The A320neo and 737 MAX families will offer double-digit reductions in fuel burn. Customers for the new aircraft highlighted this as an important factor in their fleet selection decisions. Commonality with current generation aircraft and improvements in range were also emphasised.

A320neo & 737 MAX: what they offer versus current generation narrowbodies

This analysis identifies the potential operational benefits and cost reductions the A320neo (new engine option) and 737 MAX variants will provide over current generation aircraft, and the design changes that make these possible.

A320neo family

The current A320ceo (classic engine option) family includes the A318, A319 A320 and A321 *(see table, page 19)*. The A320neo family will consist of the A319neo, A320neo and A321neo. These will feature the same basic airframe structural materials and fuselage dimensions as their direct predecessors.

A320neo models will benefit from increased cabin efficiency features that will allow them to offer higher-capacity configurations than today's typical A320ceo family layouts. Some of these cabin efficiency measures are also available for A320ceo variants.

There will be no neo variant of the A318, which failed to sell in significant numbers.

The A319neo will accommodate 140 seats in a typical two-class configuration and up to 160 in a single-class arrangement *(see table, page 19)*. In comparison, a typical A319ceo has 124 seats in a two-class set-up and 156 in a single-class arrangement.

The A319neo will have a maximum take-off weight (MTOW) of up to 166,400lbs, the same as the A319ceo. The A319neo will have a range of up to 3,750 nautical miles (nm) with a typical two-class passenger payload. The first A319neo is expected to enter service in the second quarter of 2017.

The A320neo will accommodate up to 165 seats in a typical two-class arrangement, and up to 189 in a single-class configuration *(see table, page 19)*. This compares to the A320ceo that typically carries 150 seats in a two-class configuration and 180 seats in a single-class layout.

The A320neo will have an MTOW of up to 174,200lbs, which is more than 2,000lbs higher than its predecessor *(see table, page 19)*. The A320neo will have a range of up to 3,500nm with a two-class passenger payload. Airbus claims that if the A320ceo and A320neo were configured with 150 seats, the new model would have 500nm longer range, equivalent to one hour's flying time.

The first A320neo has been delivered to Lufthansa, and is due to enter service by the end of January 2016.

The A321neo will carry 206 passengers in a two-class set-up. A single-class configuration for up to 240 seats will also be available from 2018 *(see table, page 19)*. A standard A321ceo currently accommodates 185 seats in a two-class arrangement or 220 in a single-class cabin.

Airbus has developed a long-range (LR) option for the A321neo, that features higher weight specifications. This aircraft will have an MTOW of up to 213,800lbs. This is 7,500lbs higher than the A321ceo's MTOW, and will give it a range of up to 4,000nm with a two-class passenger payload. The high-weight A321neo version will, therefore, be capable of flying 21 additional passengers over 800nm further than current A321ceos *(see table, page 19)*.

The first A321neo is expected to enter service in the fourth quarter of 2016.

New features

The most significant design change between the current and next generation A320 families is the introduction of new, more efficient engines.

A320neo family operators will be able to select between the new Pratt and Whitney (P&W) PW1100G-JM and CFM LEAP-1A engine families.

Sharklets will be provided as standard, along with cabin optimisation techniques that offer increased capacity.

Performance improvements

Airbus claims that the A320neo family will always demonstrate at least a 15% reduction in fuel burn per seat when variants are compared to ceo variants without Sharklets. Airbus says seat count increases for the neo aircraft could result in a 20% fuel-burn-per-seat advantage when compared to ceo aircraft configured with current standard seat numbers.

On an 800nm sector Airbus claims an A320neo configured in a high-density 189-seat arrangement would burn 8% less fuel per-seat than a 737 MAX 200 with 197 seats. Airbus adds that on the same sector length an A320neo in a full-service layout with 165 seats would burn 8% less fuel per seat than a 737 MAX 8 configured with 171 seats.

The A320neo family's fuel burn advantage over the ceo aircraft is mainly due to the new engines, but the Sharklets and optimised extra-capacity cabin configurations also contribute.

Sharklets are 2.4 metre tall wingtip devices made from lightweight composites. They improve aerodynamic performance and were initially developed as an option for the A320ceo family, but will be standard on all A320neo variants.

