FOUNDATION FOR AIRCRAFT SELECTION

Technical, Operational And Financial Analyses

Choosing the right aircraft requires a complete evaluation of technical, operational and financial perspectives. While newer Airbus and Boeing aircraft, for example, have evolved to be much more cost effective in areas such as fuel burn and maintenance, each aircraft type also offers unique benefits depending on an airline's business model. For example, analysis shows that the Airbus A319 operates more efficiently for low-cost carriers (LCCs), while the Boeing 737-300 is better suited for network carriers.

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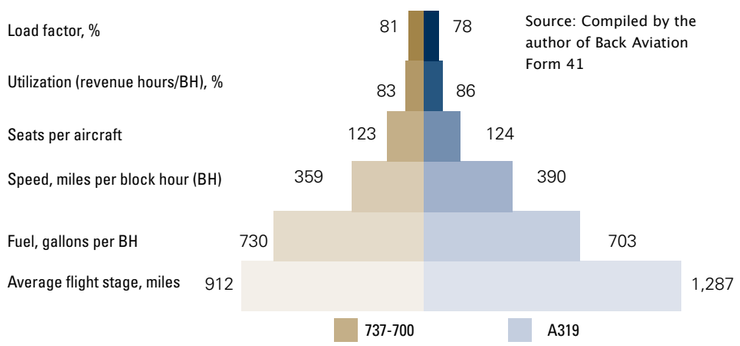
Operational Characteristics Of Narrow-body Aircraft (Traditional Network Carriers)



Narrow-body Comparison For Network Carriers There are numerous similarities between Boeing 737-700 and Airbus A319 operations and a few significant differences. The aircraft, with similar seat numbers and utilization per day, have significantly different average flight stage lengths. Network carriers that use the Boeing 737-700 compared to the Airbus A319 use it on a stage length that is 375 miles longer. When examining these aircraft from an operational and financial standpoint, it is important to realize that many of the cost differences are dependent on the airline.

Continued expansion of trade and tourism in emerging markets has strengthened the need for commercial aircraft. With global passenger-traffic growth projected to reach 6 percent this year, Boeing expects jet sales to rise by 7.7 percent to US$112 billion.

For the first time, the airline industry passed the 3-billion-passenger milestone in 2013, according to Avolon's 2014 New Year Outlook, which was released in January. Boeing plans to deliver 35,280 new aircraft, valued at more than US$4.8 trillion, between now and 2032.

According to an Airbus projection, air traffic will grow at 4.7 percent annually, requiring more than 29,220 new passenger aircraft and freighters at a value of nearly US$4.4 trillion.

Demand for commercial aircraft is also driven by resilient markets in Brazil, China, India and the Middle East, as well as continued moderate growth from developed markets in Europe and the United States. In fact, the number of passengers in China should more than triple, and the country's airline fleets will double in size by 2020. Similarly, India is expected to buy more than 900 new passenger planes worth US$86 billion by 2027.

Air transport liberalization and stronger economic interdependence among nations require airlines to acquire more aircraft to replace aging fleets and meet future passenger growth. Airbus received an industry peak of 1,619 new airplane orders in 2013, a new record of aircraft backlog, according to Euronews.

With so many new and diverse aircraft types now available, the question arises as to how a prospective buyer can accurately evaluate the options offered.

First, when selecting aircraft, airlines should examine aircraft efficiency from three perspectives:

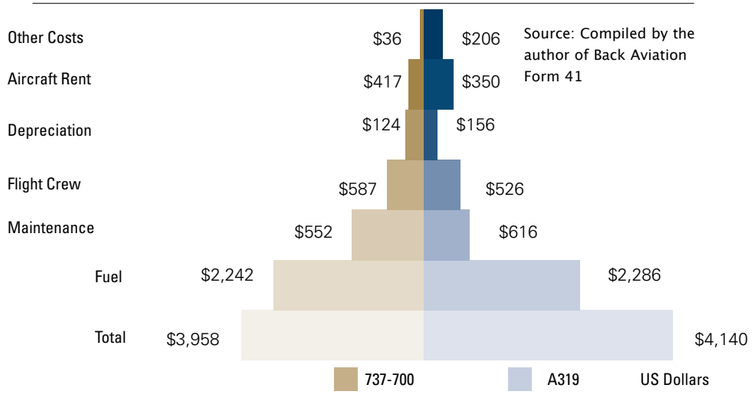
- Technical — Technical efficiencies are directly related to an aircraft's physical characteristics, including average airspeed, fuel burn and available seats.
- Operational — Operational efficiencies are those an airline can fully or partially control during the course of normal operations, such as aircraft utilization and average stage length.
- Financial — Financial characteristics are represented as the monetary impact of an aircraft's technical and operational efficiencies on an airline and are often expressed as fuel cost per block hour and fuel cost per ASM.

