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Taking your airline to new heights

JET STREAM

A conversation with Wolfgang Prock-Schauer, the chief executive officer of Jet Airways.



Special Section

FUELING UP

A look at the rising cost of fuel and its effect on the industry.



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Stretching the Tank

With the cost of fuel at record highs, airlines can take several steps — such as more effective flight planning, reducing aircraft weight and modifying ground procedures — to help mitigate the impact.

■ By Dave Roberts | *Ascend* Contributor

In the days of full-service gas stations, the driver would pull in and tell the attendant, “Fill’er up!” There was not much to consider — just go with a full tank of gas. Rising fuel prices have not only changed this for automobiles but for airlines as well. The amount of fuel in the tanks of an aircraft is determined by several other factors such as weight, flight distance and legal requirements. Today, fuel conservation is a major consideration for airlines as they attempt to cope with the high price of fuel and the amount necessary to legally operate each flight.

Aviation fuel prices are higher than ever with no expectation that they will be reduced significantly in the future. These fuel costs are the second-highest expense for airlines after labor. For every penny increase in the cost per gallon of jet fuel, airlines can pay millions of extra dollars annually in operating costs.

In the past, fuel increases were paid for by passengers in the form of increased fares. Strong competition among airlines has prevented this process as airlines strive to maintain customer satisfaction and loyalty.

But airlines are finding ways to reduce fuel usage and fuel costs. There are old and new methods, but they address the same goal — do whatever it takes to offset the rising price of fuel. Reducing one minute of flight time on each flight worldwide can equate to a savings of more than US\$2 billion annually.

Ongoing, Long-Range Solutions

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 the laws of physics for flight (aerodynamics) and restructuring aircraft control systems.



Carriers can easily minimize fuel burn by using only one engine when taxiing, shutting down engines during ground delays, using ground tugs for aircraft movement and using electric ground power units rather than auxiliary units.

New metal alloys and composite materials reduce aircraft weight while improving structural integrity and enhancing operational performance. New designs include the introduction of winglets to reduce drag and increase lift. Hydraulic control systems are being replaced with electrical systems to provide better aircraft control while reducing the overall aircraft weight.

Short-range solutions include the installation of winglets, but the initial capital expense is high, and the return on investment through fuel savings is not quick.

Identifying poor-performing aircraft and making mechanical adjustments to reduce drag is another method being addressed by airlines today. The performance of each aircraft is monitored to

determine which aircraft are poor performers and are burning more fuel because of increased drag. Steps are taken to correct these problems and improve the aircraft operation.

Reducing flight time is another 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 Fuel Consumption

Three major factors that have an effect on aircraft fuel consumption include the weight of the aircraft, speed of the aircraft and wind resistance.

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HIGHLIGHT

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

Reducing the weight of an aircraft will reduce fuel consumption because the engines must work harder to maintain flight for heavier aircraft. There are several methods used today to reduce the weight of the aircraft:

- 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 now can be more cost effective by being off loaded.
- Remove primary and outer paint to reduce the weight of the aircraft. This method was used by airlines during the 1970s fuel crisis when fuel prices soared.
- Introduce the electronic flight bag. One of the many positive aspects of EFB is the reduction of paper in the cockpit. This would include the many manuals (and weight) needed for airport and aircraft performance data.

But the greatest amount of weight that can be reduced on the aircraft is based on the actual fuel load planned for and consumed during the flight. The fuel for an individual flight is based on the minimum fuel, which is based on several calculations — the amount of fuel needed to fly from origin to destination, which is based on fuel burn rate for the type of aircraft, the weight of the aircraft and the winds; second, after calculating this fuel amount, an airline's dispatcher calculates an additional amount of reserve fuel for holding at the flight's intended destination and diversion to a planned alternate. 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 due to the extra weight. As a rule of thumb, every extra pound of weight (fuel in this case) burns approximately 3 percent extra fuel 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 and that there is justification when carrying additional fuel above the minimum.

In some cases, the opposite process is most cost effective — add more fuel than is needed to fly to the next destination, known as fuel ferrying or tankering. Tankering is the term for loading fuel used for subsequent flight segments. Airlines analyze fuel costs at each airport to which they fly, and then they calculate the costs of flying (tankering) additional fuel from one airport to another versus the costs of buying fuel at the destination airport. The additional costs of carrying additional fuel can be lower than the price of purchasing additional fuel at the destination airport.

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

- Ground procedures include:
- 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 used 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 allow 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 Improves Fuel Burn

The four forces of aerodynamics are lift (upward force), thrust (forward push provided by a propeller or engine) to elevate the aircraft, gravity (weight) and drag (air resistance, which is friction caused by air rubbing against the plane). An aircraft must be built so that lift and thrust are stronger than the pull of gravity and drag by just the right amount. Lift from the wings is used to overcome the force of gravity.

Aircraft design and shape are important in overcoming drag. The nose of the aircraft and the leading edge of the wings are rounded so they can push through the air more easily. Aircraft lift is caused by the shape of the rounded wing that creates a vacuum above the wing as air passes over and under the wing. This vacuum forces the air beneath the wing to push or lift the aircraft upward.

The airplane's center of gravity is the precise point on the aircraft where all weight is theoretically concentrated or balanced. The aircraft is designed with the center of gravity located so that the aircraft will have a slight nose-up attitude that enhances the lift capability and reduces drag. For an aircraft and flight there is an ideal trim (moveable trailing edge of the wing) position or ideal center of gravity. The closer the load planner can get to this ideal trim position, the more efficient the flight will be because of reduced fuel consumption.

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

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