Airbus has introduced a number of innovations that permit extra-capacity cabin configurations for the A320neo family. These innovations are available on all three neo variants, and include slim-line seats, a new 'Space-Flex' rear galley configuration and a new 'Smart-Lav' lavatory design. They are already flying on the ceo family.

In addition, exit limits for A320neo and ceo family aircraft have been increased by regulatory authorities.

The A319ceo's and neo's exit limit will be 160 seats from 2018. The A320ceo and neo will have an exit limit of 189 seats, while the A321ceo's has already increased to 230 seats and the A321neo will have an exit limit of 240 seats from 2018.

A key enabler for the increased exit

A320 FAMILY SPECIFICATIONS

A320ceo family	A318ceo	A319ceo	A320ceo	A321ceo
Two-class seating	107	124	150	185
Max single-class seating	132	156	180	220
Engine Type	CMF56-5B/PW6000A	CFM56-5B/V2500-A5	CFM56-5B/V2500-A5	CFM56-5B/V2500-A5
MTOW (lbs)	149,900	166,400	172,000	206,100
Range (nm)	3,100	3,750	3,300	3,200
In service	47	1,321	3,704	1,156
Order backlog	-	18	651	418
A320neo family		**A319neo**	**A320neo**	**A321neo**
Two-class seating		140	165	206
Max single-class seating		160	189	240
Engine Type		PW1100G-JM/LEAP-1A	PW1100G-JM/LEAP-1A	PW1100G-JM/LEAP-1A
MTOW (lbs)		166,400	174,200	213,800
Range (nm)		3,750	3,500	4,000
In service		-	-	-
Order backlog		49	3,337	1,087

Notes:
1). Seat capacity figures based on standard manufacturer examples. These may vary by airline.Range is based on two-class passenger payload.
2). In-service fleet and order numbers correct as of January 2016.
3). A320ceo family specs based on aircraft with Sharklets and current standard cabin configurations. These aircraft also benefit from increased exit limits.

limits for the neo variants is the A320 family's large door size. The main front and rear exit doors of the A320 family were already larger than the minimum size specified by the latest 'Type C' main door requirements. To achieve the new exit limits, Airbus was required to incorporate wider evacuation slides. The A321neo will offer a further optimisation of the passenger cabin thanks to a new exit door arrangement.

Maintenance

Since most of the structure and systems of the A320neo family will be the same as those used for the A320ceo, there will be similarities in most maintenance requirements. This includes the number, scope and interval of tasks in the maintenance planning document (MPD).

"The A320 family's maintenance programme is entirely based on tasks with intervals expressed in usage parameters," explains Bert Stegerer, head of aircraft operations marketing at Airbus. "This gives operators the flexibility to optimise their maintenance schedules according to aircraft utilisation. Operators may also switch from the typical maintenance check concept to an equalised concept where scheduled maintenance tasks are packaged into overnight events to minimise downtime."

The scope of some tasks means they still require base check visits. The intervals for these will be the same for neo and ceo aircraft. "Airbus and the operators recently launched an exercise to increase intervals for base maintenance tasks," says Stegerer. "The new target figures are 36 months/12,000FH/ 8,000FC, whichever comes first, and will apply to the A320ceo and neo variants."

New design features incorporated in the A320neo family mean that it will have fewer maintenance requirements than its predecessors in some areas. "The new engine and nacelle design will result in a reduction in scheduled maintenance requirements compared to previous engines," explains Stegerer.

"In addition, the application of an A380-style electronic bleed air system (EBAS) on the A320neo will improve reliability, while the neo's landing gear will have an overhaul interval of 12 years compared to the current 10-year interval for the A320ceo.

"For common parts, MPD tasks are similar for the A320ceo and neo," says Stegerer. "The number of tasks is halved where parts that have been redesigned for the neo are compared to ceo equivalents. Examples include the redesigned aspects of the powerplant, engine pylon and bleed air system. For the redesigned parts there is a reduction of 50% in MPD man-hours (MH) over a period of 12 years, due to some intervals being increased and some tasks deleted. There are fewer airworthiness limitation items (ALI) for the neo's redesigned parts than their ceo predecessors."

The A320neo family will feature the same on-board diagnostics system as the current ceo variants.

"The A320neo family will have a marginally lower number of systems and powerplant tasks than A320ceo variants, since more engine systems will be monitored electronically," explains Frank Mueller, A320 maintenance programme manager at Lufthansa Technik's Maintenance Product Division.