In addition, maintenance and depreciation factors are determined by the aircraft model and expressed in the form of maintenance and depreciation costs.

To illustrate these characteristics and efficiencies, competing narrow-body, wide-body and regional jet aircraft models from the major manufacturers were selected and analyzed using various operational, financial and technical metrics.

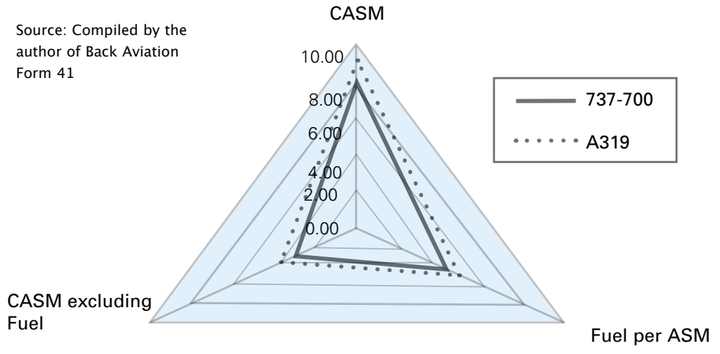
Each aircraft type was examined to determine how they have been used in the marketplace by airlines that have operated a mix of aircraft. Individual historical and current examples provided guidance for the selection and operation of new aircraft. For a prospective buyer to accurately evaluate the available options, it is necessary to evaluate these examples and the costs associated with them.

Average Block-Hour Cost Comparison (Traditional Network Carriers)



Boeing 737-700 Advantages The Boeing 737-700 offers several advantages to network carriers in comparison to its competitor, the Airbus A319. The Boeing 737-700 presents cost savings on all the measured metrics. One of the most significant cost differences is in the flight crew costs of each aircraft. The Boeing 737-700 flight crew costs a significant US$160.98 less per block hour than the Airbus A319. The Boeing 737-700 also is more fuel efficient for network carriers with a cost of approximately US$65 less per block hour. When taking fleet sizes and numbers of hours network carriers fly, this quickly translates into substantial savings.

Cost Of Available Seat-miles (Network Carriers)



CASM For Network Carriers Cost per Available Seat Mile (CASM) is significantly less for network carriers that operate the Boeing 737-700. With greater fuel efficiency and longer average stage lengths, the aircraft has a CASM of US8.18 cents while the Airbus A319 costs US9.39 cents per seat mile. After factoring out fuel costs, the Boeing 737-700 still has a cost advantage over the Airbus A319. CASM, after excluding fuel costs per average seat mile, is US$3.55 and US$4.21 for the Boeing 737-700 and Airbus A319, respectively.

Historical and Current Evaluation

Determining a single price for a specific used aircraft type is difficult at best. Aircraft valuation and selection is a complex process. The price of an aircraft depends on many factors such as:

- Aircraft age,
- Flight hours,
- Noise level,
- Flight cycles,
- Size,
- Seat capacity,
- Fuel efficiency.

In general, aircraft values depreciate over time as aging structures require an increasing amount of maintenance and face the likelihood of obsolescence. Unfortunately, the rate at which maintenance costs increase is typically higher than the rate at which non-operating costs increase. (Non-operating costs are related to financial activities of an airline that are not related to the core operations, such as interest expenses, charges on obsolescence of inventory and the cost of disposing assets.) However, increasing operating costs will at some point exceed an aircraft's revenue-generating ability and, thereby, terminate its economic life.

Moreover, the aircraft price also depends on exogenous forces such as fuel costs, financial crises, economic cycles, demand volatility, environmental regulations, aircraft safety and other factors affecting demand.

