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## Abbreviations

AI: Artificial Intelligence; SCAC: Sukhoi Civil Aircraft Corporation; FFS: Full Flight Simulators; ALA: Aerostatic Aircraft

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Mini Review

# Geometrical Theory of the Periodical Spheroid Transformation in Modelling of the Ecology Hybrid Electric and Modular Aircraft/ Airship and Flight Simulation

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## Abstract

This article is devoted to the search for the Geometry Periodic Table Regularities architect structures in the space-group set and 2D/3D integrating variation of the any Geometric Transformations of the polar Spheroid shells models and Adaptive Simulation of the Synthesis of integral-differential layouts of the Aircraft and Airship and their Full Flight or Processing Training Simulations with spherical visual panoramic screen matrix. Using idea as the periodic table of the variety of elements proposed by Mendeleev D.I., which allows us to naturally discover new yet unknown elements, it is possible to create a similar geometric table-matrix of element-by-element transformation of the layout forms of the aircraft for the development of a digital computer modeling complex in an Artificial intelligence environment, as a digital double of a qualified human designer. Perhaps the industry of electric vehicles and electric water transport and space projects can follow this path, as it is flexibly and variously.

## Introduction

At the current level of design research of new concepts of airplanes, airships and flight simulators, the extensive possibilities of digital processing of Big Data in the environment of artificial intelligence and Machine Learning allow us to systematize and identify the main periodic patterns of the evolutionary development of the air transport industry and commercial demand-offers of leading consortia and their strategic partners. Like the periodic table of the variety of elements proposed by Mendeleev D.I., which allows us to naturally discover new yet unknown elements, it is possible to create a similar geometric table-matrix of element-by-element transformation of the layout forms of the aircraft for the development of a digital computer modeling complex in an Artificial intelligence environment, as a digital double of a qualified human designer. Perhaps the industry of electric vehicles and electric water transport and space projects can follow this path, as it is flexibly and variously implemented by Elon Musk and his team.

## Trends in the Development of the Periodic Theory of Geometric Transformation of LA

Genuine broad interest and trends in mass orientation to the positive results of the development of robotic human- and animal-like systems-copies of the natural world of the Earth and challenges to their self-learning, self-improvement and self-reproduction with new materials and flexible technologies is becoming more relevant and a real "smart" process in the life of a modern developed person today and especially tomorrow (Figure 1).

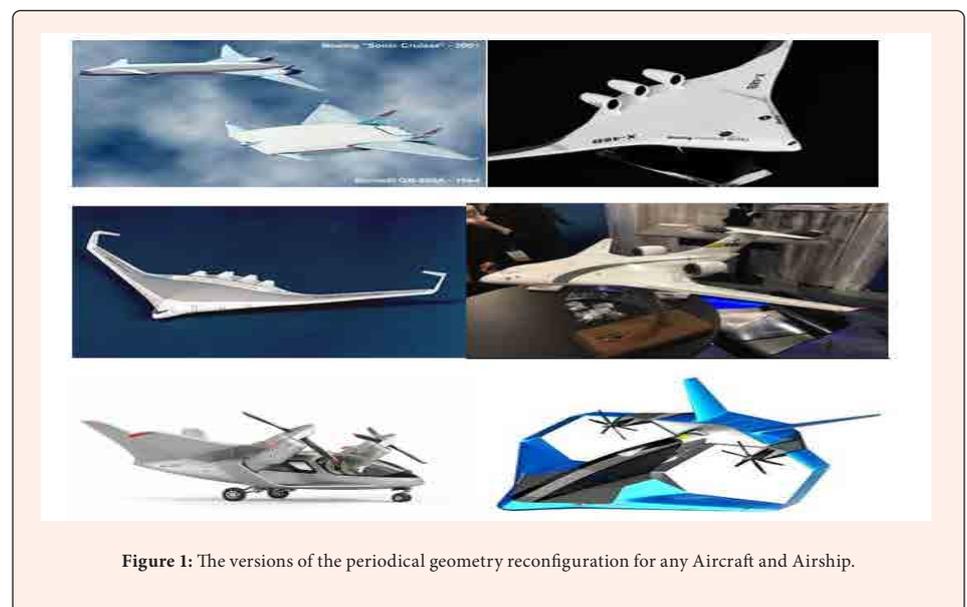


Figure 1: The versions of the periodical geometry reconfiguration for any Aircraft and Airship.

New approaches to end-to-end automated design and optimal synthesis of today's promising Modular aircraft, as it is presented in the project of Switzerland [1], and Hybrid Electric with LH2 and Solar Battery aircraft/airships, it forces a comprehensive search for innovative methods and geometric theories of shaping through periodic transform modulations of diversified layouts as a quantum matrix of spheroidal geometry with plastic stretching-sphotium and separation-truncation of transformed surfaces according to their quantitative and qualitative discrete aerodynamic architectures of aircraft. Climate problems and environmental technologies, transport and human life force us to transform the "retarding" development processes and introduce more flexible transformable and multifunctional technologies and end-to-end large-scale practices for mega- and giga factories of tomorrow to eliminate negative problems, decarbonization and the development of "green technologies and economy" through "clean ecological" energy and nature-sparing large-scale industrial and industrial national and international programs, such as under the leadership of international projects for the creation of hybrid electric passenger aircraft-European consortia IMOTHEP and FUTPRINT50 [2]. The scientific approach and the theory of geometric transformation of spheroids in the concepts of aircraft provides the basis for the transition to higher optimization levels and the ability to make an initial optimal choice through Artificial Intelligence of such a new aircraft that meets higher safe and flexible operational requirements, including robotic production and repair-saving processes by the supplier of all components within the life cycle of products and services.

