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Innovation Hybrid Electric Air Transport Projection

Ponyaev L. P. [α], Kuprikov M. Yu. [σ], Kuprikov N. M. [ρ] & Domjan R. [ω]

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I. Introduction

The Future Strategy of Modern Airlines after the Global influence of negative COVID deformation to Safe Health Air Transportation will be focus to the New Green Technologies. The New Vision to more Electrical Aircraft & Airship are forwarding as more priority to use low toxic/noise Hybrid Energy Electric Powers and Adapting low noise Eco Systems.

The Civil Aviation Science Research Programs in Europe and Worldwide have the goals to find the Optimal new Integrate Aerodynamic Geometry and Shape Frames of Grows of any International Long Range for Economy Efficiency of Small Regional and Large Inter Continental Vehicles.

Therefore new Aircraft & Airship Projects for International Air Transportation will be priority focusing as to the more Ecology Low Toxic Engines as to Hybrid Electrical Power System for decrease Noise/Sound Level in Sky and near Airports areas. The main High Tech targets are minimizing influence of the future 'Renovation' Airline Operations to World Nature and Protection of our Ecosystem. The famous Aircraft Conceptions and Dialectical Contradiction between the constantly improving new types of future Aircraft Design Methods and the continuously aging Big Hub Airport Infrastructure arose from the very first days of the advent of Aviation and it is of a fundamental Air Industry, Airlines Facilitation and infrastructure complex (7, 8, 9, 10, 19).

The main CAD/CAM/CAE and Life Circle High Tech are request concrete International R&D Design Strategy for a certain class of Aircraft, one can distinguish a group of limitations that are conceptual in Nature and have a priority influence on the generating process of evolutional Aircraft Conceptual Design (ACD).

Integrate Disk-Wing Concepts are the best aerodynamic stability on high angle of attack and more safety efficiency for Aircraft Structure. Digital Complex Criteria Analysis of the find General Optimal Construction of the Large Hybrid Electrical Aircraft and Airship for decrease of Sound &Noise Pressure Level inside and outside the Cabin and Passenger Saloon are very actually today for Globally High Tech Ecology Program.

The Analysis of Aviation Practice of any Companies confirm that the Digital AI Methods of the Large Disc-Wing Aircraft layout from the virtual mass center is given, which allows us to obtain the Aircraft layout from the actual resource conditions of Infrastructural Top Efficiency Constraints in the terminal configurations of the Modern Air Transportation Infrastructure and International ICAO & IATA Regulation.

II. New Green Innovation Geometry and Digital Complex Method

The Universal Digital Method is proposed for the Synthesis of New Innovation Solutions for Large Hybrid Aircraft (LHA) with Integrate Disc-Wing Body E-Aircraft conceptions of Passenger High Comfort compartment and may be use to any Disc Shaped Rigid-Elastic Solar E-Airship Projections future.

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A significant impact on the satisfaction of Infrastructure Requirements is provided by structural and layout solutions. The ACD taking into account the infrastructure requirements, will allow them to be taken into account in the early Stages of Aircraft Design (2, 5, 6). The solution of the problem of the ACD as a problem of mathematical Digital Modeling Software (12, 13) by CATIA5 of CAD/M/E System does not always lead to success because of the considerable dimensionality of the vector of constructive parameters X*, the complexity of the set of constraints U, as well as the large time required to compute the objective Optimal Function Vector. The main Design Decomposition Methods of the vector dynamic system of target functions, project parameters and constraints is very important. This circumstance is connected with the fact that the layout of the Aircraft is the result of Compromise Solution of Digital Design tasks, which is typical for new R&D Optimal Versions and Patenting ACD of the Future Ecology Regional and Cross Continental Air Transportation.

The results in LAB MAI as the Geometrical representation of the LHA concepts with the large Passenger or Cargo capacity made with a Drop-Shaped Body with view of the new Flying-V Lift Fuselage by TU Delft R&D in the Aerodynamic balancing Geometry of Wing Body Scheme is given (14). The Swiss SOLARSTRATOS High Altitude Aircraft as Natural Arctic Low Zero Temperature Long Time conditions for New Russian-Canadian TRANSPOLAR Airlines and test result by Russian Test Flights by TRANSAERO Airlines are using to correct Big Data Stress Analysis of any Geometry Constructions with Damping E-Active Systems for Calculation Software Projections results and Technology recommendation.

