

Design Features of Modern A320PEO Aircraft

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ABSTRACT

This article discusses the design features of modern Airbus Industry A320neo aircraft, and is the study of the mechanism, directions on the patterns of the impact of new technologies on the emergence and development of a class of long-haul passenger aircraft.

KEYWORDS: sidesticks, sharklets, hydraulics, monoplane, composite materials, slats, flaps, spars, comfort, safety

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Relevance of the topic: The current state of the aviation industry, which is experiencing difficulties around the world. The reason for these problems is, on the one hand, the current unstable situation in the air transportation market, and, on the other hand, the objective technical capabilities of aircraft manufacturers, primarily aircraft, which have already come close to the speed of sound in terms of flight speed. Crossing this threshold, as the experience of building the Tu-144 and «Concorde» has shown, is economically unprofitable. The way out of this situation is the introduction of cost-effective and new technologies that can ensure further growth in the competitiveness of air transport, as well as a stable economic position of the aviation industry, which is an important social task.

The first passenger aircraft began to be used massively from the beginning of the 20th century. They were small and carried no more than 15 passengers at a time. Over time, aviation has developed more and more, aircraft began to be produced in many countries of the world. In the last century, their models were evaluated solely in terms of passenger and cargo capacity, as well as flight range.

Air transport is now going through a difficult stage in its development of long-haul passenger aircraft based on the introduction of a whole range of new technologies into production. The vast majority of passenger aircraft types currently in service were developed back in the 1960s and 1970s and no longer meet current noise and engine emission regulations. However, none of the existing design bureaus or aircraft manufacturing enterprises have the financial ability to independently, without state support, develop and implement new models of passenger aircraft. Under such conditions, the world experience in the construction of new types of aircraft, in particular long-haul passenger aircraft, is especially valuable, which will help to avoid mistakes and ensure savings in material costs.

At present, more requirements are imposed on manufacturers - the aircraft must be economical in terms of fuel consumption and have a very low noise level. In modern conditions, these requirements are very important, and manufacturing companies around the world are obliged to take them into account.

Designs of modern aircraft by Airbus Industry, this company has recently been actively developing the production of aircraft of the 320 series, new special modifications are being developed on their basis.

The founder of all new aircraft was the A320 type. It is a twin-engine vehicle, which has a central passage that leads to the cockpit. For boarding passengers, there are 4 entrances and 4 additional exits in an emergency. The airliner can accommodate 180 passengers in two classes.

In January 2001, Airbus Industrie went from essentially a merger of several companies into one integrated private company. In it, the French, German and Spanish parts are combined into the EADS concern (European Aeronautic Defense and Space Company), which owns 80% of the shares, and BAE System, the heir to British Aerospace, owns 20% of the shares.

Now AIRBUS, as a private company under French law, is called AIRBUS S.A.S (the last three letters mean "simplified joint stock company").

Design features of the Airbus A320 neo.

Modernization of the A320 airliner - engineers and designers of Airbus Corporation are improving this aircraft, which was given the name: "A320neo".

The New Engine Option program is the latest step in the A320 upgrade. The modernization program "Neo" includes such improvements as: weight reduction, a modern interior with an extended luggage compartment. The new airframe will be made using new composite materials: plastic reinforced with fiberglass and carbon fiber. Honeycomb filler is also used.

Airbus A320 neo is an improved model with a fundamentally new category of engines. The abbreviation "NEO" stands for "New Engine Option". Installing large (more than 2 meters in diameter) LEAP-1A or PW1100G motors on the aircraft contributes to the following changes:

- reduction of kerosene consumption by 15 - 17%
- reduction of operating costs by 8 - 10%
- reduction of harmful emissions into the natural atmosphere by more than 10%
- lowering the noise level
- increase in flight range by 960 kilometers
- increase in carrying capacity by 2000 kilograms

"A320neo" differs from the aircraft of the previous A320 family simply by huge engines. They are impossible not to notice even from afar.

The flight range has also been increased: now the covered distance can be more than 5 thousand kilometers!