### Practical Approaches to Creating a Geometric Transformation Matrix

The global process of development and creation of new aircraft (aircraft) impresses with its transformable diversity, which is logically concentrated into periodically stable groups-sets, where the structural design core is an integral geometric similarity according to already worked out and compromise "mini-max" classical forms of object modeling with a given functionality and required efficiency. Modern innovative developments and processes of generating new ideas are inevitably associated with the emergence of either new computer methods (virtual and augmented reality), or the development of theories of graphical interpretation and geometric modeling (by key coordinating points and elastic "rubber"-deformable surfaces) of any complex technical systems or complexes [3,4] (Figure 2).

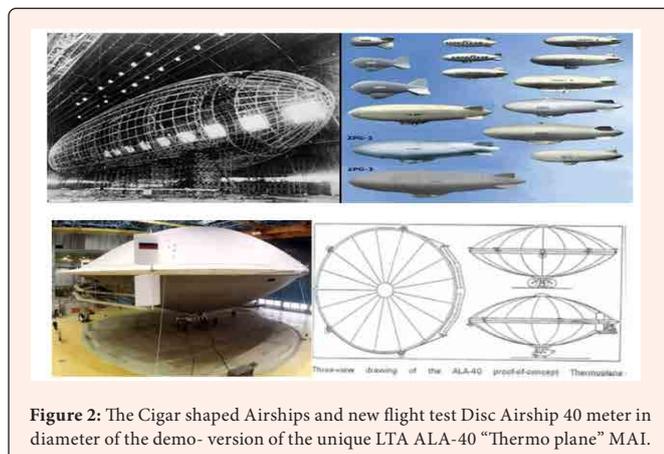


Figure 2: The Cigar shaped Airships and new flight test Disc Airship 40 meter in diameter of the demo-version of the unique LTA ALA-40 "Thermo plane" MAI.

At the same time, it is possible to trace the periodicity of the transformation of spheroidal shapes, as in the periodical table of chemical elements: on the left in the first row, where only one parameter (radius) is sufficient for shaping and the key point in the thickness of filling (as a shell) is a hollow sphere (a prototype of thin-walled air soap bubbles or balloons with hydrogen / helium), as the basis of the aerostatic principle of aircraft flight, and on the right is a filled sphere (like a cannonball), as the basis for the ballistic principle of movement in the air. In the second row of the periodical matrix-table structure, where a two-parameter definition is needed when deforming a sphere with a variable density of internal filling, we have various uniaxial deformable interpretations of the sphere or their truncation: a thin-walled disk (compression along the vertical axis) is the prototype of an innovative Aerostatic Aircraft (ALA) of the type "Thermo plane" MAI [5,6], in the development and testing of which the author participated, to the right-thin-walled segment of a disk (a truncated sphere or

spheroid) as a parachute for soaring-descent or a spheroid screen of a virtual image of the flight situation for flight simulators [7], and with a lateral truncation - a parachute-wing. Next level of the periodical matrix-table architecture is a disk shaped with a wing (a US pancake plane) and an aircraft with an annular rotor (the Violet project) - this is the basis of an aircraft with an aerodynamic principle of flight. To the right is a disk with deformation-truncation along the front and rear parts and wings of large elongation as the "Crew" project or the MAI project of an integral-shaped aircraft with a supporting fuselage and then a disk with symmetrical truncation on the sides - an ekrano plane as the MAI Dingo or the ellipsoid EKIP project. And on the right in the row is an elongated spheroid along the vertical axis (the prototype of a bullet) or the shape of a single-body rocket by the Tsiolkovsky model.

### Principles of Periodic Table-Matrix Formalization of Geometric Concepts of LA and FFS

Proposal of the such tabular-matrix formalization of geometric adaptive spheroidal transformations is easily introduced into the information design digital space and complements the software in graphic synthesis systems, computer modeling and visualization (Figure 3).