Recently, increasing fuel costs have prompted airlines to withdraw larger, older aircraft from active service and, on some occasions, smaller planes such as regional jets as well. The global financial crisis of 2008, assumed by some to be the worst since the Great Depression of the 1930s, according to Reuters, forced many airlines to furlough employees as the price of fuel skyrocketed and consumer demand plummeted.

Because fuel prices remained high during the first half of 2008, many carriers worldwide replaced their older fleets with new, more fuel-efficient aircraft. More airlines went bankrupt in 2008 than in the aftermath of Sept. 11, 2001, resulting in another significant drop in the value of older aircraft. For example, Delta Air Lines retired more than 350 aircraft from its fleet, while adding more economically efficient aircraft.

Exogenous forces such as terrorism, air-traffic liberalization and competitive-pricing practices by startups and LCCs can also significantly alter the demand for aircraft and, therefore, change estimated values.

The Sept. 11 attacks caused a decline in the market value of most commercial aircraft. Share prices of airlines and aircraft transactions plummeted, and many older planes were retired to the desert. According to Reuters, just a week after the tragedy, Boeing announced plans to cut 30,000 jobs over the next two years.

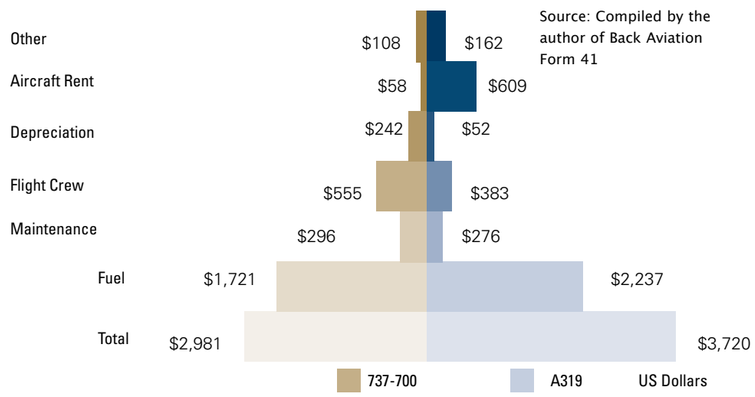
Technological progress that reduces the operating costs of new aircraft, environmental regulations restricting the use of older aircraft and/or higher fuel prices also depress the value of older, less-fuel-efficient aircraft.

On the positive side, the industry is experiencing a discernible reduction in aircraft operating costs through the contribution of advanced technologies such as improvements in aerodynamic characteristics and advancement in engine design. The application of advanced composite materials to various aircraft structures, such as the Boeing 787 and Airbus A350, enhance performance and reduce weight. As a result, aircraft today are 70 percent more fuel efficient than 40 years ago, and 20 percent more fuel efficient than 10 years ago.

The Boeing 737 MAX jetliner is expected to deliver 14 percent more fuel efficiency than the Boeing 737-800 NG. Undoubtedly, this will negatively impact the market values of Boeing 737 NGs and other classic aircraft.

As well, the Airbus A320neo is expected to provide an increase in range of approximately 500 nautical miles, in addition to an 8 percent reduction in operating costs, diminished noise production and 15 percent less fuel consumption than earlier models.

Narrow-body Block Hour Cost Comparison (LCCs)



Block-hour Comparison The Boeing 737-700 costs significantly more for LCCs when it comes to crew costs; US$172 more than the Airbus A319 per block hour. This is directly related to Southwest Airlines' higher crew compensation when compared to other LCCs.

By all accounts, newer aircraft models provide more efficient fuel consumption and lower operating costs. However, for some airlines, obtaining new aircraft is not always an option. Therefore, they may opt for a lower purchase price or lease option for older aircraft.

The remainder of this article provides a detailed analysis of the most popular narrow-body aircraft currently in operation. The first section compares the operating block-hour costs of a Boeing 737 with the Airbus A319 and A320 for traditional network carriers only. The second section makes the same comparison for LCCs only. The third and final section provides an overall comparison of traditional airlines and LCCs based on total costs for the aircraft.