The Engineering Design Results may be use as recommendations to new Geometry Optimal Projections of the Integral Disc-Wing Plane LHA and Lighter-then-Air (LTA) Vehicles as Thermoplane MAI (17) with nano film soft cover of the Swiss-China Solar Electro Accumulators Systems will be more innovation projections for E-Air Transport Solar Battery Security with reduce Noise & Toxic Level. The advantages of Digital E-Aircrafts and E-Airship projects according to the Flying Wing Scheme in relation to other schemes rise with the increase in the Dimension and Optimal Weight of the Aircraft. So, the greater value of the target load and the Air Transport Flight range is the better application of this new Integrate Wing Drop Body Aircraft and Disc Airship Schemes.

III. Methods and Features of the Layout Limiting Space for Minimize Sound and Toxic Level

Complex Analysis of any Optimal Aircraft Structure of the New Modern Aircraft are basing on the main Complex Minimax Data. The identification of the layout Limiting Space and Noise Level around/inside Large Aircraft (13) as the decomposition according to the characteristic features and the identification of a critical factor for the Long-Haul Aircraft (LHA) innovation Design projects as see at Figure 1, 2 and 3 (3, 4, 15, 16):

- Rhombus Wing low vibration frame with Ellipse Body concept;
- Bi Body low vibration structure concept;
- Delta Wing Body E-Aircraft concept;
- Fly Multi Body Airship as 3-Di T-117 projection concept.

Figure 1: New 4 Innovation Green Versions of LHA Aircraft and Airship

If we consider the whole issue, from the point of view of the 3D Volume-Weight-Drag Configuration, the optimal solution will be an Aircraft for which the external contour was obtained as a result of positioning of individual aggregates taking into account the criticality of the layout both with respect to the three axes coordinates and in three planes, and for any arbitrary radius-vector, starting from the center of mass of the Aircraft and quasi center of Noise/Sound area of Engines.

Figure 2: Any 6 Innovation Concepts of Disc-Rhombus Wing, Delta Bodies and 'Canard' Concepts of LHA Aircraft

A characteristic feature of the layout with "hard" dimensional constraints is the possibility of carrying out

spatial coupling of many units in the first iteration, which allows us to build layout from a certain virtual center. It is convenient to choose the origin of the associated coordinate system, which coincides with the real center of mass of the Aircraft. Therefore, the layout problem is reduced to the location and interconnection of units in the layout space due to infrastructure constraints from the condition of bringing the real center of mass (RCM) to the virtual mass center (VMC) and providing characteristic features for Aircraft Design LAB MAI SW, as show on Figure 4, that satisfy both infrastructure requirements and others, for example, Aerodynamic efficiency (2, 12).

Figure 3: Vision of 4 Concepts with Disc, Delta and Elliptical Bodies of LHA Aircraft

In Figure 4 shows a three-dimensional image of the layout inside 3D Airspace for the LHA, obtained from the results of the structural-parametric analysis of Airport terminal configurations, the Comp-Digital Method of Aircraft Design parking and taking into account the Aircraft height limitations from the condition of PAX ability to the parking shelter Gate (23 m). Of course, in this case, the issues of antennas and equipment layout at the top of the surface are taken into account.

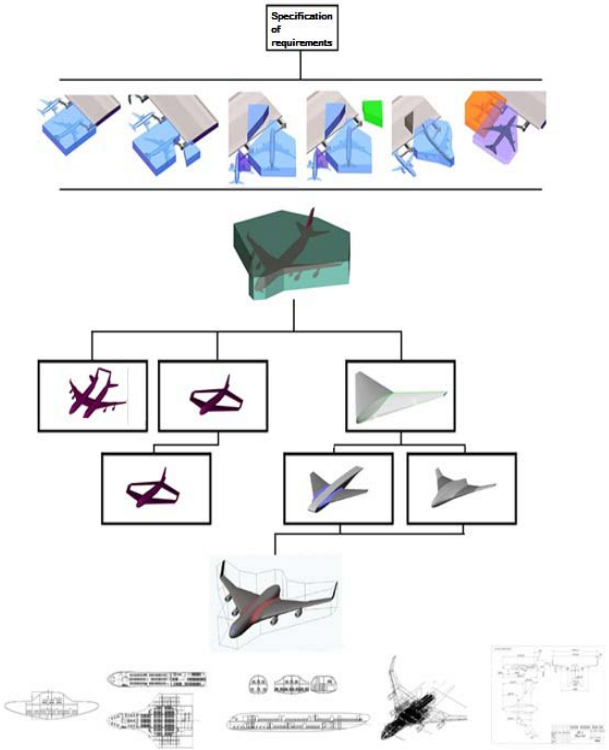

Figure 4: Influence of infrastructure restrictions on the any Geometric Shape of the Long-Haul Aircraft Scheme