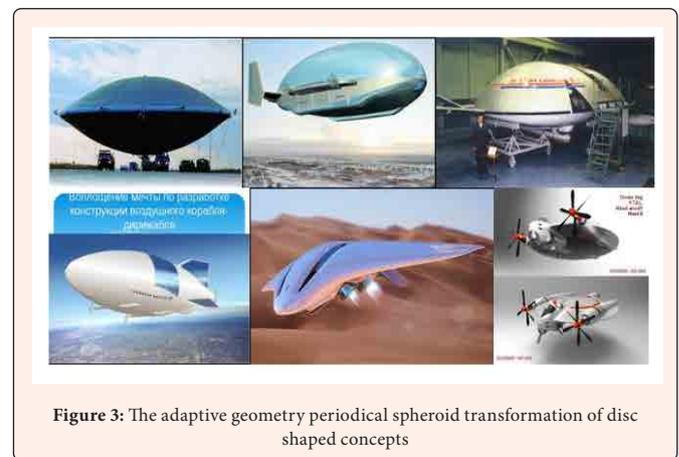


Figure 3: The adaptive geometry periodical spheroid transformation of disc shaped concepts

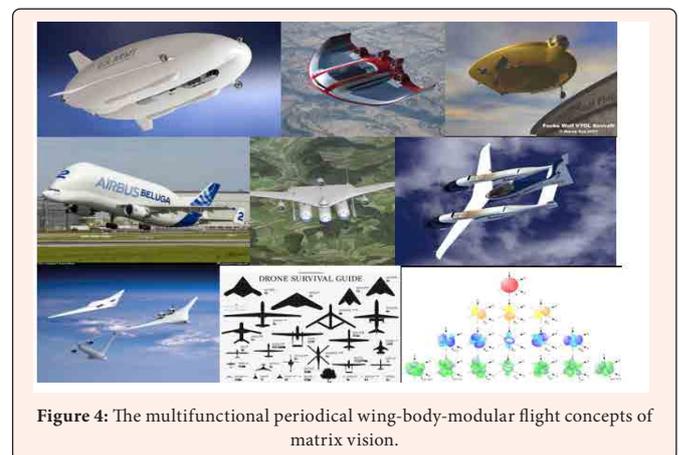


Figure 4: The multifunctional periodical wing-body-modular flight concepts of matrix vision.

There are known possible actions on geometric bodies and types of integral geometric modeling using spheroid deformation: from the initial sphere by coaxial and interaxial stretching-compression along one, two and three axes and torsion-rotation, separation and unification of volumes (fuselages, nacelles, tanks, aircraft chassis) or bearing surfaces (wings and tailings of aircraft) with their partial clipping, conjugation or addition (winglets, stiffeners, inflows), which is also incorporated in SolidWorks, CATIA5. At the same time, the use of innovative approaches in digitalizing the processes of creating geometrically complex (with big data) and transformable engineering objects allows interpreting the toolkit for developers through "geometrically plastic" or geomorphic "rubber-deformable "exotic spheres" by John Milnor [8], the base points of "epipolar geometry" by Pascal Foix [8] or



transformations in raster graphics by V Gusyatin [9]. This accelerates conceptual solutions for the synthesis of aircraft images in Artificial Intelligence (AI) systems through its required volumetric bodies of the fuselage and bearing surfaces of aircraft [10,11], disk-shaped ALA, as well as in the modeling of spheroid screens for modeling and visualization of virtual augmented reality on Full Flight Simulators (FFS) with a mobility system as produced for after sale services Division of Sukhoi Civil Aircraft Corporation (SCAC) for modern SJ-100 Regional Aircraft (Figure 4).

## Conclusion

The universal approach makes it possible to “impose targeted searches for hidden reserves” in the theory and practice of geometric transformations of the appearance of objects to generate creative ideas, to synthesize new images and develop innovative Aircraft and Airship projects with new conceptual systems: efficient traction electric motors and generators, complex pilot-unmanned vertically flying concepts (versions of the transformation of urban ground-air transport AIRBUS + Audi, Aston Martin, UBER) and the use of digital geometrically optimal 3D technologies in the creation of prototype models for the production and assembly of aircraft units, components and components. The development of the universal Geometry Periodic Table Regularities architect structures in the space-group 2D/3D integrating versions of the any Geometric Aircraft/ Airship/ Simulation Transformations of the Epi polar Spheroid shells models and Adaptive shapes of the Synthesis of integral-differential layouts of the Aircraft and Airship and their Full Flight or Processing Training Simulations with spherical visual panoramic screen matrix.

## References

1. (2022) Switzerland new Mofular Aircraft project for perspective Air Transportation.
2. Walter A, Ravikovich Yu, Ponyaev L, Holobtsev D (2020) Thermal Management challenges for HEA-FUTPRINT 50, Conference EASN papers, 2-4 September, Italy
3. (2022) Designing the future: artificial intelligence and data-centric architecture// Website CIO.
4. Sabitov O (2018) Artificial intelligence will help scientists create the most aerodynamic bike.
5. Ponyaev L (2020) THERMOPLANE Design Bureau MAI, Russia Thermoplane ALA-40/ ALA-600// Brassey's World Aircraft & System Directory 1996-1997: 545.
6. Opalenov Yu V (2012) Integral geometry on manifolds of variable curvature.
7. Ponyaev LP (2011) Review of projects: - simulators for SSJ 100 aircraft//Vesti GSS9.
8. (2020) A new optical system has trained AI – now it can solve mathematical problems at the speed of light./ Website CIO.ru.
9. Gusyatin VM (2022) Mathematical model of geometric transformations for special processors of raster graphics.
10. About nodes and exotic spheres of John Milnor// Website Peoples.ru.
11. Gudoshnikov S, Pascal Foix, EPFL-about key points, deep neural networks and epi polar Geometry.