

Maintenance differences between 737MAX and 320neo

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Abstract. The civil aviation industry in the world has been developing rapidly for some time. However, with the vigorous development of civil aviation, competition between Boeing and Airbus, the world's two largest civilian passenger aircraft manufacturers, has intensified, and new models 737MAX and A320neo have been introduced. Our country will introduce more civil aviation aircraft in the near future, so major airlines began to consider the difference on maintenance between the two types, and consider how to select models and how to determine the number of each type.

1. Introduction

1.1. 737MAX Introduction

The 737MAX is a new 737 aircraft introduced by Boeing. The 737MAX is an upgraded model of the 737NG aircraft. It is also a twin-engine single-aisle aircraft. The 737MAX series aircraft currently includes 737-7, 737-8 and 737-9.

According to the materials provided by Boeing, the listing of 737MAX is shown in figure 1.



Figure 1. The listing of 737MAX.

Compared with 737NG, the 737MAX is mainly improved in the following seven aspects.

1.1.1. Engine. The 737MAX is an optional CFM LEAP-1B engine [1, 2]. It is the latest model of CFM's engine. Compared with the current 737NG aircraft's optional engine, this engine can save 15% of fuel.

A complete set of advanced technologies for engine applications, including carbon fiber composite fan and fan casing, fourth generation three-dimensional pneumatic blade design, twin-ring premixed combustion chamber, high pressure turbine advanced cooling and coating, including ceramic matrix composites and titanium alloys. The advanced material inside. The result was a lightweight, high-performance engine optimized for the 737MAX.

1.1.2. Wingtip winglets [3]. The 737MAX uses a bifurcated, double-feather wingtip winglet. Compared to the wingtip winglets currently used in the 737NG, the wingtip winglets used in the 737MAX are more effective at reducing fuel consumption.

1.1.3. Front landing gear [4, 5]. To ensure the new engine's ground clearance, the 737MAX's nose landing gear has been extended by 8 inches.

1.1.4. Spoiler. The spoiler of the 737MAX aircraft adopts a telex operating system, as shown in figure 2. The maximum opening angle of the spoiler is increased to 60 degrees, which can reduce the requirement for landing length of the aircraft.

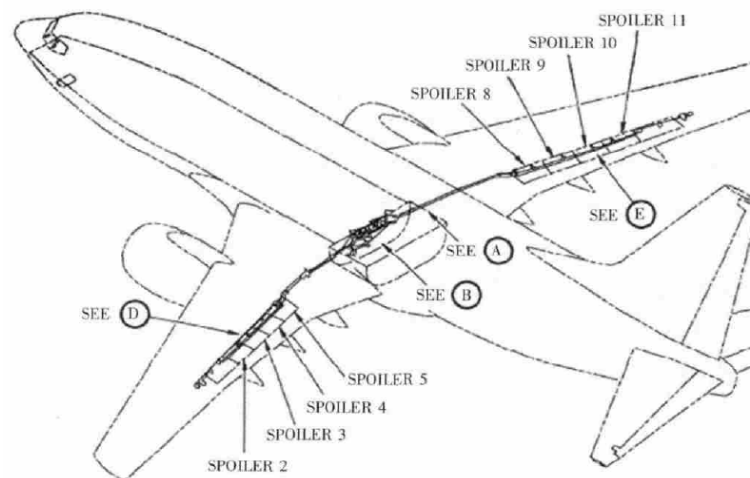


Figure 2. Spoiler of 737MAX.

1.1.5. Bleed air system [6]. The components of the 737NG's bleed air system are pneumatically controlled pneumatic components with poor reliability. The 737MAX has improved the components of the pneumatic system. The electronically controlled bleed air system has greatly improved the reliability of the bleed air system components.

1.1.6. Cockpit. The 737MAX cockpit display selects four new 9 x 12-inch display screens to replace the six 8 x 8-inch screens currently available on the 737NG aircraft. This large display is compatible with the larger cockpit display used in the current 787 aircraft. Similarly, the display has a higher graphic display capability and supports future functional expansion and upgrading.

1.1.7. Tail section. The 737MAX has improved the tail section of the aircraft, with a more streamlined design, better aerodynamic performance, and reduced fuel consumption. The installation of APU bleed air inlet door can further reduce aerodynamic drag and improve aerodynamic performance.

1.2. A320neo Introduction

On the basis of the current A320 series models, Airbus introduced the A320neo series models. The versatility between the A320neo and the existing A320 models is as high as 95%. Compared with the current A320 model, the A320neo has fewer changes, the main improvement in the following three aspects.

1.2.1. More efficient and more fuel efficient. The A320neo uses the more efficient engine CFM LEAP-1A or Pratt & Whitney's PW1100G [7]. Compared to the current A320 CFM56-5B/IAE V2500 engine, the two new engines are more efficient and fuel-efficient.