The second level shows conditionally the range of permissible placement of passenger decks of the LHA. Their layout is determined by the dimensioning height (3.8 m), the length (20-25 m, and in prospect – 40-50 m) and the Limiting deviation angles in the vertical plane (10%) of the terminal slot hand-bridges.

We make a comparative analysis of the Aircraft as the basis of the Flying Wing Scheme, Bi Fuselage and the Normal Scheme. As a base, the passenger compartment of the LHA (comp-digital first iteration) was adopted. The second comp-digital iteration is the wing and fuselage. Third iteration is the wing, fuselage and tail. And the fourth comp-digital iteration is the whole composition of the aircraft aggregates, which corresponds to the complete washable surface (taking into account the engine nacelles).

And so, the specific Volume per passenger (average in all cabins) was 2.485 m^3, which is 1.17 times worse than for the base Aircraft (as Normal Aerodynamic Scheme), but its 1.30 times better than for the Aircraft in the Lifting Fuselage Scheme, and 2% better than for the Aircraft with a Triplane Scheme with an articulated wing.

The developed Method of the Aircraft layout from the layout inside Airspace made it possible to obtain the Aircraft layout that meets all infrastructure requirements, with take-off mass of 30-40 tons less than that of the Prototypes.

IV. The Dimension of Integral Long-Haul Aircraft and Weight/Drag Reduction

Within the framework of the Research work at the Design LAB MAI, a Comp-Digital Structural-parametric Analysis of alternative layouts of the Long-Haul Aircraft with large passenger capacity was carried out. The analysis shows the advantages of the layout carried out according to the above Method (LHA-5 Flying Wing Scheme) in relation to other non-traditional Schemes and a minor loss to the base Aircraft. At the third level, the Geometric shape of the layout inside Airspace is revealed as a result of the structural-parametric analysis of the LHA infrastructure constraints. Further, there are many ways again, but we must take one of the World Patenting hypotheses:

- Circumferential fuselage,
- Twin-fuselage scheme,
- Flying wing
- Drop-shaped fuselage, etc.

Some alternatives are graphically represented at the fourth level as results of R&D on the MAI Aircraft Engineering Graphic & Comp-Modelling Department may be introduce of the Figure 4. But let's analyze it. At the first stage, we determine the required volume for placing one passenger.

Traditionally, the layout of the passenger compartment of the LHA is realized from the cross section, which is replicated in length as a model, taking into account the nuances of kitchens, wardrobes, toilets, etc. However, the excess pressure causes a circular cross section.

$$\mathbf{V_1 = SH + V_{diff.}} = \mathbf{0}.93 * 2.1 = 1.953\text{m}^3$$

Figure 5: Change of Geometric shapes of the Cylindrical Shaped fuselage from excess pressure with any Integrate Wing Body and Hybrid E-Power Innovation

The fuselage, made in a cylindrical shape and having a circular cross-section, has a minimal mass. On the Figure 5 show a change in the Geometric shapes of the cross section of the cylindrical-shaped fuselage from the influence of excess pressure is given. In order for the section to keep the shape in the beam fuselage structure in the frame, in addition to the longitudinal force elements, the formers are installed, as transverse power elements.

Choosing a variant of the E-Aircraft concept with an Integral Fuselage-Wing and distributed along the trailing edge of Multi Small Electric Fans can create a synergistic effect to increase the resulting Super Circulation and accordingly the carrying capacity of the Aircraft like Jet Blowing Systems.

At the second stage, the number of passengers is taken from the specification of requirements, which multiplied by the volume of one passenger allows us to determine the Minimum required Volume of the Aircraft. If the volume is known, then the minimum area of the washable surface has a body equivalent to the Sphere, see Figure 6.