Airlines And Their Aircraft

Several single-factor ratios are outlined to benchmark financial and operational performance for three narrow-body aircraft — Boeing 737-700, Airbus A319 and Airbus A320. These ratios can be used to compare and contrast different types of aircraft and lay the foundation for fleet planning and aircraft selection.

The Boeing 737 series is the best-selling jetliner in the history of the airline industry. More than 7,700 Boeing 737s have been produced and 3,467 orders are yet to be delivered as of January. On average, 1,250 Boeing 737 aircraft are in flight at any given time, with 24 departing or landing somewhere in the world every minute. The Boeing 737-700, 737-800 and 737-900 compete directly with the Airbus A319, A320 and A321 in the narrow-body, short- to medium-haul commercial aircraft market. As of February, approximately 5,924 Airbus A320 family (comprising the A318, A319, A320 and A321) aircraft have been delivered, of which 5,723 are in active service.

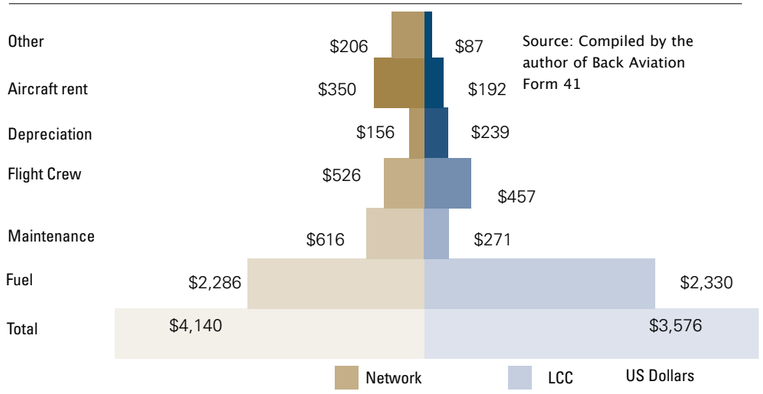
These two families of aircraft are popular with LCCs. Southwest Airlines, WestJet, Virgin Blue and Ryanair use the Boeing 737 NG, while JetBlue, Virgin America and Air Asia utilize the Airbus A320 family, and easyJet flies both. These aircraft are also employed by network carriers. United Airlines, Delta Air Lines and American Airlines use the Boeing 737 NG family. United Airlines and Delta Air Lines also operate aircraft in the Airbus A320 family.

Regardless of the geographical location, fleet planning must be based on five fundamental factors:

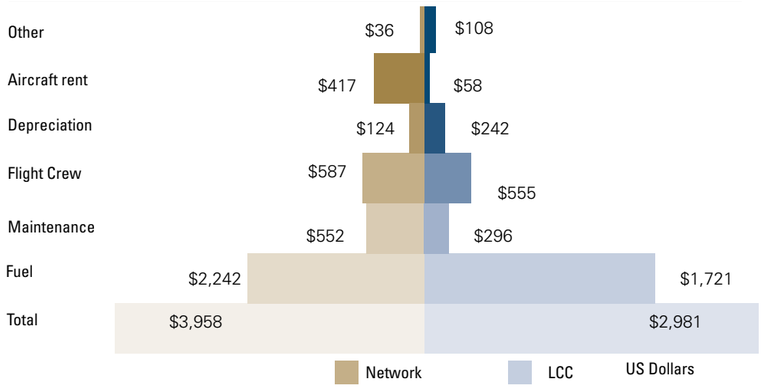
- Financial viability,
- Which aircraft best suits the network,
- When they are needed,
- How many are required,
- Replacement or net addition.

US Airways is currently the only U.S.-based network carrier that flies Airbus A320 aircraft but does not operate any Boeing 737 NG aircraft. Other Airbus A320 family users include Frontier Airlines and Spirit Airlines, both with more than 25 Airbus A319s in their fleet.