The fan casing is also made of composite materials. The innovative technology of composite fan blades and casings can help reduce the weight of the aircraft with LEAP engines by approximately 450 kg.

On the other hand, the LEAP engine uses a high-performance core machine, which includes a 10-stage super-high-pressure ratio compressor driven by a secondary high-pressure turbine and a second-generation double-ring premixed cyclone combustion chamber. These are all great help to reduce the fuel consumption of the aircraft.

1.2.2. Wingtip winglets. The A320neo's wingtip winglets use shark fin winglets to replace the current A320-used dart winglets. According to Airbus's data, fuel consumption will be reduced by 4% with shark fin winglets.

1.2.3. New composite materials. The A320neo uses a new type of engine with a larger thrust. However, the bearing parts of the fuselage are not simply thickened and thickened. Instead, many new composite materials are used to make them stronger and lighter.

2. Comparison of two models of data

2.1. Comparison of two model sizes

The basic dimensions [8] of the 737-8 and A320neo aircrafts are shown in table 1.

Table 1. Comparison of two model sizes.

Model	Body length	Aircraft height	Span	The maximum width of the cross section of the fuselage
737-8	39.52 meters	12.54 meters	35.92 meters	3.76 meters
A320neo	37.57 meters	11.75 meters	35.48 meters	3.95 meters

It can be seen that in terms of size, the 737-8 is 2 meters longer than the A320neo and can have more rows of seats, but the A320neo's body is wider than the 737MAX, which means better passenger comfort and a faster cabin service.

2.2. Comparison of the weight of the two models

The weights [8] of the 737-8 and A320neo are shown in Table 2.

Table 2. Comparison of the weight of the two models.

Model	Aircraft operation weight(OEW)	Maximum take-off weight(MTOW)
737-8	45,560 kg	82,190 kg
A320neo	45,888 kg	78,997 kg

Compared to the 737-8 and A320neo, the 737-8 is 328 kg lighter than the A320neo, but the 737-8's maximum takeoff weight is 3193 kg heavier than the A320neo.

2.3. Comparison of the number of seats in two models

Based on the actual cabin size of the 737-8 and A320neo, with the same two-cabin layout and the same seat spacing, the number of seats for the 737-8 is 170 and the number of seats for the A320neo is 157, a ratio of 737-8. The A320neo has 13 more seats.

Also worth mentioning is that the B737MAX uses Boeing's "sky interior." This design stems from the research results of the B787 dream-liner interior.

The interior of the cabin has a more visually large porthole and a customized LED lighting system. The inside of the cabin is beautifully curved and can create a more comfortable and relaxing environment for passengers.

The aircraft has a larger volume of shaft-mounted overhead luggage compartments, which has a 1.6-fold increase in volume compared to conventional designs, and can reduce the oppression of passengers' heads and enhance the ride experience.

3. Comparison of two types of maintenance

The 737MAX and A320neo were compared from maintenance proposal and aviation materials.

3.1. Maintenance proposal

For security and economic considerations, Airbus MPD and Boeing MPD continue to use MSG-3's analysis logic to tie up the airworthiness restrictions and require the development of planned maintenance projects for related models. IP44 is used to optimize the solution later in the process. Both have cancelled the letter check.

Due to the slightly different requirements of EASA and FAA regulations and the two companies adopting different document publishing systems, the two companies differ in the details of the MPD.

The Airbus-related MPD rules and descriptions in all aspects are more detailed and operable, and are suitable for inexperienced operators to purchase. Airbus MPD has relatively loose structural project intervals and sampling requirements. The requirements for production arrangements are relatively high.

3.2. Aviation materials

According to the estimates of the airline's aviation materials department, the introduction of an 737MAX aircraft requires an additional 1.2 million U.S. dollars in the purchase of aviation materials.

According to data provided by Airbus, the introduction of an A320neo aircraft requires an acquisition cost of approximately 1.5 million U.S. aviation materials. It can be seen from the perspective of aviation materials that the 737MAX saves about US\$300,000 per aircraft compared to the A320neo.

4. Conclusion

At present, many airlines have established more efficient maintenance engineering systems, including reliability management, project management, quality management, production planning and training management, as well as independent maintenance capabilities from line maintenance to C inspection and D inspection.

However, due to the differences between Airbus aircraft and Boeing aircraft, especially the differences in plant facilities, tools and equipment, personnel, technical documents, aviation materials and training configurations, as well as differences in maintenance systems and procedures, as a result, airlines have to consider more about their own situation when making aircraft model selections.

Behind the 737MAX and the A320neo, the competition between the two aircraft is not only the competition between the two aircraft, but also the competition between their respective technologies, and even the competition between the two aircraft manufacturers. The bottom line is that the sources of these competitions are the highly similar market forecasts of the two manufacturers and their accurate grasp of the market. It is foreseeable that such healthy competition will continue and continue to promote scientific and technological progress and technological innovation until new models or improved models are available.

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