

ADVANCED, EXTREME ENDURANCE, MULTI-MISSION, POWERED VENUS GLIDER [PVG] WITH VTOL CAPABILITY M. Kroupa¹; N. Coleman, ME²; ^{1,2}New Frontier Technology Group, Riverside, CA 92591; Libby, MT 59923 (NFTG_MK@PROTONMAIL.COM)

Introduction: We propose a highly efficient, maximally versatile, large payload capable, powered ultra-light glider to explore the entire surface and atmospheric regions of Venus, or other bodies having a gaseous envelope, at all altitudes, for continuous, extended missions in the range of 30 years without landing. Several landing and take off [VTOL] embodiments are considered. Low cost multi-craft networked constellations can be deployed in a single mission or over many years for maximally effective 4D exploration.

Viability: Similar aircraft architectures were proven in terrestrial platforms, such as the NASA Pathfinder/Helios [1], SunGlider [2] and the ApusDuo [3] which fall into a new category of craft called High Altitude Pseudo Satellites (HAPS). The endurance and performance of the PVG is significantly greater.

Energy input free, even propulsion-less, dynamic soaring and other means can be employed when convenient or required to power the mission potentially indefinitely.

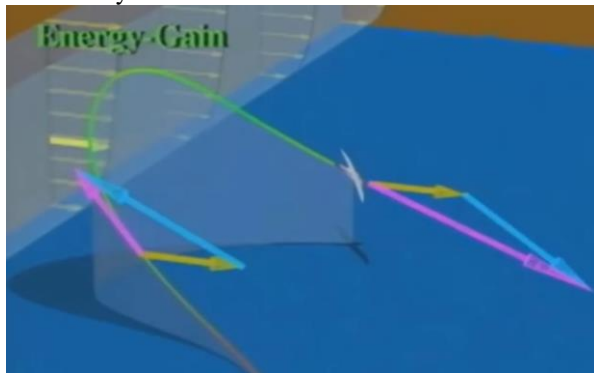


Fig. 1 energy-free dynamic soaring using wind energy

Relevance & Alignment: NASA, ESA and others are developing concepts for controlled variable-altitude balloons for study of the atmosphere at altitudes between 52-62 km. Not only is the PVG able to study at high altitudes but is capable of descending below the cloud deck and, in several embodiments, is capable of even repeatedly landing to directly explore points of interest close up on or below surface.

In addition to carrying a large suite of scientific equipment, in some missions the high capacity 'mother ship' is capable of deploying various long endurance attritionable micro-vehicle networks comprised of mission specific vehicles such as free balloons, gliders, or subterranean probes and/or vehicles. These vehicles further extend the effective operating range and scientific capability of the PVG in 4D space.

Several landing and take-off [VTOL] embodiments are considered which is extremely novel. Using any one of these vehicles, imaging and research is possible at any altitude, on surface and even below surface using recoverable, reusable probes and vehicles. Such landings would be brief to prevent damage from the Venusian environment. This level of audacious technology and exploration is not possible using balloons or any other platform under consideration by anyone.

Besides being costly and short lived, the balloons and airships have poor motivity control which then provides limited value for scientific endeavors and can potentially have mission nullifying effects. PVG's dynamic control will prevent such a fate.

Basic Operation of Core Embodiment: To lower mission costs, the PVG will deploy in space, slowing down in the upper atmosphere by shedding the transit velocity from Earth in a dynamically controlled low angle descent after which the propulsion system or maneuvers will sustain flight for as long as the craft materials allow which will be on the order of decades. Note that mission energy supply is not a concern or a temporal limiting factor.

PVG's high speed capability allows constant exploration in stationary loitering during daylight or darkness.

Hurdles: We are not aware of any significant parameters and constraints on the primary or ancillary architectures and equipment.

Conclusion: The system designs, modularity, scalability, versatility and economics clearly demonstrate superior solutions which will enable sustained exploration presence on the Venus, Mars and beyond for years to come. Terrestrial apps abound.

Opportunities; NFTG and its associates are open to collaboration with qualified strategic partners/team for all concepts and technologies discussed here and a broad suite of innovations discussed elsewhere^{4, 5, 6} Contact me for more details.

References: [1]

[https://www.nasa.gov/centers/dryden/history/pastprojects/Era](https://www.nasa.gov/centers/dryden/history/pastprojects/Era%20pathfinder.html)

[2] <https://www.avinc.com/about/haps>

[3] [https://www.uavos.com/uavos-offers-new-principles-of-](https://www.uavos.com/uavos-offers-new-principles-of-operating-solar-aircrafts)

[4] Advanced, Scalable, Continuous Energy & Power Generation and Derivative Technologies [final]
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