737 MAX family

The 737 MAX will be the fourth 737 generation of aircraft to enter service. The original 737-100 and -200 series were introduced in the late 1960s and followed by the 737-300, -400 and -500 in the 1980s. The 737NG family then entered service from 1997 and eventually included the -600, -700, -800, -900 and -900ER variants.

The 737 MAX family will include three main variants: the 737 MAX 7, 737 MAX 8 and 737 MAX 9. There will be an additional high-capacity sub-variant of the 737 MAX 8, designated the 737 MAX 200. There is no MAX equivalent of the 737-600, which is the smallest member of the NG family and, like the A318, did not sell in large numbers.

The 737 MAX 7, MAX 8 and MAX 9 are developments of the 737-700, -800 and -900ER. They feature the same basic cabin dimensions and capacity options as their predecessors *(see table, page 20)*. The 737 MAX 200 will accommodate more seats than the MAX 8 or -800 variants thanks to an extra mid-exit door.

The 737 MAX 7 will accommodate 126 seats in a typical two-class configuration, and up to 149 in a single-class cabin *(see table, page 20)*. It will have an MTOW of up to 159,500lbs, which is 5,000lbs higher than that of the 737-700. The 737 MAX 7 will have a range of up to 3,350nm when operating with a full passenger payload in a typical two-class set-up. This is about 350nm more additional range than the 737-700.

The first 737 MAX 7 is currently scheduled for delivery in 2019.

The 737 MAX 8 will accommodate 162 passengers in a two-class arrangement and up to 189 in a single-class configuration *(see table, page 20)*. It will have an MTOW of up to 181,200lbs, which is 7,000lbs higher than that of the 737-800. The 737 MAX 8 will have a range of up to 3,515nm with a full two-class passenger payload, giving it a range advantage of 600nm over the 737-800.

The 737 MAX 8 will be the first member of the MAX family to enter service, with the first aircraft due for delivery during the third quarter of 2017.

737 FAMILY SPECIFICATIONS

737NG family	737-600	737-700	737-800	737-900ER
Two-class seating	110	126	162	178
Max single-class seating	130	149	189	220
Engine Type	CMF56-7B	CFM56-7B	CFM56-7B	CFM56-7B
MTOW (lbs)	144,500	154,500	174,200	187,700
Range (nm)	2,840	3,010	2,935	2,750
In service	57	1,047	3,803	357
Order backlog	-	33	1,070	158

737 MAX family	737 MAX 7	737 MAX 8	737 MAX 200	737 MAX 9
Two-class seating	126	162	-	178
Max single-class seating	149	189	200	220
Engine Type	LEAP-1B	LEAP-1B	LEAP-1B	LEAP-1B
MTOW (lbs)	159,500	181,200	181,200	194,700
Range (nm)	3,350	3,515	2,700	3,280
In service	-	-	-	-
Order backlog	60	1,787	100	223

Notes:
1). There are a further 900 737 MAX aircraft on order where the precise variant is unknown.
2). Seat capacity figures based on standard manufacturer examples. These may vary by airline. Range is based on two-class passenger payload.
3). In-service fleet and order numbers correct as of January 2016. There are also 52 737-900s in service. 737-700 fleet number includes two ER variants.
4). 737NG specs based on winglet-equipped aircraft.

The 737 MAX 200 is based on the 737 MAX 8 airframe with an additional mid-exit door that will permit a single-class configuration of up to 200 seats *(see table, this page)*. The 737 MAX 200 will have the same MTOW as the standard 737 MAX 8. The 737 MAX 200 will, therefore, have shorter range than the 737 MAX 8, since it is likely to be operated with a larger passenger payload. With a 200-passenger payload, the 737 MAX 200 will have a range of 2,700nm.

The first 737 MAX 200 is expected to be delivered in 2019.

The 737 MAX 9 will accommodate 178 seats in a typical two-class configuration and up to 220 in a single-class cabin *(see table, this page)*. Its MTOW of up to 194,700lbs will be 7,000lbs higher than that of the 737-900ER. The 737 MAX 9 will have a range of up to 3,280nm when operating with a full two-class passenger payload, equivalent to an additional 500nm of range compared to the 737-900ER.

The first 737 MAX 9 is scheduled for delivery in 2018.