The cabin of the aircraft is equipped taking into account the convenience of passengers: a wide step between the seats, individual screens for entertainment, communication systems and Wi-Fi, an advanced air conditioning system that guarantees fresh air. On March 1, 2019, the first airliner of this class was solemnly welcomed at the Tashkent International Airport.

Compared to previous A320 models, the new A320neo will produce less noise and emissions. The wing of the aircraft will also undergo modifications, in particular the wingtips, which now, according to the standard, will have the shape of a shark fin, the so-called "sharklets". This modification of the wing reduces fuel consumption by 2-3 percent. Thanks to innovations, it will be possible to increase the flight range by 950 km and increase the carrying capacity.

The main part of the mechanization of the wings is made of heterogeneous artificial materials. These are spoiler panels, nose cone, slats, flaps and more.

The wingtip starts where the wing spars end and is typically a hollow monocoque/semi-monocoque structure containing the navigation light(s) and often static discharges (lightning bolts). The keel and stabilizer tips have a similar design.

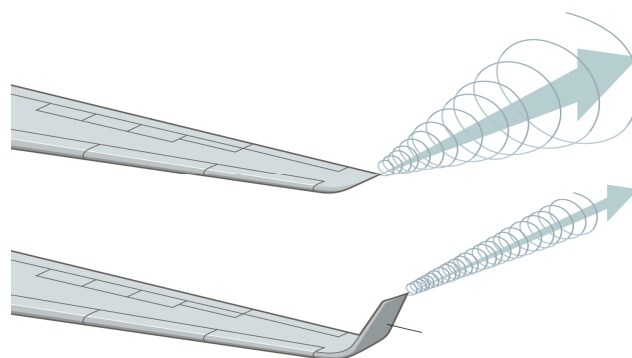


Fig.1. Wingtips sharklets.

Aerodynamic sharklets are installed on the wingtips - small additional elements at the ends of the aircraft wing planes in the form of wings (Fig.1), which serve to increase the effective span of the wing, reducing the inductive drag created by the vortex breaking off the end of the wing and, as a result, increasing the lift at the end of the wing. They also allow you to increase the elongation of the wing, almost without changing its span. Winglets increase the fuel efficiency of aircraft or the range of gliders. Currently, the same types of aircraft can have different ending options. For example, sharklets raise the tip of the wing up.

The lifting force of the wing is formed due to the difference in pressure under the wing and above the wing. Due to the pressure difference, part of the air

flows over the edge of the wing from the area of high pressure from below to the area of low pressure from above, thus forming a tip vortex. The energy of motion is spent on the formation of a vortex, which leads to the appearance of an inductive resistance force.

The tip vortex also leads to a redistribution of lift along the span of the wing, reducing its effective area and elongation, and reducing the lift-to-drag ratio. The installation of aerodynamic winglets helps to achieve the optimal shape of the lift force distribution.

The disadvantages of using wingtips are a significant increase in the effect of wind on the aircraft during takeoff and landing, as well as more severe turbulence when flying in a turbulent atmosphere.

The main characteristics of the aircraft Airbus A320neo

Dimensions:

- Length (m) 37.6
- Scope wings (m) 35.8
- Height (m) 11.8
- Square wings (kv.) 122.4

The weight:

- Max. takeoff weight (kg) 73 500 - 78 000
- Max. landing weight (kg) 64 500 - 66 000
- Max. weight without fuel (kg) 62 800 - 64 300
- Max. commercial loading (kg) 16 600
- Fuel tank capacity (l) 23 760 - 26 750

Flight data:

- Flight range with max. Loading (km)
- 6 850
- Max. cruising speed (km/ch) 830
- Max speed (km/ch) 890
- Ceiling (max. flight altitude) (m) 11 900
- Engines CFMI Leap-1A 2 x 12300 kgf
- PW1100G-JM2x 12300 kgf

Passenger cabin:

- Number of seats (economy) 180
- Number of seats (economy / business) 150
- Cabin length (m) 27.5
- Cabin width (m) 3.7

Airbus A-320 and A320 neo layout

Many factories in Europe are engaged in the manufacture of parts at the same time. The final assembly of the finished machine was carried out only in the city of Toulouse, but since 2008, due to the great demand for these airliners, it was necessary to deploy the assembly in the city of Hamburg. In order to increase the speed of production, it was decided in 2011 to start building aircraft in China.

