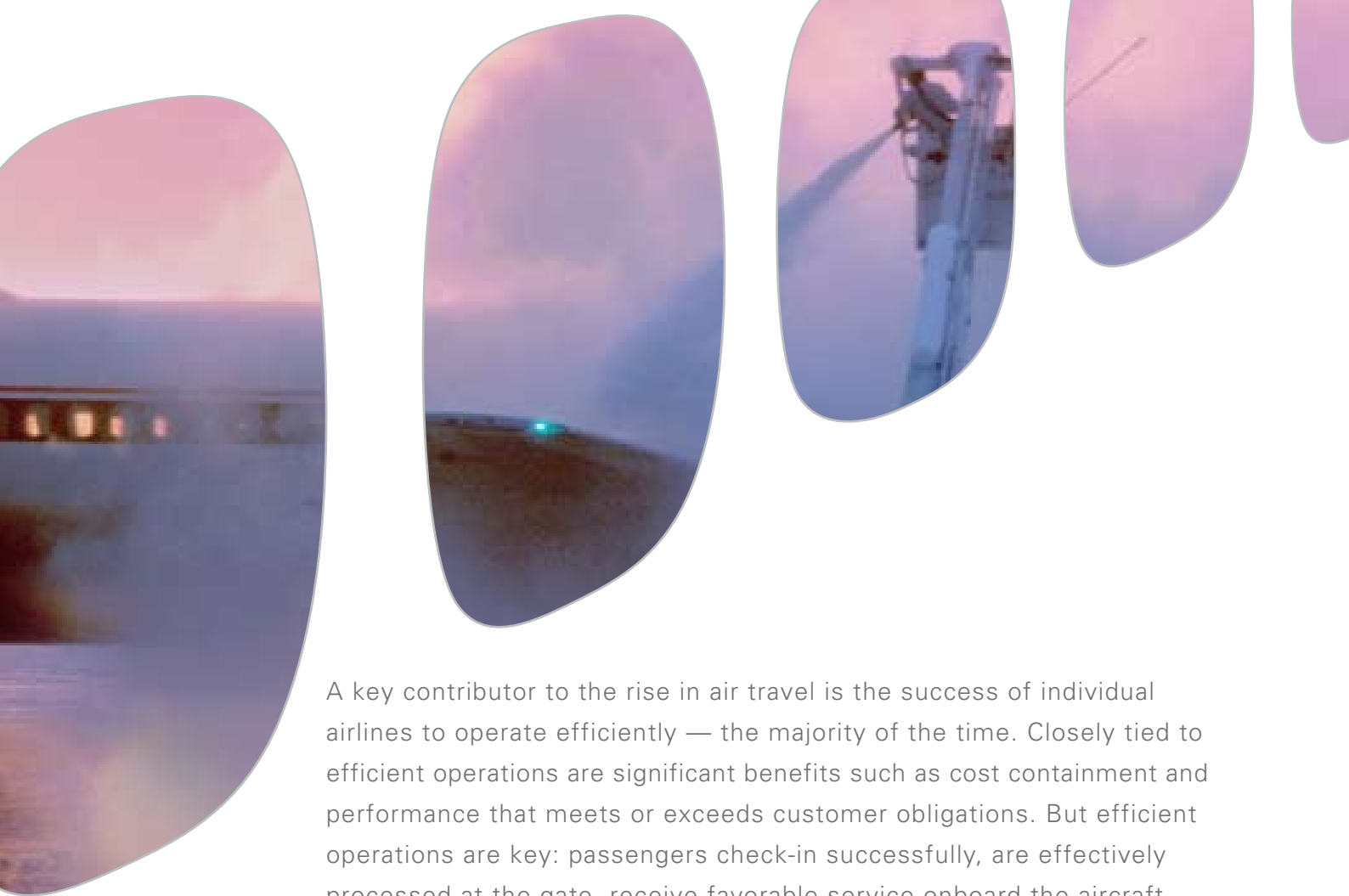


efficient operations

Efficient airlines capitalize on integrated solutions and processes.

Few industries generate the level of attention and notoriety as the aviation industry when it is at its best — or its worst. From the announcement of new aircraft to major irregular operations that cancel hundreds of flights and strand thousands of passengers, airlines are constantly in the spotlight. On the positive side, each new generation of aircraft shrinks

the globe by decreasing the flying time between continents, which, in turn, opens new avenues for worldwide economic growth as companies expand their businesses into other countries. The result: more people than ever before are flying, using air flight as a standard mode of transportation much like the automobile.



A key contributor to the rise in air travel is the success of individual airlines to operate efficiently — the majority of the time. Closely tied to efficient operations are significant benefits such as cost containment and performance that meets or exceeds customer obligations. But efficient operations are key: passengers check-in successfully, are effectively processed at the gate, receive favorable service onboard the aircraft and arrive at their destinations on time — along with their luggage.

Not Without Challenges

Airlines are challenged to perform efficiently and effectively on the day of operation — a day that occurs 365 times each year. When the last flight of the day lands and passengers disembark and bags and cargo are unloaded, the process starts over again with the preplanning for the next day's operations. This cycle happens at more than 2,000 airlines each day around the world — 2,000 airlines that operate in excess of 23,000 aircraft and transport more than 2 billion passengers annually!

Efficient operations don't just happen. Airlines face myriad operational challenges — schedule disruptions, limited resources such as aircraft, crew and maintenance personnel, and increasing customer expectations. And each day brings a new set of challenges that personnel must react

to when accomplishing the safe and efficient movement of passengers and cargo:

- Increasing fuel prices that have reached an all-time high and now represent the largest single expense for airlines,
- Effective utilization of resources to improve productivity while reducing labor costs,
- Irregular operations that occur from as simple an event as a mechanical problem on a single aircraft to a weather storm that closes many airports and cancels numerous flights,
- Internal and external difficulties such as air traffic control limitations that reduce on-time performance to less than acceptable levels.

SOC staff members monitor and control the very essence of the airline operation.

Communication And Coordination Hub — The SOC

To achieve efficient operations, airlines rely on the people and tools located in their system operations control centers, or SOCs. It takes the combined effort of many operations business units during the day of operations to make air travel possible.

Flight operations; crew management; maintenance, repair and overhaul; dispatch; airport and ground staff; reservations; and passenger service personnel ensure the efficient and timely transportation of passengers, bags and cargo. And they rely on their specific systems to develop and deliver necessary data. This symbiotic relationship between employee and technology enables the formation of sound, multi-level decisions.