A-319 Block-Hour Cost Comparison



Boeing 737-700 Block-Hour Cost Comparison



Block-hour Cost Comparison: Network Versus LCC When conducting a block-hour cost comparison between the Boeing 737-700 and the Airbus A319, there are similar cost structures but notable individual differences. For both network airlines and LCCs, the biggest cost was fuel, which accounted for 57 percent and 58 percent of costs, respectively. For network carriers, 14 percent of total costs are attributable to maintenance costs, while they were only 10 percent for LCCs. However, LCCs had a higher percentage of flight-crew costs partially due to the relatively highly-compensated Southwest Airlines flight crews. There is also a higher percentage of costs (8 percent compared to 3 percent) for LCCs in terms of aircraft depreciation. However, network carriers are confronted with significantly higher aircraft rental costs.

Operational Characteristics

The block-hour costs for each aircraft model are compared for both network carriers and LCCs. Then each aircraft's costs and the associated benefits and savings are analyzed.

When comparing these aircraft from an operational and financial standpoint, it becomes clear that many of the cost differences, such as fuel costs, maintenance costs, labor costs and airport charges, are dependent on the airline. Fuel burn, for instance, is invariant, although it is indirectly affected by stage length, aircraft age and flight procedures. Nonetheless, airlines consistently search for ways to conserve jet fuel and thereby lower their fuel costs. However, some costs are relatively invariant to airline operations.

For example, India-based low-cost GoAir announced that it will only hire female cabin crew in the future to save £330,000 (US$538,974) a year on fuel because all-female crews weigh 33 pounds to 44 pounds less on average than mixed cabin crews. However, other costs, including crew salaries, aircraft depreciation, and aircraft and airport leases, as well as soft costs, such as high aircraft utilization, higher-density seating, efficiency through simple structures, and lean and productive personnel, are highly dependent on airline's unique operational characteristics.

Aircraft Comparison For Network Carriers

When comparing the operational characteristics of Boeing 737-700 and Airbus A319 for network carriers, one of the most significant differences is flight crew costs. The Boeing 737-700 flight crew costs US$160.98 less per block hour than the Airbus A319. The Boeing 737-700 also is more efficient for network carriers in terms of fuel burn, with a cost of approximately US$65 less per block hour than Airbus. This number quickly translates into real savings when fleet sizes and numbers of hours flown are taken into account. When an airline decides to add an aircraft to its fleet, the effect of the operational characteristics must be taken into account.

Cost per available seat mile (CASM) is significantly less for network carriers operating the Boeing 737-700. With greater fuel efficiency and longer average stage lengths, the aircraft has a CASM of US8.18 cents, while the Airbus A319 costs US9.39 cents per seat mile. Even when fuel costs are not considered, the Boeing 737-700 still has an advantage over the Airbus A319. After excluding fuel costs per average seat mile (CASM ex-fuel) is US$3.55 and US$4.21 for the Boeing 737-700 and Airbus A319, respectively.

LCC Average Block-Hour Comparison

For LCCs, the Boeing 737-700 crew costs are US$172 more per block hour than the Airbus A319, which can be attributed to Southwest Airlines' higher crew compensation compared with other LCCs.

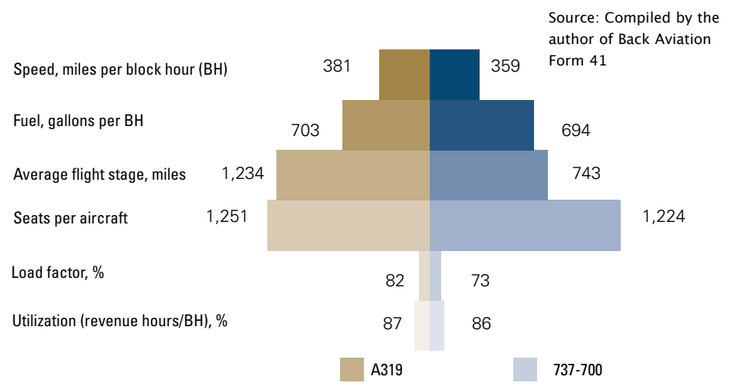
LCCS clearly show diverse trends in operational characteristics compared with those of network carriers. The Boeing 737-700 is flown on significantly shorter stage lengths with the average being 491 miles less than the Airbus A319. Airlines using the Airbus A319 use the aircraft on longer stage lengths to compensate for the high fuel burns.