New features

"The 737 MAX family builds on the Next Generation 737 family," explains Boeing spokesperson Lauren Penning. "The main differences are the new, more efficient engines that require subsequent strengthening of the wing and airframe to accommodate them, in addition to an eight-inch increase in the length of the nose landing gear. The MAX includes other improvements, such as large screen displays on the flightdeck and the Advanced Technology (AT) winglet."

Like the 737NG family, the MAX variants come with a single engine option. They will all be powered by the new CFM LEAP-1B engine family.

Performance improvements

Boeing expects the 737 MAX family to provide double-digit reductions in fuel burn over current 737NG variants.

It estimates the 737 MAX 7 will burn 13% less fuel per seat than today's latest winglet-equipped 737-700s on a typical US domestic service with a route length of 800nm and a standard two-class passenger payload. Boeing believes the 737 MAX 8 and 737 MAX 9 will demonstrate 14% reductions in fuel burn per seat versus the 737-800 and 737-900ER. If the 737 MAX variants were compared to early-build 737NG aircraft, Boeing believes they would demonstrate fuel burn savings of 20% per seat.

Boeing also claims that a 737 MAX 8 would have an 8% lower fuel burn per seat and 8% lower operating costs per seat than an A320neo on a 500nm sector with a typical two-class passenger payload.

There are several design features that will contribute to the 737 MAX family's improvement in fuel burn performance.

"Most of the fuel burn reduction can be credited to the new engine/airframe combination," says Penning. "About 1% can also be attributed to the new, more aerodynamic tail cone and a further 1% to the new winglet design, although this can increase to 1.8% on longer routes.

"For the 737 MAX variants, the tail cone will be extended and the section above the elevator thickened to improve steadiness of air flow," explains Penning. "This eliminates the need for vortex generators on the tail. These improvements will result in less drag, giving the aircraft better performance.

"The new AT winglets combine rake tip technology with a dual-feather winglet concept," continues Penning. Unlike traditional solutions, the AT winglet design features dual fins, with one protruding above and the other below the main body of the wing. "The concept is very efficient because the effective wing span increase is strategically balanced between the upper and lower parts of the wing," explains Penning. "This moves the system's centre of gravity down, minimising the weight penalty, while allowing maximum aerodynamic efficiency."

The AT winglets are designed as part of the 737 MAX wing and are, therefore, a standard feature.

Maintenance

The 737 MAX variants will include some features designed to improve maintenance efficiency, but overall maintenance requirements and costs are expected to be broadly similar to those of the 737NG family.

"Most of the design changes relate to the new LEAP-1B engines," says Penning. "These have been optimised to provide the 737 MAX with the best possible fuel efficiency, while maintaining similar reliability and maintenance costs to the CFM56-7B family in use on the 737NG. The 737NG family has a 20-30% maintenance cost advantage over its nearest competition and an industry-leading 99.7% dispatch reliability rate. We expect the MAX to maintain an advantage over the competition in terms of maintenance costs."

The 737 MAX maintenance programme will be largely based on the latest 737NG maintenance programme. Boeing expects that the airframe maintenance costs associated with the MAX will be close to those of the 737NG family. It claims that the 737 MAX maintenance programme leverages the advanced check intervals of the current

Airbus expects the A320neo family to demonstrate a 15-20% reduction in fuel burn per-seat when compared to current A320ceo aircraft without Sharklets. The majority of this reduction will be due to the new, more efficient PW1100G-JM and LEAP-1A engines.

737NG, while accounting for changes and improvements in systems and structures.

Despite similarities with its predecessors, the 737 MAX family will have some new features designed to improve maintenance efficiency.

"The 737 MAX will feature a more centralised Built-in Test Equipment (BITE) system that technicians can access from the flight deck after a flight," explains Penning. "The MAX will have additional systems reporting BITE and maintenance data, so that technicians can better assess dispatch limitations and maintenance actions. The 737 MAX will also build on enhanced connectivity to provide real-time data to the ground about systems during flight. These changes will make it easier for airlines to plan operational decisions in advance around maintenance requirements.

"The 737 MAX will include an enhanced on-board network system (ONS) comprising a Network File Server (NFS) and an enhanced Digital Flight Data Acquisition Unit (eDFDAU)," continues Penning. "These systems will provide a new set of capabilities including: advanced data collection at line speed, an on-board repository of loadable aircraft software parts, and the capability to process data in real time."