Experienced personnel and specialized systems notwithstanding, efficient operations cannot be achieved without outstanding communication and coordinated effort. This is the overarching goal of the SOC.

To better visualize this important function, compare airline operations to the human body, where communication and coordination among various parts is essential to existence. For example, if the right leg and foot don't know that the left leg and foot have taken a step, they simply drag behind while the body hops forward on one foot — a very inefficient use of resources. Or, if the hands and arms aren't aware that a ball has been thrown toward the body, then the ball smacks the chest, possibly stopping

the heart. A major disruption in operations. Thankfully, the human brain protects and controls the body, supplying needed information via the nervous system to produce appropriate actions and reactions.

The SOC is the “brain” of airline operations. It distributes data to appropriate personnel and helps coordinate resulting decisions. Integration among the various systems (the nervous system) enables the transport and sharing of data through the SOC network. And software solutions generate the data, providing decision support for SOC personnel.

Armed with timely data, SOC staff members monitor and control the very essence of the airline operation at any given time. The SOC never sleeps; it's a full-time, 24-hours-a-day, 365-days-a-year operation that oversees the airline — its schedule, flights, aircraft, staff, passengers and cargo. By evaluating relevant data, analyzing what-if scenarios, forming appropriate decisions and working together as one in a truly integrated operation, SOC personnel can achieve efficiency.

This process is expedited by employing a united philosophy across all operations departments. The efficient SOC is seamlessly connected to the many core business units that manage the airline's daily operational control, including flight scheduling, flight and aircraft movement control, flight planning, dispatch and flight following, crew scheduling and tracking, load planning and weight and balance, maintenance and engineering, and passenger services. By centralizing, consolidating and integrating operational control functions, an airline can establish and better achieve a cooperative corporate operating philosophy. When operations adhere to this philosophy, efficiency is imminent.

Advances in information technology and integration of automated systems and solutions improve SOC capabilities.

Information Technology And Integration

The ability of the SOC to communicate and coordinate among its departments has significantly improved with the advancements in information technology. Automation enables improved exchange of information within the SOC as well as between the SOC and external operational groups such as airport control centers, air traffic control, line maintenance and hangar facilities, pilots flying aircraft and airline engineering departments. And data exchange is more efficient, response times quicker and employee productivity increased. With more dependable data accuracy, problems can be analyzed rapidly and more efficiently, enabling better decision making with a proactive versus reactive posture. Even the human factor, often a problem during critical periods, is improved with decreased errors and reduced redundant tasks.

Along with automation and information technology, integration of automated systems and solutions further improves SOC capabilities. During normal operations, integration of data enables an airline to fly

more efficiently and reduce costs associated with flight time, resources, fuel consumption, delays and cancellations. And by providing common situation awareness to the various departments, integration enables information for qualified decisions. With automated SOC systems fully integrated, changes in one system are immediately reflected across other systems. Data is entered once and shared throughout the SOC as well as forwarded to other affected areas such as dining, ramp, cargo and passenger services at the airport.

Additionally, integration reduces the risk of miscommunication since SOC controllers and other airline and airport employees have access to the same set of data — data available in real time and updated with more current and accurate information. Plus, there are economic benefits associated with automation and integration — fuel savings, improved on-time performance, enhanced recovery from irregular operations, optimized payload through effective load and flight planning, and increased productivity for SOC controllers and dispatchers.



SOC Responsibilities

In addition to serving as the operations communication hub, today's SOC is responsible for combinations of the following functions:

- Planning and executing the daily operational plan and flight operations for all scheduled and non-scheduled aircraft movements toward on-time operations according to government and corporate policies and requirements,
- Monitoring, coordinating and controlling the airline operation and its resources on the day of operations,
- Managing operational control of the airline when irregular operations occur caused by adverse weather, aircraft or other mechanical problems, airport or air traffic control problems, or labor issues,
- Minimizing passenger disruption during irregular operations by operating the schedule as close to plan as possible and providing alternatives for passengers when flight delays or cancellations occur,
- Serving as the coordination point during emergencies.

Planning And Executing

On-Time Performance

The success of daily airline operations is gauged by the efficient and effective completion of flights as close to published schedule as possible. Bringing it all together — airworthy aircraft, qualified and legal flight crews, sufficient ground resources, and passengers and cargo — is a challenge. Months, even years, go into the planning of a flight schedule.

By incorporating operational considerations into the flight schedule, a robust schedule emerges. Created in the schedule development stage of the planning process, a robust schedule helps minimize the operational impact due to disruptions and schedule changes by including such attributes as maintenance overnights sequenced into the aircraft rotations every three to four nights, consideration for successive tight turns, special turn requirements and the flexibility to create swap opportunities at critical times of the day. A set of clearly defined feasibility constraints and open lines of communication among scheduling and operating groups makes develop of a robust schedule possible.

The result is a flight schedule that can profoundly impact the real-world, day-to-day airline operation.



The SOC controls the execution of the plan to meet the legal requirements of various governments, the laws of aerodynamics and the goals of the airline. After safety, efficient operations represent an essential factor of success when executing the daily plan. It is achieved through enhanced flight movement from departure to flight path to arrival; reduced fuel consumption; enhanced personnel productivity; and timely, cost-effective recovery during irregular operations.

Creating A Trip Plan For Each Flight

Most trips, whether by car, boat or train, begin with a plan. The best route must be determined as well as the conditions along the route and how long it will take to reach the destination. In addition, the cost of the trip must also be considered. An efficient airline's flight plans are based on the most efficient and economical methods. They are developed and designed to ensure the operation of each flight adheres to all legal and safety requirements. Included in the flight plan are the flight route, speeds, altitudes, flight times and airport details to include designated alternate airports. Dispatchers within the SOC check for airworthiness of the aircraft, weight limitations for each segment of the flight from taxi to takeoff to landing, route and altitude limitations and restrictions,

required fuel for operation to destination, and contingency to alternate airports based on current and forecasted weather. In addition, flight planning considers costs to the airline. Economical routes, altitudes and flight speeds are selected considering weather and air traffic control constraints. Factors related to flight schedules and connecting flights for passengers as well as fuel consumption and decisions to carry additional fuel are also weighed when determining the flight plan.

Optimizing Fuel Usage

In a recent survey conducted by *Sabre Airline Solutions*[®], nearly all leaders of airlines around the globe who responded viewed fuel costs as their top challenge and the most critical impediment to profitability. Worldwide, these leaders' opinions were virtually identical with 94 percent or greater saying fuel prices will have a "significant" cost, revenue or operational impact on their businesses.