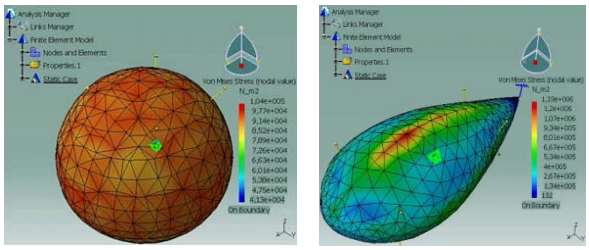

Figure 6: A Sphere and Integral Pressure Schemes Vision equivalent to the fuselage 3D Volume of the long-haul Aircraft

Excess Optimal pressure of Weight and Sound Loads, which suppresses the shell from the inside, gives a uniform distribution of the stress-strain state. However, for a flight in the Atmosphere, the Spherical shape is not suitable. The Geometric shape for subsonic flight should be stretched and be more like an Aerodynamic profile.

Performing the Geometric operations of affine extension-compression with an equivalent Sphere in 3D Volume, we obtain the Disk, see Figure 6. The structural-parametric analysis of the stress-strain state shows a pronounced anomalous zone. For its compensation, a power element connecting the two poles is needed.

V. The Perspective Disc Shaped Geometry for Minimum Structure Vibration Loads

The Aerodynamics of Discs Shaped of Dirigible was use for Innovation Projection in MAI. It's the MAI Light-then-Air (LTA) Disc Shaped THERMOPLANE (Figure 7) is the unique and patented Project supported by President of Russia or other version as Ellipse Body ATLANT Projects may be MAI self new initiative with the Laminar Flow Control and Solar Battery Nano Film Upper Surface System as used now and show on Figure 8 for more Electrical Skyships PAX & Cargo Transportation for Flight and Rescue Operation with

complete the LHA as High Ecology Air Transport Aircraft & Airship conceptions to Future Mobility Development (17, 18).

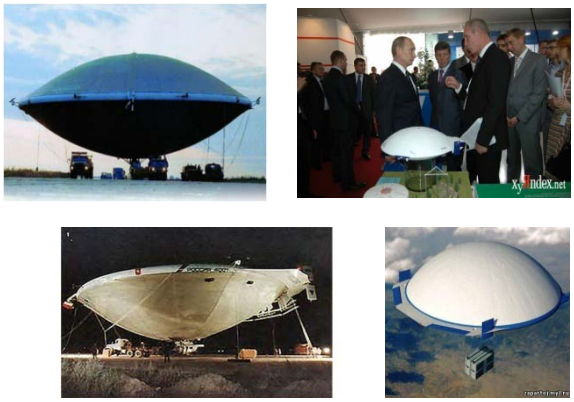

Figure 7: The patented Disc Shaped LTA THERMOPLANE ALA-40 Project by MAI

The LTA are oriented to a long time flight, so a high priority in the formation of the washable surface is a High Aerodynamic Quality. And it is the higher, the lower the resistance and the greater the bearing capacity is. The Drop Shape of the bearing fuselage and the washable surface of the LHA Aircraft made according to the more efficiency Integral Formation with minimum Vibration and Noise/Sound Interferences as minimum influence to the World Ecology.

Figure 8: The Solar Batteries Small Swiss Aircraft and Thales Alenia Airship

Inside the disk-shaped LTA, you can easily form at least three vertical confusers with wide pipes on the upper surface and narrowing confusers at the outlet – a rotary nozzle system with control of the thrust vector from the vertical to the horizontal component of the LTA cruising thrust, which will provide a significant recharge of the power generator systems through the turbine and built-in power storage, reducing the level of vibration and noise inside and outside the LTA.

Super Vortex or Tornado Turbo Energy Technologies (Tornado Like Jet Technologies - TLJT), allow you to increase the power of the generated flow, accelerate the flow of solid medium flowing in and out of the nozzle, concentrate and significantly increase the speed, almost without additional hydraulic losses between the streamlined surfaces and the environment involved in the vortex movement. When providing the necessary and sufficient conditions for self-organization of TLJ, determined from the analysis of exact solutions, such jets are embedded in the environment of origin, locally changing its dynamic state (11).

