importance due to a widespread tendency to use foreign equipment, which has special requirements for its operation.

Serial production of large-scale models of the Fokker Dr.1aircraft as well as the possibility of its testing for aerodynamics in a wind tunnel can be carried out by Antonov State Company.

Scientific supervisor: Shulga T.V.,
Senior Lecturer

UDC 004 94..629.7 (043.2)

Tkachuk E.O.
National Aviation University, Kyiv

3D PRINTING IN AVIATION

Industrial 3D printing methodology as a unique production tool is used to create narrowly focused products, for example, implants in medicine and plastic prototypes of something. In the aerospace sphere mass "printing" of aircraft engine parts from metal alloys is an important stage of this technology.

GENERAL ELECTRIC became the industry pioneer. The manufacturer of aircraft engines drew attention to the fact that the use of different alloys in the parts significantly improved their physical and technical properties and made it possible to bring aircraft performance to a fundamentally new level. The traditional method of casting does not allow to combine different materials within the same technological process, while 3D printer for metal makes it possible to make a part from a single piece of material, saving time and money. GE used 3D printed nozzles in a new engine for improving the injectors. Experimental nozzles were certified in 2016. And now the cost of orders is reported to have reached $ 22 billion. The manufacturer intends to produce 25,000 parts per year made by three-dimensional printing technology.

AIRBUS, the European leader in the field of aviation, was one of the first companies to take a responsible step in implementing 3D printing**.** It was here that the first experiments were carried out with the manufacture of exclusively 3D-printed components for aircraft, and the introduction of 3D technologies at the industrial level was welcomed. It is thanks to Airbus 3D printer in aviation is no longer a dream but a full-fledged reality. Some 3D printing elements are already used in selected Airbus models, among them A320neo and A350 XWB. The company announced the inclusion of components printed on a 3D printer into the serial production of A350 XWB aircraft capable of carrying from 266 to 280 passengers, the fuselage and wing designs of which are made of a carbon fiber reinforced polymer. As for the details for which the 3D printer was used in aviation, it is a titanium bracket built into the suspension assembly. 3D printing is designed to facilitate aircraft building by optimizing the geometry of components, the use of composite materials in manufacturing aircraft parts, lower consumption of material for additive production, which reduces costs enabling aircraft to save fuel and eliminate waste of material. In this case, a powder of chromium and cobalt is used. The computer controls the laser, which melts it in the indicated places, creating layers 20 microns thick. This method is faster than manual

welding, since the device can work round the clock. In the scientific laboratory Airbus went even further. Engineers from Hamburg have created an unmanned aerial vehicle, printed on a 3D printer with almost all the elements of the body, except the remote control module and electronic propellers, printed on a 3D printer. The four-meter drone called "Thor" successfully crossed a 40 kilometer route from Hamburg to Stade, where it landed at the company's plant. The project is of an experimental nature. It will test different designs of fuselage framework, wing shape and other body elements. On the basis of the "Thor" a solid body plane will be made close to the serial models.

A line of Aneto gas turbine engines presented by **Safran Helicopter Engines** in 2017 is a compact power unit with inlet guide vanes and a rotating combustion chamber made by the 3D printing method which is 30% more powerful than the units of similar dimensions. At the same time, the device remains reliable and economical. The machine has flown 25 hours, lifting the machine to the air 35 times and – no problems found!

PROSPECTS OF 3D PRINTING IN AVIATION Airbus developers intend to switch eventually to the additive production of at least half of the components in future aircraft. Future aircraft themselves will undergo not only in the structural innovations, but changes in the interior as well. The next item expected by Airbus are the cabin brackets and aircraft air pressure receivers being currently at the testing stage. According to Airbus' plans, optimization through 3D technologies will touch every aircraft element so as to obtain light, spacious and technologically advanced aircraft.

Of course, the implementation of these plans will take decades. However, it's nice to realize that the company is confidently moving towards this goal. Today, 3D printing is actively used in aviation to implement projects that, without 3D technologies, would never leave the framework of just a concept. The abandonment of casting and machining technologies will open up incredible opportunities for aircraft designers. With equipment working on additive technology, it is possible to create other new forms paying no attention to production limitations.

Scientific supervisor: Akmaldinova O.M.,
PhD (Philology), Professor, Head of the Department

UDC 005.334.2 (043.2)

Tselitan Y.M.
National Aviation University, Kyiv

CONFLICT MANAGEMENT IN TEAMWORK

The ability of effective resolving and preventing production or labor conflicts is a professional competence for a manager. In advanced companies, the ability to solve constructive conflict appears among corporate values.

Conflict situations are inseparable in the workflow. Conflicts are usually arisen because of differences in views and priorities, lack of recognition or promotion, feelings of insecurity or breakdowns in communication. All these factors lead to the loss of confidence and productivity inside the team.

In order to avoid the negative consequences of such discrepancies, there is a great