Aviation fuel prices are higher than ever with no expectation that they will be notably reduced in the future. These fuel costs are now the highest expense for airlines, having surpassed labor for the top spot. For every penny increase in the cost per gallon of jet fuel, airlines can pay millions of extra dollars annually in operating costs. As a result, carriers are searching diligently for methods and procedures to reduce fuel burn to offset this uncontrollable expense.

Reducing one minute of flight time on each flight worldwide can equate to a savings of more than US\$2 billion annually.

Previously, airlines were reluctant to increase ticket fares with higher fuel surcharges because of strong competition to maintain customer satisfaction and loyalty. Today, however, these same airlines have determined it necessary to raise fares to help cope with rising fuel prices while they search for additional operational ways to reduce fuel usage and costs.

There are ongoing, long-range fuel-saving solutions in the works, but airlines need them now. The aerospace industry continues to design and enhance airframes and engines that improve performance while improving fuel efficiency. These improvements are achieved by reducing aircraft weight, coping better with aerodynamics and restructuring aircraft control systems. New designs include the introduction of winglets to reduce drag and increase lift. Plus, reducing aircraft weight will be accomplished by the use of new metal alloys and composite materials and by hydraulic control systems with electrical systems, which will also provide better aircraft control.

Identifying poor-performing aircraft and making mechanical adjustments to reduce drag is another method of reducing fuel usage. The performance of each aircraft is monitored to determine which aircraft are poor performers, burning more fuel because of increased drag. Steps are then taken to correct the problems and improve the aircraft operation.

Reducing flight time is a short-range alternative to help save fuel. Airlines and air traffic control groups continue to search for new methodology to decrease flight times through more direct routes and improved procedures resulting from new technology. Reducing one minute of flight time on each flight worldwide can equate to a savings of more than US\$2 billion annually.

Reducing Aircraft Weight

Reducing aircraft weight has a significant affect on aircraft fuel consumption since engines don't have to work as hard to maintain flight for lighter aircraft. There are several methods used today to reduce aircraft weight:

- Remove unused or non-essential items such as pillows, blankets, magazines, magazine racks and certain galley equipment that were onboard to enhance passenger services, but can be offloaded to decrease weight and therefore increase fuel efficiency;
- Remove primary and outer paint; a method used by airlines during the 1970s fuel crisis when fuel prices soared;
- Reduce the amount of fuel carried for each flight segment,
- Lower number of provision meals by basing them on specific passenger counts.

Optimized flight planning, tankering and other methods can help an airline achieve 2 percent to 3 percent in fuel consumption savings.

By far, the greatest amount of weight that can be reduced on the aircraft is determined by the actual fuel load planned for and consumed during the flight. Planned fuel for each individual flight includes fuel needed to fly from origin to destination. Calculations for this amount consider the fuel-burn rate for the aircraft type, the aircraft weight and winds. Dispatchers then calculate reserve fuel to be held at the intended destination as well as reserve fuel to fly to a planned alternate if needed. Added together, the result is the minimum fuel load required to operate the flight.

When additional fuel is carried above the minimum or legal amount required for a flight, more fuel is burned during the flight due to the extra weight of the additional fuel. Every extra pound of weight requires approximately 3 percent extra fuel burn per hour. Therefore, it is essential that the flight planning system calculates the optimum level of minimum fuel to reduce the amount of fuel onboard and reduce in-flight fuel burn. In addition, justification is required when carrying additional fuel above the minimum.

Tankering

In some cases, the opposite process can be more cost effective — carrying more fuel than is needed to fly to the next destination, known as fuel ferrying or tankering (the term for loading fuel used for subsequent flight segments). Employing an automated decision-support system, airlines analyze fuel costs at each participating airport and then calculate the costs of tankering additional fuel from one airport to another versus the cost of buying fuel at the destination airport. Sometimes, the additional costs of carrying additional fuel can be lower than the price of purchasing additional fuel at the destination airport.

Ground Procedures

In addition to reducing aircraft weight, there are several ground procedures that can be modified to reduce fuel usage:

- Using only one engine when taxiing,
- Shutting down engines during ground delays as appropriate,
- Using ground tugs for aircraft movement on ground,
- Using electric ground power units instead of the onboard auxiliary power units powered by jet engines and jet fuel to provide electricity and ground-conditioned air when on the ground.



Improved Flight Planning Procedures

Automating dispatch and flight planning has changed flight operations around the world. Today's automated flight planning systems help reduce fuel costs through new flight planning techniques working in concert with new navigational technology including:

- Using cost index-based flight planning in conjunction with the onboard flight-management computer to optimally calculate flying speed based on winds and aircraft weight,
- Utilizing reduced vertical separation minima to enable greater access to fuel-efficient routes that are now available due to the increased altitude separation requirements,
- Lowering cruise speed when possible to reduce in-flight fuel consumption and avoid early arrivals and extended ground holds waiting on a gate,
- Utilizing more precise navigation tools such as global-positioning satellite and better wind forecasting methods to reduce excess fuel on international flights.

Proper Aircraft Loading

An aircraft's center of gravity is the precise point on the aircraft where all weight is theoretically concentrated or balanced. Based on the aircraft type, amount and distribution of fuel on board, weight of

cargo and baggage, and number of passengers, there is a safe center of gravity range in which the aircraft can operate from the departure to arrival gates. For each aircraft and flight there is an ideal center of gravity or ideal trim position — setting the trim tabs on the aircraft to improve the flying attitude. Because of the aircraft shape, flying with a nose-up attitude decreases the drag caused when the aircraft moves through the air. A reduction in drag lowers the associated thrust required to move the aircraft through the air, which translates into reduced fuel burn or consumption. Therefore, the closer the load planner can get to this ideal trim position, the more efficient the flight and the less fuel consumed.

Load planning, a critical safety element in flight operations, gathers detailed data on items to be loaded on the aircraft and calculates the load plan based on the aircraft's basic operating empty weight or dry operating weight, meaning without fuel. Included in the items to be loaded are the booked passengers, estimated bags, mail and cargo for a particular flight leg, resulting in an estimated zero fuel weight. This function ensures that passengers and cargo are loaded within the proper center of gravity and aircraft weight limitations. The result: a smoother, more efficient fuel-burning flight.

Since it is necessary for SOC load planners to coordinate closely with other SOC staff and airport personnel, integration of systems enhances load planners' productivity and effectiveness.

The challenge to reduce fuel costs will continue even if fuel prices stabilize or decrease. Airlines are finding that they can significantly alter their bottom lines through awareness and knowledge of proper fueling procedures.