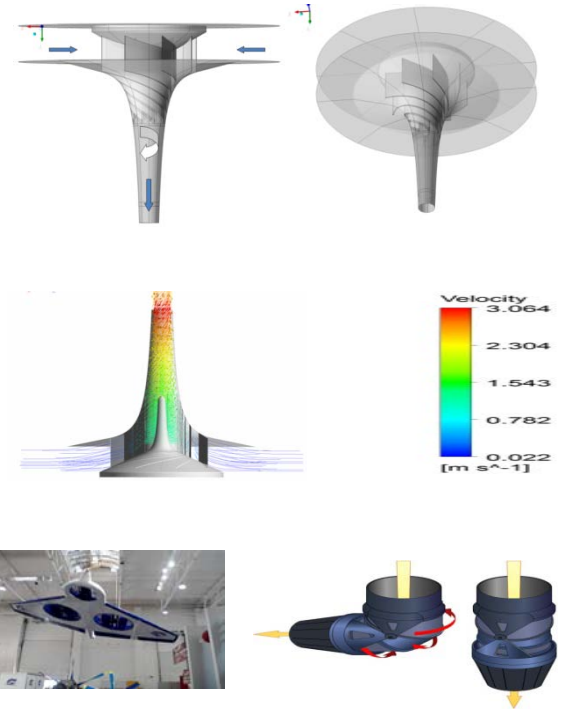

Figure 9: The Super Vortex E-Generators for Disc Airship E-Thermoplane MAI

The formed swirling current carries out the suction of the medium from the surrounding space the flow power of which is N_{in} the sucked flow moving along the confuser, accelerates, concentrating the total power in the formed Tornado-like Flow:

$$N_{out}/ N_{in} = k \cdot R_{out} \cdot W^3 / H_{in} \cdot W_0^3$$

where W_0 is the flow rate of air flowing into the confuser, W is the flow rate of air flowing from the nozzle, k – coefficient determined by the geometry of the constrictors, the values H_{in} and R_{out} are regulated by the geometry of the constrictors and the formation of Tornado-like pressure of a given flow to ensure increased flight speed LTA at low source power and low cost of electricity.

The Romanian ADIFO project, named as an omnidirectional flying drone (1) is made in the form of a Disk and its designers have quite reasonable explanations. It is similar to the Vought V-173 (USA) Disc plane (20). The working prototype created for testing has a diameter of 1.2 meters and is equipped with a Hybrid Electro-reactive Propulsion system.

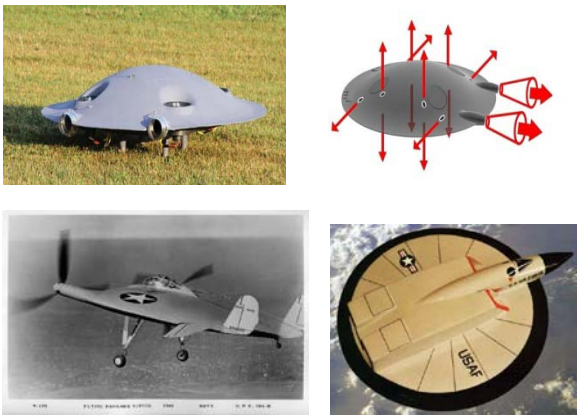

Figure 10: The Disc ADIFO Model Drone with Active Vectors Control Shema and Disc Vought V-173 Aircraft

The ADIFO "Flying Saucer" Shape was specifically designed to give the vehicle certain characteristics: - the device is unique in that it can move in any direction with the same aerodynamic characteristics and can fly just as well in subsonic or supersonic modes, which changes the current flight paradigm. The shape of the "Saucer" in contrast to the usual wing of the Airplanes provides maximum maneuverability. The device is similar to a Drone in its ability to take off vertically and "hover" in the air using Four Electric Turbo Fans.

According LHA optimal concepts analysis the main variants Body Wing Shema of the Internal layout of passenger cabins are obtained for the case of transportation of 616 passengers in a three-class layout of cabins for a distance of 13 700 km. At the same time, the degeneration of the Flying Wing Scheme is clearly visible. In this dimension a developed fuselage part already appears. This fact is connected with the peculiarities of the layout of passenger cabins. The need to provide the specified volumes, height and width of passenger compartments requires an increase in the Internal Volumes of the Flying Wing. For example, the increase in overall heights in the central part of the wing is due to the provision of a Minimum height of the Passengers Cabin Saloon and decrease inside/outside the 3D Volume of Noise Engines Level. Therefore, in the central part of the wing the chords are enlarged to provide the necessary overall heights.