This enterprise has a sufficiently powerful base, which allows the production of 4 liners every month.

The plant in Hamburg is currently considered the most powerful and advanced in manufacturing. It is located near the Elbe River, where there is a huge area with assembly hangars and buildings for engineers and designers. To ensure high-quality and successful work, this plant has 19 thousand employees.

The main components are produced by a separate country. So, the tail section of the machines is produced in Hamburg or Bremen, the nose section is made by Spanish designers. Housing components are produced simultaneously by France and Germany. And the UK is engaged in the production of wings for aircraft.

In the bow of the aircraft, the most calm flight. This part is located far from the engines (Fig. 2), so there is the least noise and chatter here.

The middle part of the plane is quite comfortable. Little felt turbulence, moderate engine noise. Rows 8-15 are located above the wings, which guarantees a limited view from the porthole.

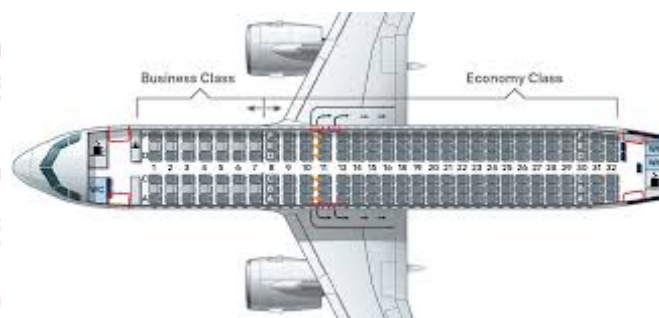


Fig.2. Scheme interior Airbus A320 neo

The last row is adjacent to the common economy class cabin. As for him, these are seats from the 6th to the 25th row. Everything is pretty monotonous here, although there are also improved seats purchased for an additional fee. However, for them, the passenger must meet certain requirements of the company.

Tail section – the most inconvenient and most secure part. According to statistics, passengers flying in this part of the aircraft survive more accidents than other passengers.

Airbus A320 and A320neo cockpit - instead of the helm, the captain and co-pilot of the Airbus A320 use sidesticks. At the same time, a crew member, before taking control, warns: "I have controls", and presses the orange button. After that, only his sidestick works.

Pilot seats - ergonomic, they are regulated not only on the principle of "closer - farther". Pilots set the position of the backrest and its height in order to sit

with maximum comfort. The design of the chairs is thought out to the details: you will not see sharp protruding corners. Also in the cockpit there is a retractable table, oxygen masks for pilots, a fire extinguisher and even a glove compartment for documents.

Have you thought about whether it is convenient for the pilot to control the aircraft with his left hand?

Flight safety – this is a set of properties of the aviation system that characterizes its ability to function (fly) without accidents.

In practice, along with the phrase "flight safety", the term "flight safety level" is often used. These are similar, one ordinal, but not identical concepts. If "safety" is usually considered as a characteristic or indicator, which allows you to express the relevant properties of the aviation system, then the "level of safety" is a value that determines the quantitative or qualitative value of this indicator. Therefore, the level of flight safety should be considered, first of all, as a quantitative characteristic of the aviation system, expressing its ability to function (fly) without accidents.

This question is quite difficult to answer even for experts in the field of aircraft engineering. After all, it is impossible to compare two aircraft of different classes. In this case, the results will be biased and cannot be taken into account as official data.

If you believe the statistics, then we can say that Airbuses crash much less often than Boeings. But does this say anything about their safety? Engineers say no. In order to conduct a comparative analysis of the reliability and safety of aircraft, it is necessary to take two airliners of the same class and determine the evaluation criteria. Surprisingly, with this approach, it will not be possible to identify the winner. For example, Boeings have more conveniently located emergency exits, while Airbuses have an automatic system that prevents pilots from completely taking over control.