Monitoring, Coordinating And Controlling

Controlling Flight And Aircraft Movement

A primary ingredient of the service an efficient airline offers its customers is the flight schedule, and maintaining its integrity is one of the SOC's primary goals. The flight schedule is the foundation for an airline's day of operation, a complex process designed to coordinate the published schedule with the required aircraft, crews and operational resources at various airports. An airline's movement control system oversees the reporting and monitoring of actual flight times as compared to the flight schedule. When irregular operations cause changes to flight times, the movement control system ensures that disruptions are identified and corrective action is administered to return the flight schedule to normal.

On any given day, events occur that prevent the schedule from operating as planned, upsetting the timing of critical flight events. When a disruption to the flight schedule occurs, various departments have a vested interest in which solutions are selected. Crew scheduling desires a solution that reduces crew costs. Maintenance control wants a solution that ensures scheduled maintenance is accomplished. Airport personnel prefer a solution that accommodates

passengers as quickly as possible. It is the responsibility of the SOC to balance these competing interests and produce a system-wide solution rather than a local one.

Following The Flights

Flight following is the real-time tracking of flights from departure to arrival. SOC staff monitor the position of each flight at all times after departure, enabling them to respond to any occurrence during the flight that may require communication with the flight crew. Estimated arrival times can be more accurately determined as a result of proper flight following, and destination airports and passengers can be updated when any change occurs.

Maintaining Aircraft

The mechanical condition of aircraft must be constantly monitored, and it is the airline's maintenance, repair and overhaul division that accomplishes aircraft service checks and maintains the airworthiness of the airline fleet. Unsolved aircraft mechanical issues directly affect operations efficiency, resulting in flight delays or cancellations, lost productivity of staff and crewmembers, and reduced aircraft utilization time.

Ground management tools provide information that serves as an alert mechanism for SOC controllers.

Located in the SOC, the airline's maintenance personnel oversee the maintenance operation. With a strong maintenance background and understanding of the airline's maintenance requirements and procedures, these subject matter experts are an integral part of the SOC's core decision-support unit. Maintenance controllers work closely with movement controllers and dispatchers to monitor flight status and potential problems that may occur when mechanical problems exist. In addition, they work with operations controllers and serve as liaisons between the SOC and the ground maintenance teams at the airports.

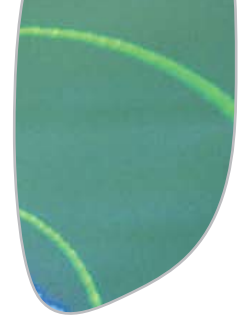
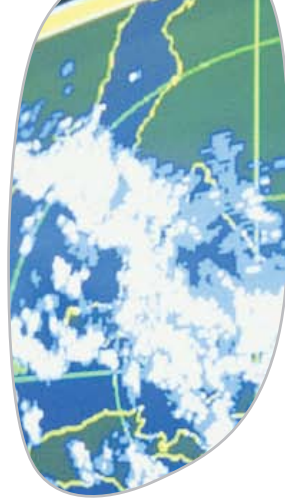
Keeping the maintenance program at the center of the decision-making process for airline operations contributes significant benefits for the efficient airline:

- Performing the right corrective action the first time — resulting in fewer “timeless” delays for maintenance,
- Making the unpredictable predictable — resulting in fewer unscheduled mechanical disruptions and more proactive rather than reactive withdrawals from service,
- Programming activities in the right place at the right time and with the right resources — resulting in reduced duplication of effort and “over-maintenance,”
- Coordinating deployment of aircraft to optimize the utilization of the aircraft.

Automating Ground-Handling Management

The SOC relies on its automated movement control and resource management tools to oversee the airline and airport operations each minute of the day. To round out this function while flights are on the ground, SOCs have turned to automated solutions that monitor all ground operations activities — from pre-arrival planning of a flight and activities on the ground to departure activities. Adding flight, ground and ramp activities to the oversight function provides an integrated overview of an airline's total airport operations, facilitated by integration among the ground management solutions and the airline's movement control and resource management tools so information can be shared with each.

Primarily a local airport resource, ground management tools provide information that serves as an alert mechanism for the airline's SOC controllers. Armed with this essential decision-support information, airport and airline management minimize operational disruption and increase aircraft utilization. Using a tasks list of activities and associated duration of time to complete each activity, the ground management solution assists airport ground control in managing scheduled ground activities and tasks in the operations time frame. By interfacing with the SOC movement control system, updates to the flight schedule are made quickly, and default ground activities



and tasks are generated. Similarly, ground activities are updated as they occur via interfaces with the airline's ground management and event tracking systems or through an interface with handheld devices. Using decision-support software, the devices alert the airport control center when variations to schedule or completion of tasks occur. An automated ground management solution offers operational staff real-time, accurate data and helps ensure that the right person receives the right data at the right time.

Airport Accommodation

The airport plays a vital role in the formation of customer opinions of an airline. After all, the airport is the first place the passenger comes face to face with airline personnel.

Airports are like small cities employing personnel to handle the many aspects of preparing flights for departure and arrival. Airport employees take care of the physical loading and unloading of cargo and baggage, cleaning and re-supplying of aircraft, and catering the aircraft with beverages and food prepared in the kitchens at or near the airport. In addition, each system on the aircraft can be checked and maintained by ground personnel who are thoroughly trained in aircraft operations — from changing a seat cushion to replacing an engine while others add water, oil and fuel to the aircraft for each flight.

Throughout the airport, customer service personnel assist passengers as they move through the airport maze from curbside to boarding gate. For the successful airline, passengers' airport experiences can play an important role in their overall feeling about the flight and the airline specifically. An airline depends on repeat business — travelers who will choose it again and again. Even though ticket prices and schedules can strongly affect this choice, airlines realize that customers who have a negative experience at the airport many times equate that experience with the airline — an impression that can directly affect an airline's bottom line.

When events disrupt airline operations, their effects also impact airport operations. Even the most outstanding planning, scheduling and training are tested when aircraft mechanicals, storms or air traffic problems occur. Efficient coordination of airport activities must be in place and equipped to handle any contingency.