Engines

New engine technology represents the most significant design modification in both the A320neo and 737 MAX families. The new engines will be responsible for providing most of the fuel burn improvements promised by the new aircraft.

CFM LEAP

The CFM LEAP family includes the LEAP-1A, -1B and -1C variants.

The CFM LEAP-1A will be one of two engine options for the A320neo family. The LEAP-1A has a fan diameter of 78 inches and a bypass ratio of 11:1. It will have thrust ratings of 24,500-32,900lbs, depending on the aircraft variant.

The CFM LEAP-1B is the sole engine option for the 737 MAX family. The LEAP-1B has a fan diameter of 69 inches and a bypass ratio of 9:1. It will have thrust ratings of 23,000-28,000lbs, depending on the MAX variant it equips.

CFM expects the LEAP engine to provide a 15% reduction in fuel consumption and CO2 emissions in comparison to current generation engines. It expects these fuel burn savings to be achieved, while maintaining comparable maintenance costs with today's CFM56 engines.

PW1100G-JM

The PW1100G-JM series is a member of P&W's PurePower® PW1000G family.

The PW1100G series currently includes four variants: the PW1124G-JM, PW1127G-JM, PW1133G-JM and PW1135G-JM.

All four variants will have a fan diameter of 81 inches and a bypass ratio of 12.5:1.

The PW1124G-JM and PW1127G-JM will power the A319neo and A320neo respectively. Both variants will have thrust ratings of up to 24,000lbs or 27,000lbs. The PW1133G-JM and PW1135G-JM will both be available for the A321neo, with thrust ratings of up to 30,000 or 33,000, and 35,000lbs respectively.

P&W expects its standard PW1100G-JM engines to provide a 15% fuel burn reduction over current generation engines. A new PurePower Advantage configuration is currently being developed and will provide additional 2% fuel burn savings by means of new aerodynamic and cooling technologies. This new build standard will be fully interchangeable with the current PW1100G-JM standard engines. It will enter service in 2019 and achieve full production incorporation in 2021.

P&W claims the PurePower Advantage configuration will provide operating cost savings greater than $200 per flight hour (FH).

In PW1000G family engines, the fan drive gear system (FDGS) enables the fan to rotate slowly for optimum efficiency, while the low pressure compressor (LPC) and low pressure turbine (LPT) turn faster to create more power in fewer stages and with fewer parts. P&W claims the unique hybrid metallic fan blade, sixth-generation single crystal high pressure turbine (HPT) airfoils and the high-speed LPT are major contributors to the fuel burn performance.

PW stated that its intention is to deliver the quoted fuel burn savings, while retaining maintenance costs consistent with today's narrowbody engines. It claims the geared architecture is a major factor in achieving this, since it reduces part count by 2,000 airfoils and lowers the life limited part (LLP) disk count by six stages relative to a conventional design. To keep engines on wing, the PW1000G family has borescope access in every stage, on-wing blending capability in the compression system, and uses advanced diagnostics and prognostics to monitor engine health around the clock. From a shop visit perspective the smaller part count and LLP disk reduction lessens the overall work scope. The FDGS is designed to run for infinite life with no LLPs.

Order trends

There are currently 4,473 A320neo and 3,070 737 MAX family aircraft on firm order.

The most popular variant of the new

The 737 MAX family will include the 737 MAX 7, MAX 8, MAX 200 and MAX 9. The 737 MAX 8 will be the first member of the family to enter service with delivery due during 2017. The first MAX 8 aircraft was rolled out of Boeing's factory in December 2015.

Airbus narrowbody family is the A320neo with 3,337 on order *(see table, page 19)*. The largest A320neo customers are IndiGo (430), AirAsia (304), AerCap (164) and easyJet (130). There are also 410 A320neos on order with unidentified customers.

There are 1,087 A321neos on order. The largest airline customers for this variant are Wizz Air (110), American Airlines (100) and Turkish Airlines (92).

The smallest member of the A320neo family is proving to be less popular. There are only 49 A319neos on order.

It is only possible to identify precise variants for 2,170 of the 3,070 737 MAX aircraft on order. An analysis of these 2,170 aircraft reveals that the 737 MAX 8 is the most popular model with 1,787 on order, followed by the 737 MAX 9 (223). There are also 100 737 MAX 200s and 60 737 MAX 7s on order. The smallest member of the family is again the least in demand, echoing the trend apparent in A320neo family orders.