According to official data, 26 serious accidents and disasters occurred during the entire period of operation of the Airbus Industry A320. In most cases, according to the results of investigations, the human factor was the cause of the plane crash - incorrect actions of the pilots and crew led to tragic consequences.

Cases of rough are mentioned in these cases, there are no victims, but the aircraft is not subject to further operation. The largest accident associated with the Airbus Industry A320 is considered to have occurred in 2007 in Sao Paulo - a TAM airline aircraft rolled

out of a wet runway, crashed into an airport fuel depot and caught fire. There were 199 people on board the plane, there were no survivors.

One of the most popular modes of transport, especially when traveling long distances, is by air. Traveling by plane is fast compared to land transport, highly comfortable and safe. Despite the information about tragedies and plane crashes, according to statistics, the flight is the safest way to travel.

If we compare the frequency of air crashes and road accidents, it becomes clear that the plane is still much more reliable.

Findings: The first generation of long-haul passenger aircraft was severely affected by the unfavorable economic situation of the mid-1970s, resulting in a new second generation of long-haul wide-body passenger aircraft in the early 1980s. It was characterized by the use of new technologies in the field of aerodynamics (a rear-loaded wing, VZK, a stabilizer with a variable installation angle) and the use of CM for the manufacture of aircraft airframe elements (glass-, boron- and carbon-fiber plastics).

The appearance of the third generation of long-range wide-body passenger aircraft was caused, on the one hand, by the increased impact of the economic factor on civil aviation (steady growth in the air transportation market in the 1980s), on the other hand, the introduction of a number of new technologies into production, the most important of which were concentrated in the field of computer technology, which began to be used at all stages of the life cycle of long-haul passenger aircraft from aircraft design to its maintenance (high-level CAD, EDSU, digital on-board navigation and control systems, CALS-technologies).

The result of the introduction of these "critical technologies" was a significant increase in the performance of long-haul passenger aircraft of the third generation compared to the second.

AIRBUS S.A.S. is successfully developing and quite successfully competing with the Americans. Aircraft A320, which successfully compete with the B-737. Both of these models have many modifications. Entire families of such machines have already been formed. But the interesting thing is that although the Boeings are close in parameters to the A320s, they are not officially called the Airbus.

Specialists of both companies monitor their ratings very zealously. They are ready to talk for hours about how the «Boeing» differs from the «Airbus», and extol their own models of aircraft. But dry statistics speaks for itself - «Airbuses» were able to occupy

their niche in the world market, and their share is fifty and a half percent. And on the account of «Boeings» a different share - forty-nine and a half percent.

All of the above about the Airbus A320, we get a good medium and short range aircraft. The interior is comfortable and has a number of significant advantages over competitors. The design itself and the electronic filling are still successfully modernized and meet the latest requirements of technical progress. Economy and low engine noise level make it more profitable to use.

Based on the above data, we can say with confidence that airlines prefer to buy «Airbuses» for themselves. However, the difference in percentage between the two leaders is not too great, so the «Boeing» company has every chance to become more popular and attractive in the world market.

REFERENCES:

- [1] Sheinin V.M., Makarov V.M. The role of modifications in the development of aviation technology, M., 1982. 223 p.
- [2] The highest level of achievement in the European aircraft industry. A single family of airliners. // Airbus Industry, 1997.

- [3] Udalov K.G., Komissarov D.S. Boeing 767, M., 1994. 58 p.
- [4] Selikhov A.F. The main tasks and characteristic features of ensuring the strength of wide-body passenger aircraft // Durability of aircraft structures. - M.: Mashinostroenie, 1982.
- [5] V.K. Grechikha "Organization of flight work and ensuring flight safety" M., 1984.3s.
- [6] Aviation guide on Avia.ru. A320-110 Passenger aircraft for short and medium haul airlines

Internet:

- [1] Airliners.net. Airbus A320
- [2] www.airlines-infrom.ru
- [3] aircraft.airbus.com
- [4] [lex.uz.ru.docs](http://lex.uz.ru/docs)
- [5] uzairways.online/
- [6] avia.tutu.ru/plane/
- [7] avia.pro/blog/