Acting much like an airline's SOC, the airport control center coordinates the many airport activities. Control center experts with an office view over the ramp area, in many cases, provide aircraft ramp movement control while aircraft taxi on the tarmac into and out of the gates. When the aircraft reaches active taxiways, this control is taken over by air traffic control. Other personnel engage in in-range communication with the inbound flight crews, providing up-to-date field conditions and gate

Today, more than 70 percent of passengers are using some form of electronic capability for making reservations, checking-in and boarding.

assignments. These radio positions often convey information about maintenance requests from the crews to the local maintenance office. Additionally, members of the airport control center oversee the ground operations that must occur before flight arrival, while the flight is on the ground and after flight departure, and then coordinate and communicate this activity to the control center, which monitors for any disruptions to the work schedule that may lead to flight delays.

Striving for on-time departures and performance, airlines communicate assignments and assignment changes to ground personnel as well as load crews via handheld devices to ensure these messages are received. Accurate weight and balance information is critical when preparing the correct load manifest that is given to the flight crew before flight departure. To ensure accuracy, when aircraft loading is complete, information on cargo bin locations and associated cargo and bag weight is quickly relayed back to the central load planning office using the same handheld devices.

Automated control of ground-handling tasks is now available, enabling efficient airlines to be more proactive in addressing potential ground activities that may cause flight delays or even cancellations.

Passenger Handling At The Airport

Passenger processing at the airport has changed drastically in the past 10 years with the widespread acceptance and usage of information technology and the Internet. The efficient airline not only adopts the new technology, but adapts it to passenger handling. Passengers today are savvy when it comes to IT solutions such as the Internet, mobile phones, PDAs, wireless communication, Bluetooth and Blackberries. To the flying public, new technology is a way of life; travelers depend on this technology in their businesses and private lives and expect airlines to take advantage of the same level of technology or better.

To enhance the passenger process at the airport, airlines have incorporated techniques that shrink airport check-in lines and reduce the number of airport staff required for check-in. Self-service check-in was the first new method introduced to speed up the check-in process. Initially, passenger acceptance of these kiosks was slow due, in part, to their limited use by passengers who did not have bags to check. But as kiosk processes improved, usage rapidly increased with passengers experiencing a reduction in check-in time and baggage check-in. Using touch-screen kiosks, passengers can now check in for a flight, select a seat and generate bag tags and boarding passes.



The technology evolution continued as airlines offered passengers the ability to check in 24 hours a day using the Internet and printing a paper boarding pass with a barcode on their personal printers. Using the Internet, passengers could also check on the status of their flights as well as confirm the expected departure and arrival gates.

It wasn't long before this capability was expanded to allow check-in and flight information access using cell phones or PDAs. Passengers even established contact information with the airline, enabling gate changes or flight delays to be communicated via mobile phone or e-mail. The number of passengers using electronic check-in and boarding-pass generation increases each month. It is forecasted that in the near future most passengers will use this method of check-in. Today, more than 70 percent of passengers are using some form of electronic capability for making reservations, checking-in or boarding.

Expanded electronic capabilities enable passengers to not only search for flight information and check in, but book a flight or change a flight and request upgrades. Even electronic boarding control is being introduced and tested, using a two-dimensional encrypted bar code — a more secure bar code than the previous

one-dimensional version used by most airlines for online boarding passes — that can be e-mailed to the passenger's mobile device. Using a gate reader, the gate attendant simply scans the bar code, allowing passengers to quickly board the aircraft. The two-dimensional encrypted bar code will also be better accepted by airport security groups around the globe.

These technology advances will continue to reduce the number of passenger service representatives required for check-in or boarding control, freeing them to concentrate on other passenger-related services.

Resource Management

To carry out the operational plan that is managed by an SOC and coordinated at the airport requires many different resources — from labor to equipment to airport real estate. To be economically successful, however, the efficient airline must not only have the right resources, but must also optimize those resources and their utilization.

Labor ranks high on the list of airline expenses — second after fuel costs. It is no wonder then that airlines continue to search for more efficient methods to better manage their resources and improve staff productivity. To accomplish the many functions associated with the day of operations

Using integrated, automated resource management tools, airlines have recognized as much as a 25 percent savings in administration costs.

requires an army of people. Efficient airlines employ automated solutions that reduce the time and effort required to plan, schedule and manage daily resources. Airport staff scheduling presents many challenges when performed manually — especially when attempting to produce work schedules for the many different workgroups needed at an airport. As airlines grow in size, the increased complexity of operations requires more time and greater resources to manage the number of staff and associated equipment at each airport.

Turning to automation has helped many airlines, but efficient airlines have also deployed solutions that are not only automated but also integrated with other operational tools, providing planning as well as management of resources on the day of operations. Integrated to the planning tool, administrative software automates administration processes such as schedule bidding and scheduling exceptions such as vacation requests, training, overtime and sick leave.

Automated planning tools analyze flight schedules and generate optimal resource levels. Optimization enables the airline to incorporate specific work rules around weekend, morning and night shifts as well as the use of part-time employees that establishes the right staff for the schedule while considering employee needs. Automated decision-support solutions also help

determine the level of staff control required for a given flight schedule and then optimize resource scheduling and utilization during the operation.

On the day of operation, the integrated solution provides decision support by visualizing real-time flight activity, automating task assignment and managing exceptions. Day-of-operations resource management tools enhance the control of airport handling operations by employing sophisticated planning models and visual alerts and providing access to real-time operational data. Not only does the airline have a staffing plan designed for the operational conditions of the day, but resource management staff at each airport can also adjust the resources as the operation changes. Delayed flights can be adequately staffed using these tools, which have overall view of the entire operation at the airport and are able to deploy resources from one area to another as needed. In addition, communication with other systems that provide the required operational information (such as flight information, flight loads, staff attendance or gate/stand assignments) enables resource planners to make timely decision-support choices.

Airlines using these tools have been able to recognize as much as a 25 percent savings in administration costs by automating the generation of complex work rosters and streamlining employee administration.

When using automated tools, gate planners can effectively create more feasible gate schedules.

Crewmembers

As with aircraft, scheduling and managing flight crews is essential to efficient operations. Crew scheduling actually begins prior to the day of operation and, like flight scheduling, is a very complex requirement — creating a working plan for numbers of pilots and cabin crew, determining required qualifications and researching where crew will be based. The term “flight crew” refers to multiple crewmembers, including cockpit and cabin crew for a single aircraft. Within each aircraft crew complement, different crewmember types must be determined. Crew scheduling ensures that there are legal and qualified crewmembers assigned to each flight.

Add to this normal complexity the many challenges on the day of operation when disruptions may occur, and the task becomes monumental. It is at such times when improper assignment planning and mismanagement of crew during the day of operations themselves can be contributing factors to disruptions. It is no wonder then that automation of the crew management system and optimization of the results is essential for successful airlines. By considering the latest crew information and schedule, and leave and training plans stored in the system’s database, crew planners establish an accurate foundation of up-to-date crew resource and requirements data.