The largest identifiable customers for the 737 MAX 8 are Southwest Airlines (170), AerCap (100), American Airlines (100) and Norwegian (100). The largest customer for the 737 MAX 9 is United Airlines (100) while Ryanair is currently the only organisation with 737 MAX 200s on order (100).

The remaining 900-strong 737 MAX order book does not specify the precise variants. It lists 365 orders where the variant is stated as 737 MAX 7/8/9, 527 where it is listed as 737 MAX 8/9, and a further eight where no variant is specified.

Where an order states multiple variants, it is not clear if the customer will be obligated to take delivery of all of the models specified, and if so, how many of each. Lion Air (201) is the largest customer among the 527 orders where the variant is listed as 737 MAX 8/9.

Fleet commonality

Adding a common or similar model to those already in the fleet can help to minimise costs associated with spare parts inventories and flight crew or maintenance personnel training.

"The A320neo has more than 95% parts commonality with an A320ceo of equivalent build standard, and both aircraft share the same type rating," explains Stegerer. "Current ceo family pilots need only a few hours of self-study to fly the neo as well, mainly to familiarise themselves with the new engines. Full flight simulator sessions and type rating checks are not mandatory in this case.

"Completely replacing a fleet of A320ceos with A320neos, can typically save airlines $2 million per aircraft in transition costs due to flight operational, maintenance and parts commonality between the ceo and neo families," adds Stegerer. "If neo variants partly replace ceo aircraft, this saving can be even higher due to the reduced complexity of operating ceos and neos in parallel over an extended period of time."

"We have worked hard to maintain fleet commonality between the 737 MAX and the 737NG because of the advantages the 737NG has in the market today," says Penning. "These include the highest reliability and lowest maintenance costs. Maintaining commonality will help ensure existing 737NG customers have a smooth transition to the 737 MAX.

"We expect a significant percentage of the 737NG spares investment will carry over to the 737 MAX," continues Penning. "Our goal is to maximise commonality, while still achieving the new levels of performance offered by the 737 MAX. 737NG pilots will need minimal training to be qualified on the 737 MAX."

Fleet commonality considerations appear to have played a role in A320neo and 737 MAX family order trends. Many have been ordered by or for airlines that already operate direct predecessors.

Based on orders, it is possible to identify 58 airlines that will operate variants of the A320neo family. All but six of these airlines already operate A320ceo variants. Of these six, the narrowbody fleets of Korean Air, Lion Air and Norwegian are currently based on variants of the 737NG. All three airlines have a combination of A320neo and 737 MAX variants on order.

It is currently possible to identify 35 airlines that will operate variants of the 737 MAX. Only four of them do not already operate 737NGs. Two of these four are Air Canada and Monarch Airlines. Both currently have narrowbody fleets exclusively based on the A320ceo family, and will replace their A320ceo variants with 737 MAX aircraft.

Customer views

Aircraft Commerce consulted a number of A320neo and 737 MAX customers to identify principal reasons for ordering these new aircraft.

easyJet

UK-based low-cost carrier (LCC) easyJet flies over 240 aircraft on more than 780 routes over more than 32 countries.

The airline first began services in 1995, and initially operated an all-Boeing fleet. This was based around the 737-300 and later the 737-700. In 2003 easyJet introduced its first A319. Since that time the carrier has phased out the 737s and established an all-Airbus fleet, incorporating 172 A319s and 98 A320s.

easyJet has 51 A320ceos and 130 A320neos on order. These aircraft will all be delivered by 2022. The first A320neos are expected in mid-2017, and will be equipped with CFM LEAP 1-A engines.

Both variants will be configured with

There are about 4,500 A320neo family aircraft on order, including more than 3,300 A320neos. The first A320neo was delivered to Lufthansa on 20th January 2016.

a single-class cabin accommodating 186 seats. In comparison, the airline's active A319 and A320 aircraft accommodate 156 and 180 seats respectively.

"The A320neos have been ordered primarily for fleet replacement and growth," explains Chris Essex, head of fleet strategy operations planning and analysis at easyJet. "Some will be used to replace A319s."

This suggests that a need for extra capacity was an influencing factor in easyJet's order selection process.

"Commonality with the existing fleet was one of many considerations in our aircraft evaluation," says Essex. "In all cases we evaluated the economic benefits. We expect the A320neos to demonstrate operating cost reductions in line with those published by the manufacturer."