The Boeing 737-700 operates an average of 11.7 block hours per day while the Airbus A319 performs for approximately 11.9 block hours a day. Frontier Airlines, Spirit Airlines and United Airlines operate their aircraft for more than 11 hours a day, while Delta Air Lines and US Airways use the same aircraft for less than 10 hours a day. Because an airline cannot make money with its aircraft sitting on the ground, US Airways and Delta Air Lines would likely need to increase utilization of the Airbus A319 to become more profitable.

Load factors are 9 percent less on the Boeing 737-700, which, on average, has three fewer seats than the Airbus A319 when utilized by LCCs. By increasing daily aircraft utilization, LCCs achieve a lower CASM. (Daily aircraft utilization is the ratio of aircraft hours flown divided by the aircraft days available.)

By serving smaller, uncongested airports and focusing on point-to-point flights, LCCs maximize the number of daily block hours and, thus, aircraft utilization. On the other hand, profitability may be adversely affected if these aircraft are deployed on routes to sparsely populated local airports, with not enough revenue.

Operational Characteristics Of Narrow-body Aircraft (LCCs)



Operational Characteristics For LCCs Load factors are 9 percent less on the Boeing 737-700, which, on average, has three fewer seats than the Airbus A319 when utilized by low-cost carriers. LCCs can realize a lower CASM with these aircraft by increasing daily utilization. They can maximize the number of daily block hours, thereby increasing aircraft utilization, by serving smaller, uncongested airports and focusing on point-to-point flights. However, this could negatively affect profitability if the aircraft are deployed on routes to underpopulated local airports with only a competitive yield.

Network Versus LCC Block-Hour Costs

Generally, the costs incurred by LCCs are lower than those of network carriers on a block-hour basis. These cost advantages enable LCCs to compete on the basis of price in a highly similar market, giving them a significant competitive advantage. Commonly, LCC enters an uncongested secondary airport, instead of entering a congested major airport, reducing the taxi time and fuel consumption. LCC fuel costs are US$1,721 compared with US$2,242 for network carriers due, in part, to successful fuel-hedging practices by Southwest Airlines.

Another way of interpreting cost comparisons is to identify the aircraft cost structure in terms of percentages for network carriers and LCCs, which is represented as a breakdown of the Boeing 737-700 cost structure. They have similar cost structures, but each business model has notable individual differences.

For both network airlines and LCCs, the biggest cost is fuel, which accounts for 57 percent and 58 percent, respectively. Network carriers attribute 14 percent of total costs to maintenance, while LCCs attribute 10 percent for the same factor. However, LCCs show a higher percentage of flight crew costs, as mentioned previously.

Aircraft depreciation is a higher percentage of costs for LCCs, 8 percent compared with 3 percent for network carriers. However, network carriers face a significantly higher percentage of aircraft rental costs. This differential reflects the lease versus buy decision, which is made when carriers choose to work with operating lessors of aircraft versus owning, and subsequently depreciating their planes.

Fuel-purchasing plans may contribute to the lower CASM of LCCs operating the Boeing 737-700. Southwest Airlines paid a lower price per gallon of fuel (US$1.70 compared with more than US$2 for the other carriers), achieving lower fuel costs per available seat mile (ASM) and a lower total CASM.

AirTran Airways, now part of Southwest Airlines, was able to achieve a low CASM of US5.2 cents, due, in part, to its low crew costs of US0.65 cents per ASM. Even after removing fuel costs, the CASM achieved by LCC carriers is US2.52 cents compared to US3.55 cents for network carriers.

Overall, network carriers flying the Airbus A319 pay US$564 more per block hour than LCCs. On the other hand, network carriers spend, on average, US$44 less on fuel per block hour and US$83 less on depreciation costs.

Clearly, there is not a "one-size-fits-all" approach to aircraft selection. Each aircraft serves a specific purpose for individual business models. So when airlines make adjustments to their fleets and conduct the proper analyses, it becomes evident which aircraft is better suited for particular business models. These types of large investments require a certain methodology to ensure the most financially sound outcome. And it goes back to the basics of examining aircraft efficiency from operational, technical and financial perspectives.

Prof. Bijan Vasigh is co-author of "Aircraft Financing: Strategies for Managing Capital Costs in a Turbulent Industry." He can be contacted at vasighb@erau.edu.