Using automated decision-support tools to schedule crewmembers, crew planners can determine the potential impact of operational variations such as changes to schedules, equipment types, crew base locations and other supporting resources. The use of these effective crew resource planning systems enable airlines to create more exact hiring and training policies that will drive availability of critical crew resources when needed on the day of operations.

In the SOC, crew controllers track crewmembers as they check in and begin their assignments. If integrated with the SOC’s movement control and ground management systems, the crew management solution provides crew controllers with sophisticated tools to quickly respond to schedule and operational changes and maintain efficient and legal crew rosters. With automated alerts providing advance warning of potential disruptions or rule violations, crew controllers have time to take corrective actions — a necessary requirement to help maintain on-time performance.



Ground Support And Gate Personnel

In addition to solutions for managing airport staff assignments, highly sophisticated tools are available to manage other variable resources such as the assignment of gates and ground-support staff and equipment.

Determining and optimizing an accurate fleet of ground equipment needed to manage a flight schedule and support airport operations is a tremendous costs-avoidance function that an efficient airline uses. GSE levels required to support a given flight schedule depend on the number of flights as well as the aircraft type supported. GSE resource management tools produce working charts that provide the total GSE requirements for pre-determined time intervals for each flight-specific and non-specific workgroup. With these tools, airport planners can evaluate the impact of new flight schedules, handling contracts and handling-company standards, as well as deal with operational changes that often occur during every flight complex during the day.

When an airline has only a few gates at an airport, it is easy to determine where to park an aircraft for its next flight. But when faced with 60 gates and potentially 120 aircraft

on the ground at the same time, the task of assigning gates becomes quite difficult. Many factors must be considered when developing a parking plan — the capability of the gate to accommodate certain aircraft, the pre-positioning of ground equipment for a particular aircraft type so this equipment can remain in place from flight to flight and the possible connecting pattern of inbound passengers. When using automated tools, gate planners can effectively create more feasible gate schedules than any manual process. Consideration is given to gate characteristics, adjacency constraints, overnight parking, simultaneous departure restrictions, international arrivals and departures, and wingtip gate distancing.

Managing a set plan on the day of operations is the real key to success for the efficient airline. The gate management system is integrated into the real-time flight and resource-monitoring systems that support the day of operations. The system monitors flights and provides graphical decision support for the control of flight ground operations. It constantly evaluates real-time data, analyzes changing conditions and automatically detects potential problems. Solutions can then be automatically calculated, visually planned and examined, and fully or partially disseminated. To help in the decision-making process, the system enables users to run what-if scenarios when disruptions in operations occur.



In-flight Provisioning

In the area of in-flight provisioning, an efficient airline employs an automated catering and cabin service solution that offers optimized solutions through data sharing.

By connecting directly to an airline's reservations and departure control systems, an enhanced in-flight provision system can achieve more accurately forecasted passenger counts as well as provide forecasts by class for each departure; automated adjustments for special meals, upgrades, go-shows, no-shows and non-revs; updates to the printed catering report and much more. Along with forecasting features, the system offers order visibility, increased use of reusable inventory and better inventory control. Taken together, this functionality can help reduce airline-owned inventory costs by up to 7 percent.

When the system is integrated with flight schedule data numerous additional benefits are gained. System automation enables personnel to quickly create provisioning plans, determining what product and services are required onboard based on airline-defined service rules and policies, and then store the associated pricing. Once completed, those plans can be applied to the flight schedule as appropriate to the flights and classes of service offered. Integration with the flight operations system ensures the provisioning schedule is always in line with the latest flight schedule adjustments.

Additionally, the in-flight provisioning solution automates the time-consuming task of planning galley loading, enabling personnel to plan the loading process with automatic monitoring of the weight being loaded and available space within each galley and position. The system also predicts the future use of airline-owned items by station based on flight schedule information, forecasted passenger counts, levels of service and provisioning rates over a specified time period. These outputs can be directed to suppliers and warehouse locations to provide production requirements and planned budgetary impacts.

When it comes to staying in touch, a secure Web site facilitates communication of schedule-change alerts and requirements and increases collaboration with caterers, suppliers and warehouses around the globe.

By integrating and automating business processes and systems, management has time to make more strategic decisions about in-flight service and associated costs. And reduced labor-intensive tasks associated with galley planning, inventory reconciliation and invoice auditing, free employees to provide the next level of passenger service excellence.

Cargo Operations

Over recent years, experienced airlines have transformed their “sideline” cargo operations into a vital component of their business strategy. Key ingredients for this success are systems integration and automation.

To enhance the customer process in the cargo area, a successful cargo operation supports numerous distribution channels such as phone, e-mail, cargo community systems and the Internet, distributing shipment information for convenient customer access from any where at any time. This multi-channel process shortens lines at the counter to book, accept and check on shipments, reduces call times and decreases the number of staff required at the call center and the counter. In addition, the automated cargo solution offers processes and tools that handle booking-to-tender variability, auto-dimensioning of cargo and pre-clearance of customs and cargo security, helping enhance the cargo customer’s experience.

By employing systems integration, cargo companies have a clear understanding of flight schedules, changing conditions and anticipated available cargo space. This insight comes from sharing data across systems. Flight schedules and schedule changes from the flight scheduling system are evaluated to determine viable shipment routes. The cargo booking system selects the cheapest route that will provide the correct service to customers, providing only feasible routing options. With data relating to operations schedule changes supplied from the movement control system, effective rerouting of shipments can occur. Additionally, accurate cargo space forecasting is made possible through analysis of passenger counts provided by the passenger revenue management system. And throughout the day, the cargo solution keeps abreast of cargo demand at various airport terminals, minimizing overall staffing and support costs.

An enhanced in-flight provisioning system can reduce costs associated with providing in-flight service by up to 10 percent of the total catering budget.

By employing systems integration, cargo companies have a clear understanding of flight schedules, changing conditions and anticipated available cargo space.

Coupled with integration, automation facilitates sound decision making. The cargo reservation system provides shipments booked, tendered and flown while the automated cargo revenue management system reciprocates with cargo capacities and overbooking levels. The departure control system sends post-departure flight data including actual payload, actual passengers and actual bag weight. Decisions relating to long-term contracts and pricing can be based on analysis of historical customer and shipment information. Automation also streamlines the billing process by accurately rating shipments, eliminating billing errors and time needed to fix problems. In the event that a shipment is not delivered in

full, on time or without damage, the cargo solution offers a fast and easy way to communicate with customers, alerting them of shipment status and providing an easy way to file and process claims. Paperwork flows through the accounting process as quickly as possible, enabling account receivables to be collected in a timely fashion.