Norwegian

Norway-based Norwegian is the third-largest LCC in Europe, operating over 400 routes across more than 130 destinations.

Norwegian initially focused on short-haul flying, but has now also established a long-haul operation. The carrier's narrowbody fleet has been based exclusively on 737 family aircraft. It initially built up a fleet of 737-300s but these have now been phased out in favour of the larger and more modern 737-800.

Norwegian's current narrowbody fleet comprises 94 737-800s. The airline has 36 additional 737-800s on order, as well as 100 737 MAX 8s and 100 A320neos.

"The A320neo will be introduced from 2016 and the 737 MAX 8 from 2017, explains Thomas Ramdahl, chief commercial officer at Norwegian.

Norwegian is keen to benefit from the promised reductions in operating costs offered by the A320neo and 737 MAX 8. "We are experiencing significant expansion and new, fuel-efficient aircraft are necessary for continued growth," says Ramdahl. "We expect the A320neo's and 737 MAX 8's fuel burn to be significantly lower than the current generation narrowbodies. Norwegian will be the European launch customer for the 737 MAX, which will be 10-12% more fuel-efficient than the 737-800. The A320neo's engines will have 15% lower fuel consumption than current A320s. Norwegian has selected the PW1100G-JM to power its A320neos.

"A large portion of the A320neos and 737 MAX 8s will be used to replace older aircraft," continues Ramdahl. "We do not want to operate aircraft older than seven or eight years of age. Our fleet is one of the youngest in Europe, with an average age of 3.6 years. Flying brand-new, state-of-the-art aircraft will reduce our maintenance costs in the long run."

Norwegian believes the new aircraft will offer new route opportunities. "The 737 MAX has the range to fly transatlantic flights that could potentially unlock completely new routes," claims Ramdahl.

The airline believes its decision to migrate towards a dual Airbus and Boeing narrowbody fleet will allow it to benefit from some commonality with its existing fleet, while avoiding the potential drawbacks associated with dependence on a single type.

"We already have extensive experience as a 737 operator, which will be beneficial from a crew and maintenance commonality perspective when the 737 MAX enters our fleet in 2017," explains Ramdahl.

"Selecting a dual fleet secures an optimised delivery schedule to suit our demand requirements," adds Ramdahl. "It also reduces the risk of delayed certification and other risks of being dependent on one aircraft type."

Monarch

Monarch Airlines is a UK-based scheduled leisure airline. It provides more than 6.5 million annual seats between the UK and destinations including the Mediterranean and the Canary Islands.

Monarch's current fleet consists of eight A320s and 25 A321s. The airline announced an order for 30 737 MAX 8s in 2014 and the intention to transition to an all-Boeing fleet.

"The first 737 MAX 8 is scheduled for delivery in April 2018," explains Julie Philpott, head of 737 MAX programme at Monarch. "We are scheduled to introduce eight 737 MAX 8s in 2018, 14 in 2019 and eight in 2020. We plan to have an all-Boeing fleet by 2022."

"We are in the early stages of drafting our configuration for the 737 MAX 8 aircraft, but our current blueprint is for 189 seats," says Philpott. "The airline currently configures its A320s and A321 with 174 and 214 economy-class seats respectively.

"A strategic objective for Monarch is the transition from multiple aircraft types to one single aircraft fleet," says Philpott. "The fleet renewal project supports our continuing drive for further efficiencies to bring unit operating costs into line with low-cost competitors over the medium term. The 737 MAX 8 will contribute significantly to our strategic objectives, improving service levels and providing cost savings through fuel economy and better asset utilisation.

"The two main areas of operating cost reduction will be fuel-efficiency, with an anticipated reduction in fuel costs of 15% per aircraft per year, and reduced maintenance costs," continues Philpott.

"The current fleet has an average age of 12 years. The average age will reduce to three years by the time we have completed transition to an all-Boeing fleet in 2022. With the average age of the fleet reduced by nine years, the new, younger, single-type fleet will lead to a significant reduction in associated maintenance costs," adds Philpott.

Boeing claims its 737NG family has a 20-30% maintenance cost advantage over its nearest competition. It expects the 737 MAX to maintain an advantage in maintenance costs. Boeing believes the 737 MAX will demonstrate fuel burn savings of between 13-20% compared to 737NG aircraft.