VI. Conclusion

The advantages of aircrafts designed according to the Flying Wing Scheme in relation to other schemes rise with the increase in the Dimension of the Aircraft. So, the greater value of the target load and the flight range is the better application of this new Integrate Aircraft Scheme. In comparison with the base Aircraft of a Normal Aerodynamic Scheme, the Noise Level decrease up to 84%, and in comparison with a Tree Plane Scheme with an articulated wing - 94% from the Classical Version of Aircraft and Cigar Shaped Airship. The Computer Digital Structural & Parametric Analysis of the influence of infrastructural requirements on the 3Dimention Complex Synthesis of Long-Haul Aircraft and Solar Disc Shaped Airship Projection to use also More Electrical Hybrid Power Ecology Systems. The new Body Plane LHA and Lighter-then-Air (LTA) Vehicles with cover of Nano Film Solar Electro Systems will be more innovation projections for Worldwide Security Air Transportation with reduce CO_2 Toxic Pollution and Noise level.

References Références Referencias

1. ADIFO challenges alien UFOs! (2019), *Internet Science View,* May 23.
2. Aivedian A. 2012, Kuprikov M. 2012, Markin L. 2012: The layout of aircraft. Moscow: *MAI Press,* 294 p.
3. Corfield G. (2020), Airbus and Rolls-Royce hit eject on hybrid-electric airliner testbed after E-Fan X project fails to get off the ground test, *Internet Science View,* 27 April.
4. Delft University FLYING-V Body Wing Aircraft – New Ecology Project, (2019), *Internet Yandex News,* June 5.
5. Dolgov O. 2008, Kuprikov M. 2008: Momento-inertial factor in the formation of the shape of the Aircraft. Moscow: *MAI-PRINT Publishing House,* 180 p.
6. Dolgov O. 2010, Kuprikov M. 2010, Kuprikov N. 2010: Features of detecting the moment-inertial appearance of perspective aircraft, in the early stages of design. *Bulletin of the Moscow Aviation Institute. #2* (17), p.1-4.
7. Eger, S.1986, Liseitsev N.1986, Samoilovich O. 1986: Fundamentals of automated design of aircraft. Moscow: *Mashinostroyeniye (Mashine Industry),* 232 p.
8. FUTPRINT50, (2020): Future propulsion systems: towards a hybrid/electric aircraft, EC GA #875551, H2020-MG-2019- INEA.
9. GE and XTI Aircraft Partner for Hybrid Propulsion, (2019), *Internet Science View,* 02 August.
10. IMOTHEP, (2019): Future propulsion and integration: towards a hybrid/electric aircraft, EC GA #875006, H2020 MG-2019- INEA.
11. Kiknadze G. 2009, Gachechiladze A. 2009, Gorodkov A. 2009: Self organization of Tornado like Jets in Flows of Gases and Liquids and the Technologies Utilizing this Phenomenon Proceedings, *ASME Conference HT 2009* – 88644 July 19–23, California, USA.
12. Kuprikov M. 1999, Maksimov S. 1999: Influence of infrastructure restrictions on the appearance of a long-range aircraft. *News of universities "Aviation equipment",* #1, p. 52-55.

13. Kuprikov, M. 2003: Structural-parametric synthesis of the geometric shape of the aircraft under severe constraints. Moscow: *MAI,* 64 p.
14. Kuprikov M. 2012, Patrakov A. 2012: Use of CAD/CAE systems in detecting the appearance of the main aircraft. *Proceedings of the IX International Symposium "Dynamic and Technological Problems in Mechanics of Constructions and Continuous Media*" Moscow: MAI, 2012. p. 58-59.
15. New Ecology Passenger E-Aircraft for 186 PAX will be flight about 2030, (2020), *Internet Science View,* 11 March.
16. New Wing-Transformer, (2019), Popular Mechanics Journal, #12, December.
17. Ponyaev, L. 1997: Thermoplane ALA-40/ALA-600. *Catalog Brassey's World Aircraft & System Directory,* p. 545.
18. Ponyaev, L. 2018: The Periodical Geometry of Engineer Design Principals by use the Optimal Spherical Transformation to the Disc Shaped LTA. *Scientific Technologies, S&P Journal* PSSN 223-2966: *Natural & Technical Science,* Moscow, Russia, # 9, p. 60-65.
19. Richardson J. 2019:750 Horsepower Electric Aviation Engine Tested By MagniX, *Internet Science View,* October 24.
20. Zimmerman C. 2018: "Flying pancake", *Internet Science News,* 05 February.