Cargo operations are an extension of an airline and its efficiency, symbolized by systems integration and automation for optimal performance and peak customer satisfaction.



Irregular Operations

Operational control can be a routine task — provided the SOC is able to execute the day's flight schedule — if sufficient resources are available to operate the schedule and if there are no disruptions. However, disruptions inevitably happen, causing local resource shortages that require corrective action to avoid unacceptable delays or flight cancellations.

While the SOC cannot prevent disruptions caused by external factors, the effective execution of business processes and systems determines how well an airline handles and recovers from these events. SOC personnel must react to the disruptions — whatever the magnitude — to keep the airline running as smoothly as possible.

Disruptions are caused by many factors including resource limitations involving aircraft, crewmembers and ground personnel; mechanicals; weather; and air traffic control

restrictions — even poor communications. An example involves the need to address a specific item during a scheduled maintenance "C" check. If the status of the check is not communicated, it is impossible to accurately project when the aircraft will return to service or if the incomplete check will cause the aircraft to be grounded. Projecting poor communications across SOC departments would result in a lack of vital real-time information such as connecting passengers, in times, estimated times of departure, and additional or special flights. Under these circumstances, developing an effective plan for recovery would be impossible.

The efficient airline overcomes communication problems by integrating various systems and sharing data with appropriate departments, enabling data integrity (avoidance of corruption, duplication, conflict) and rapid response times.

Minimizing the impact on passenger service and maintaining the integrity of the published flight schedule requires close cooperation and communication among all SOC departments. As already described, airline



operations today require the right tools and the right people working together as one to fulfill an airline's goals day after day. The coordinated effort under normal conditions is complex and very demanding. However, seldom do airlines face a normal operational day. Irregular operations, off-schedule operations and disruptions are all terms used to identify varying-level events that have major ramifications to airline operations.

Often the decisions that must be made to return the airline to normal operation may be effected by factors that are diametrically opposed to one another. The decision to cancel a flight may cause an aircraft to be out of position for a scheduled overnight maintenance check. Or the decision to operate the flight on a delayed basis to await connecting passengers may cause crew-members to miss their connecting flights, thus delaying those flights as well. To make optimum decisions, the SOC must provide

the same data and relay the same situations to all functional groups within the center.

Major advances have been made in aviation technologies, including jet aircraft with multiple redundant back-up systems, sophisticated weather forecasting and alerting systems to warn of impending problems. In addition, automated airline planning and tracking systems ensure that the most complex flights are matched with necessary resources. Even though technological advances help minimize the distress related to operational disruptions, they still occur. In fact, the number of delayed flights continues to rise, and the length of delays has increased.

All airlines want to return to normal operations quickly in an effort to minimize:

- The disruption and inconvenience caused passengers. While many irregular operations, such as weather delays, are unavoidable, how the efficient airline responds to these disruptions is critical in maintaining passenger goodwill.

- The impact on an airline's bottom line. Irregular operations drive considerable expenses as airlines attempt to return to normalcy.

For many years, airline leaders have thought they could only be reactive to events that cause off-schedule operations. They have sought new methods to handle disruptions and minimize related impact. Many plans called for holding spare aircraft in reserve or having additional crewmembers standing by in case they might be needed. Each of these fall-back solutions proved to be expensive and not as effective as desired.

During the early years of aviation, the only recovery solutions were based on manual means and, in most cases, were handled by each individual airport independent of other airports in an airline's system. In the mid 1960s, the SOC concept began with airlines seeking the oversight of their day of operations from a central location in one of their major cities. Soon, one of the main purposes of the SOC became to coordinate the recovery from irregular operations.

Even with this consolidation, the recovery solution itself was based on a manual operation. With the advent of computers and information technology, the manual

system shifted to automation during the next 30 to 40 years, enabling SOC staff to better control the day of operations as well as flights, aircraft, crews and passengers. Reaction to problems was more exact, quicker and involved solutions or plans that included multiple flights, crews, aircraft and airports at the same time.

At the forefront of the efficient airline's automation solutions are tools addressing the root causes of irregular operations and processes that enable the airline to minimize their impact. These solutions address passenger needs when flights are cancelled, delayed or diverted while assisting the airline to develop and execute a recovery plan to return to normalcy at the earliest possible moment.

Aircraft, flight crews and passengers constitute the primary components affected by irregular operations that require examination to enable effective recovery. Within these areas, consideration must be given to aircraft maintenance routings; crew connection assignments; passenger origin-and-destination itineraries; operational constraints such as air traffic slots, airport slots, curfews, gates and weather alerts; in-flight provisioning; and relevant market factors such as coverage, revenue and equipment requirements.

In an integrated SOC environment, reaction time to irregular operations increases due to instant notification of changing events.

Efficient airlines have secured solutions that optimally reaccommodate passengers displaced due to flight cancellations, delays or diversions.

Effective solutions are available today that integrate with an airline's movement control, crew management and passenger handling systems to provide alternatives for flight delays, cancellations, equipment swaps and diversions to quickly and effectively recover from a schedule disruption. Decisions to cancel or delay a scheduled flight must be based on the bottom-line benefit to the airline. It's not only important to consider the number of passengers on the aircraft but also what revenue contribution comes from the flight. In addition, an airline controller must consider all possible solutions including potential equipment substitutions and dynamic flight schedule adjustments. Such decision-making procedures require timely access to passenger itinerary data in conjunction with aircraft and crew assignments.

Truly integrated solutions today derive all requirement data directly from the centralized flight operations database, and suggestions proposed by the system adhere to prevailing operating conditions and restrictions. For example, if a particular airport is unable to support operations of a specific aircraft type, the recovery tool does not assign this aircraft type to that airport. Of course, the solution generated by the decision-support system will depend on the integrity and accuracy of the data stored in the centralized database — a factor addressed by efficient airlines through the recovery tools they deploy.

One of the benefits of implementing a recovery decision-support system is the establishment of consistent decision making across the airline to include the SOC, airports, ground personnel and crewmembers. In many cases, individual airline controllers make split decisions that have a significant impact on the airline's profitability. By standardizing the recovery decision-making process across a pre-determined recovery methodology, airline management can be confident that the optimum decision was made based on suggestions provided by the best recovery decision-support system.