"The ultimate simplification to a single common aircraft type will enable Monarch to realise benefits across the group with improved process efficiencies in all areas from maintenance and ground handling to the provision of the on-board service to customers," claims Philpott.

"In selecting the future fleet, Monarch completed a fair and thorough process to determine which airframe manufacturer we would choose. The 737 MAX and A320neo families are equally capable and the order was not ultimately won on the characteristics of the aircraft alone," concludes Philpott.

SWISS

Swiss International Airlines (SWISS) is the national airline of Switzerland and is part of the Lufthansa Group. It flies to over 100 destinations across 49 countries from its hubs in Zurich and Geneva.

SWISS operates regional, narrowbody and widebody aircraft. The carrier's narrowbody fleet consists of five A319s, 22 A320s and eight A321s. It has a number of narrowbody aircraft on order, including one A321ceo, 10 A320neos and five A321neos.

The A320neos and A321neos are scheduled for delivery between 2019 and 2022. SWISS is yet to determine which engine variant will power the aircraft.

SWISS identified several key criteria that influenced its decision to order A320neo family aircraft. These included a need to replace ageing A320ceo variants, expected reductions in operating costs, and commonality considerations.

"The A320neos and A321neos will primarily be used to replace older A320s and A321s," explains Martin Apsel-von zur Gathen, head of performance management and fleet development at SWISS. "The A319 fleet will gradually be replaced by the CS300 variant of the Bombardier C Series family operated by SWISS subsidiary SWISS Global Air Lines."

"We expect the cash operating cost (COC) of the A320neo to be 3-5% lower than the A320ceo," says Apsel-von zur Gathen. "We expect a fuel burn improvement of about 15%, while like-for-like maintenance costs should remain stable. When the ageing maintenance factor is taken into consideration, however, we expect the maintenance costs of a new A320neo to be 20-30% lower than those for an A320ceo approaching the end of its economic life.

"Commonality was one of the main factors for selecting the A320neo family," says Apsel-von zur Gathen. "Although most of the current A320ceo variants in the SWISS fleet were manufactured in the late 1990s and are approaching the end of their economic life cycles, some are still quite young. By ordering A320neos and A321neos, we can avoid the phase-out costs associated with replacing younger members of the fleet or the complexity costs of operating two aircraft types in parallel.

"In addition, the A320neo family covers a unique capacity range of 130-240 seats," continues Apsel-von zur Gathen. "While the lower end of the scale is well covered by the 737 MAX, there is currently no competition for the A321neo at the upper end. Another factor in our decision to select the A320neo family was the ability to grow the aircraft gauge on certain routes, or to at least maintain it on the level we will achieve with the A320ceo family after the current cabin modifications."

Air Lease Corp

Air Lease Corporation (ALC) is a US-based lessor. ALC orders new aircraft and places them on operating leases with airlines.

ALC's portfolio includes regional, narrowbody and widebody aircraft. Its narrowbody portfolio includes 737-700s, 737-800s, A319s, A320s and A321s.

According to its Q3 financial report for 2015, ALC has more than 250 narrowbody aircraft on order, including A320neo and 737 MAX variants.

"The vast majority of the neo and MAX aircraft we have on order will replace current generation A320 and 737 family aircraft," says Ryan McKenna vice president and head of strategic planning at ALC. "We have seen significant demand for the 737 MAX 8 and A321neo in particular. ALC is the launch customer for the long-range A321. That particular aircraft may take some of the 757 replacement market."

McKenna acknowledges that the fuel burn reductions promised by the A320neo and 737 MAX families play a large part in their appeal to airlines, but also stresses some of their other benefits. "The neo and MAX aircraft offer incremental range advantages over their predecessors. In some cases this might allow for new longer routes to be operated. Alternatively it might allow any existing routes that occasionally suffer from payload restrictions to operate with maximum passenger and cargo allowances. Some of the new models will also offer more seats than their predecessors while the passenger cabin experience will be further refined with new types of seats and on-board connectivity systems," adds McKenna.

McKenna agrees that maintaining commonality with an existing fleet can be an important factor when selecting between the A320neo and 737 MAX families. "The incumbent manufacturer always has a bit of an advantage. We are, however, seeing some airlines make split fleet decisions," adds McKenna. "One example is Korean Air. It has traditionally been a Boeing operator, but has both A320neos and 737 MAXs on order." AC