"PROTOTYPE OF UNMANNED AIRCRAFT TO EXPLORE THE SKIES OF VENUS: EXPLORATION & ASTROBIOLOGICAL RESEARCH"

A Novel Concept for High Altitude Atmospheric Exploration.

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Introduction: We developed a design concept derived from the previous CYTHEREAN SEP research, in this case will focus on the development of a complementary design of unmanned aircraft (UAVs) capable of withstanding the adverse conditions of the planet Venus flying over a height between 50 km and 60 km (kilometers), all in order to collect important scientific data that can accurately reveal the composition of isotopes and particles in the atmosphere of Venus , in addition to clarifying the recent discovery about strange spots detected in the ultraviolet spectrum, which do not dissipate or dilute with other components, and at the same time seems to absorb ultraviolet light. Relevant engineering studies will be submitted to ensure the feasibility and operational safety of the proposed aircraft, such as materials, mechanical properties of these engineering estimates and the design of the UAV adapted to research needs.

Figure 1: Aerial platform. own source.

The aircraft named (AFISV) Venus Atmospheric Flying Research Station, Figure 1, is a large platform which is formed of fibers of solar panels in its wings which will have a hinge-like deployment mechanism and also a low-power turbine, is designed to fly over at least 90 earthly days. It will have high-tech instruments to observe and take scientific samples, in addition its aerodynamic design will allow to withstand the high air currents that are presented on this planet.

The objective of the designs is to carry out aerospace studies with mathematical aeronautical models, which validate the operation, service life, aerodynamic behavior and other variables that allow prototyping and developing the ship.

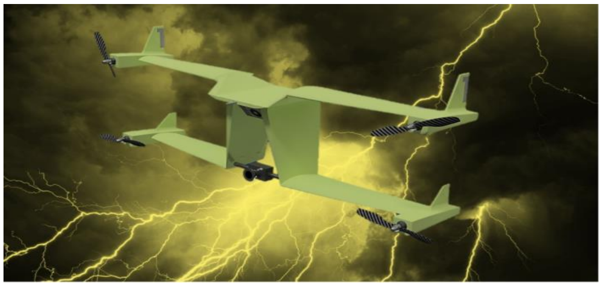

Figure 2: drones. own source.

Figure three shows the design of a drone which detaches from the main ship and will fly over at specific points to take scientific samples, multispectral images, images in the ultraviolet range among others. The drone could be used as a sacrificial platform because it will be located in hard-to-reach locations, predicting new flight paths so that AFISV avoids passing through these locations and ensuring the safety of the main ship. The mission calls for the use of three drones to cover more areas of research, drones have a mechanism for vertical and horizontal flights, in addition to equipment that would provide data to the AFISV spacecraft for processing interpreted and transmitted to the ground.

Figure 3: Glider. own source.

The design of Figure 3 consists of a deployable wing glider which takes advantage of the strong air currents experienced on the planet Venus to fly at different heights of the surface; it would also reduce its energy consumption to a high percentage and prolong more mission time. The following illustrates the design of the folding design so that it can be stored and coupled in the tapered control module for atmospheric ingress protection:

Figure 4: coupling in heat shield. Own source

The manufacturing materials that make up the ship are a very important complement within this research this allows to evaluate variables such as weight, thermal resistance, mechanical resistance, corrosion and other factors that analyze the future behavior of the ship to evaluate possible events that help predict a high success rate. some material proposals will then be presented in the following tables:

PRINCIPAL MATERIALS	SPECIFIC GRAVITY (g/cm^3)	RANGE OF THERMAL CONDUCTIVITY (W m1K1)	RANGE OF PRESSURE RESISTANCE (GPa)	RANGE OF ELASTIC MODULE (GPa)	RANGE OF CORROSION
Carbon Nanotubes theoretical	1.4	6000	68	1000	**Corrosion rate (mm/year) = 0,00327(a* icorr/n)**
Carbon Nanotubes (measured)	1.4	150	1.8	80	
Used On	Used in the aircraft's winds, Empennage, tailfin, and in the powertrain coating				
SOURCE 1:	[1] [2]				
			YOUNG (ELASTIC) MODULUS	BENDING STRENGTH	RANGE OF CORROSION
Carbon Fiber Reinforced Polymers (CFRP)	1.8-2.0 g/cm^3	170	13-16 GPa	80-120 MPa	► 2.3V 0.77A/m^2=> 3.1236E-5 ► 2.3V 3,081A/m^2 => 1.4195E-5
Used On	Used in the critical parts of the aircraft, Fuselage, the wings, and in the power engine coating				
SOURCE 1:	[3] [4] [5]				

SECONDARY MATERIALS	SPECIFIC GRAVITY (g/cm^3)	RANGE OF MELTING POINT (°C)	RANGE OF PRESSURE RESISTANCE (MPa)	RANGE OF ELASTIC MODULE (MPa)	RANGE OF CORROSION
Titanium	4.54	1668	*ASTM 1: 240 *ASTM 23: 828	*ASTM 1: 170 *ASTM 23: 759	0.03 mm/year
Used On	Used on clamping system of the powerengine				
SOURCE:	[6]				
Aluminum	2,7	660.32	207	280	0.8–0.28 µm/year
Used On	Used on the Aircraft´s Flaps				
SOURCE:	[7] [8]				

*Range of Corrosion: Where **a** is atomic weight, **icorr** is corrosion current density, **n** is the number of equivalents exchanged, and **D** is density*

One of the materials to be considered in the tables above is carbon Fiber Reinforced Polymers (CFRP). This compound allows to compensate for strength and weight; its application in the aerospace world is getting stronger due to the mechanical properties that are better than metal alloys.

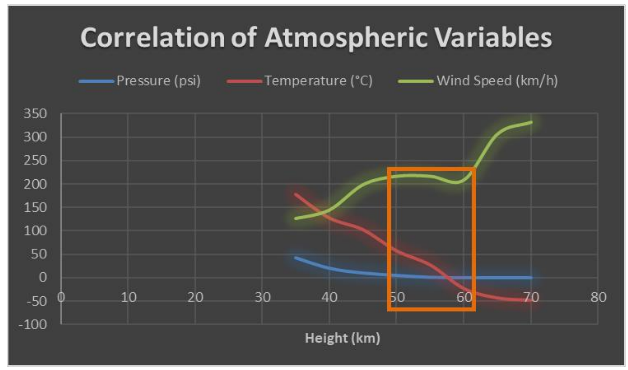

Figure 5: Own source, Correlation of atmospheric variables

In the graph above, the optimal operational area is delimited in the orange table, between a balance of atmospheric variables, in which pressure and temperature are inversely proportional to the height, and the wind speed is proportional to the height, so a equilibrium point must be found that meets the best flight conditions for the unmanned aircraft, with an optimal operating height between 50 to 60km of the surface.

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