Today, irregular operations represent a much talked about topic among airline leaders as well as the traveling public. Passengers demand that airlines better handle irregular operations while minimizing, if not eliminating, the impact on them. The belief is that today's technology should be able to handle any circumstance.

Efficient airlines of today have secured solutions that optimally reaccommodate passengers displaced due to flight cancellations, delays or diversions. These recovery solutions value each passenger according to an airline-defined customer relationship management index. Airlines may define the value of the passenger based on



various criteria such as fare paid, class of travel, frequent flyer status, miles flown (to recognize high-mileage travelers that may be traveling on a free ticket), passengers on international connections, unaccompanied minors or passengers traveling with infants. The CRM index is used to prioritize passengers to effectively create alternative itineraries that address passenger needs while enabling the airline to minimize disruption-related costs such as hotel expenses, passenger compensation and interline fees. Next, the itineraries are rebooked and passengers are notified through an automated alerting process. The passenger reaccommodation system creates a rebooking solution based on the list of disrupted flights provided. The overall strategic business objective of this system is to build solutions where an airline can meet passenger needs and contractual obligations while minimizing the overall cost

impact due to schedule disruptions. The process of moving disrupted passengers and minimizing schedule changes is simplified and customer service is improved.

Recovery decision-support solutions used by the efficient airline are seamlessly integrated with the movement control system, passenger handling system and associated decision-support tools for aircraft and crewmembers. Through this integration, passenger coordinators in the SOC or at the airport have access to the latest schedule in real time including schedule manipulations made by operations controllers.

Decisions that consider all aspects of an airline's operations (resources, costs and revenue) ensure a constant focus on minimizing passenger disruptions and protecting profitability. In addition, the ability to make quick yet accurate operations decisions enables an airline to maintain its competitive market position.



Partnering For Efficiency

Today's successful airlines rely on the continuing development of automated solutions that assist in controlling operations and integrating core operational components. However, while automated solutions become more sophisticated in their offerings, associated support becomes more complex. Many of the best solutions in the marketplace require significant investment in hardware, third-party software and other IT resources. At the same time, airline IT departments are seeing reduced budgets and are spending too much time on tactical projects rather than focusing on driving value.

Many of these airlines are shifting away from local IT installation and moving to supported or hosted environments in which the automated software and hardware are provided by a third party that excels in developing and maintaining a reliable operating system for the airline. In this scenario, the airline does not require expert IT technicians on staff to develop, maintain or support these automated programs or an in-house "centralized, climate-controlled" environment for computer hardware. More and more airlines are using their resources to concentrate on the operation of the airline and allowing IT companies to maintain the automated solutions.

Recovery During Critical Times

Another advantage for those airlines that utilize a third-party automated data center is the avoidance of IT disaster. In the case of a catastrophic event that might take down an airline's primary data center for weeks or even months, the daily operations can be adversely affected as mission-critical systems become unavailable. Of the airlines that continue to maintain locally installed automated solutions, many are utilizing third-party automated data centers to back up data and systems as an alternative resource should a disaster occur at the airline's data center. Having a proper disaster recovery plan in place can significantly reduce the financial impact of a major event by restoring access to important systems in a timely manner and preventing extended periods of inoperability.

Efficient Operations Today

Unlike the early days of aviation, air travel is often taken for granted — the lifting of an enormous metal machine with hundreds of people onboard into the air and setting it down safely at its destination. Aerodynamics is now a recognized science accepted as a standard way of life for most people. Knowledge of and enhancements to air travel capabilities are expanding. And with the many advances in air travel, operational control is evolving in multiple ways as well.

With safety as the primary goal, operational control continues to maintain strict standards to prepare and conduct each flight. The objectives of airlines, however, must also include the goal to be a successful business entity, providing a quality service with on-time performance for its passengers. To accomplish this, airlines rely on a strong operational control process that manages and oversees every facet of the day of operations. The operational control processes of the efficient airline have progressed over the years to what they are today — coordinated airline departments using integrated automation solutions that plan, monitor and carry out every detail of the day of operations.

The efficient airline continues to adopt new methods, processes, procedures and equipment to ensure that operations meet the challenges of the day and provide passengers the best service possible. Focusing on efficiency, these airlines created the centralized SOC to better provide operational control. Computers were then introduced to the efficient airline's SOC to better oversee aircraft assignment, crew scheduling and tracking, flight plan calculation, maintenance planning and flight information dissemination.

While improvements have been steadily made to the automated tools that computers provide, two factors continued to create airline inefficiencies. First, these tools did not address what to do in the case of irregular operations or disruptions to schedules. The SOC staff had to be reactive in handling disruptions and had to use their best judgment based on experience during these times. Second, the computer systems were not designed or developed at the same time or by the same vendor. Thus, information or data had to be entered into multiple computer systems exposing the SOC to data input problems, information being out of sync among systems and incorrect decisions being made due to the lack of data integrity.

Successful airlines have sought new automated solutions that address both of these problems and are now using solutions that address the irregular operations by providing SOC staff with proactive rather than reactive capabilities. Automation creates multiple scenarios that can be analyzed by the SOC team to determine which solution will be best to incorporate for the current flight operations.

Equally important, these airlines have changed their automated solutions to those that are integrated throughout the SOC and accessed by associated airline personnel charged with managing the day of operations. Integrated SOC solutions have provided the ability to:

- Share decision-making capabilities with multiple departments and reduce operational costs through smarter and proactive rather than reactive problem solving,

- Reduce operational risk due to data consistency and timely availability of data within departments,
- Create opportunities for the cross-utilization of resources in the operations area through common tools and data,
- Manage crew member impact during operational disruptions,
- Optimize flight plans and load plans,
- Reduce exposure to costly flight delays and cancellations,
- Reduce overall IT costs.

The story of efficient operations is ongoing. The air travel industry along with operational control and the SOC role continues to evolve and improve. But for today, many airlines are enjoying more efficient operations and deriving better results because of automated, integrated operational control coordination that is able to effectively manage the day of operation as well as routine days and irregular operations days.

Visit our Web site at
www.sabreairlinesolutions.com

Worldwide Headquarters
Sabre Airline Solutions
3150 Sabre Drive
Southlake, Texas 76092 USA

Please contact our nearest regional office for more information:

Asia / Pacific
Tel: +65 6215 9500
E-mail: contact.apac@sabre.com

Europe, Middle East, Africa
Tel: +44 208 538 8539
E-mail: emea.contact@sabre.com

The Americas
Tel: +1 682 605 6750
E-mail: contact.americas@sabre.com



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