

December 2022

Rocketry as Testing Platforms for Payloads

Pedro LLanos

PI, Embry-Riddle Aeronautical University

Sathya Gangadharan

CO-I, Embry-Riddle Aeronautical University

Follow this and additional works at: <https://commons.erau.edu/faculty-research-projects>

Scholarly Commons Citation

LLanos, P., & Gangadharan, S. (2022). Rocketry as Testing Platforms for Payloads. , (). Retrieved from <https://commons.erau.edu/faculty-research-projects/30>

This Article is brought to you for free and open access by Scholarly Commons. It has been accepted for inclusion in Faculty Research Projects by an authorized administrator of Scholarly Commons. For more information, please contact commons@erau.edu.

Research Projects

Embry-Riddle partners with private and public entities to assist in developing solutions to today's and tomorrow's aeronautical and aerospace problems. Here at the world's largest aviation-oriented university, our focus on applied research is unique.

[Back to research list](#)

Rocketry as Testing Platforms for Payloads

PI Pedro LLanos

Design, assemble and launch small rockets as testing platforms to test small payloads which are flown aboard suborbital flight vehicles. We have successfully launched Level 1, Level 2 rockets, and we are in the process of finalizing the Level 3 rocket.

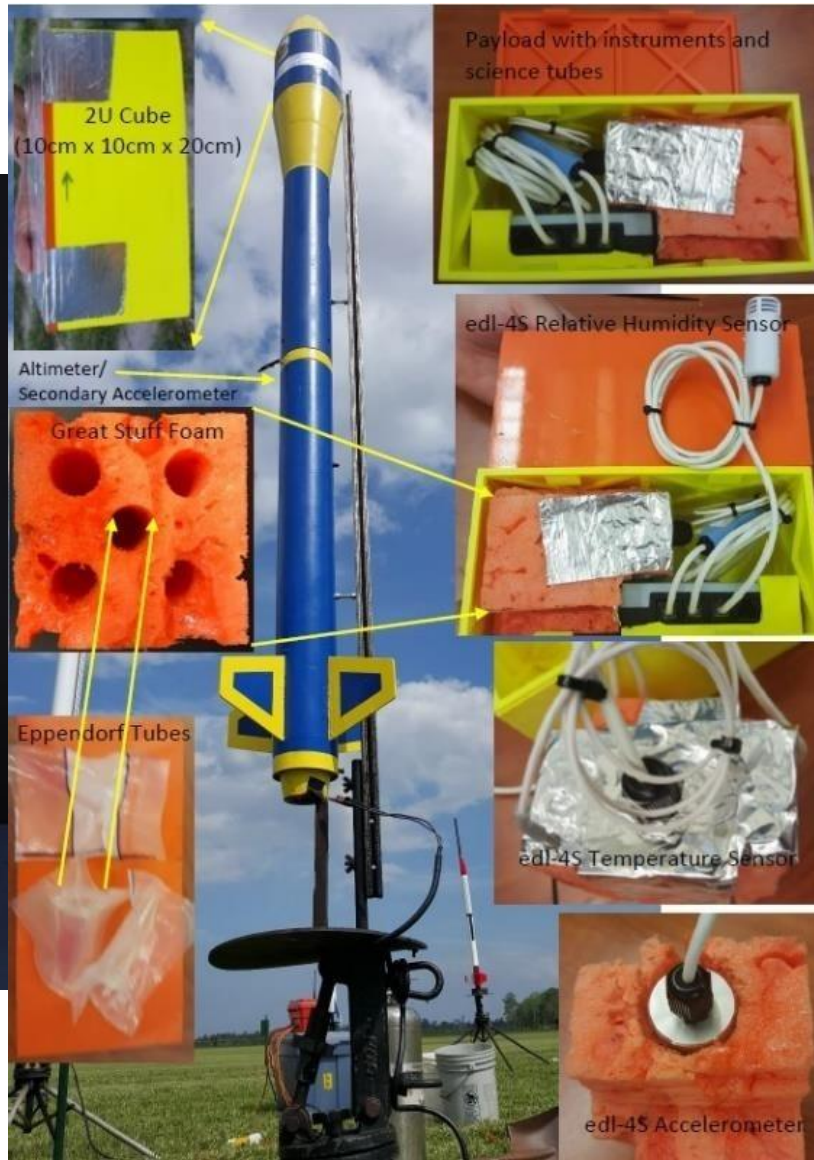
Practical experience for students in rockets and payloads is very valuable in the space industry, and it is something that would give them an advantage over other applicants. Students in Embry-Riddle Aeronautical University's Payload and Integration class were given the opportunity to build Level 1 and Level 2 rockets and gain experience developing, testing, and integrating payloads into a rocket. These payloads were then flown to suborbital space aboard Blue Origin's New Shepard.

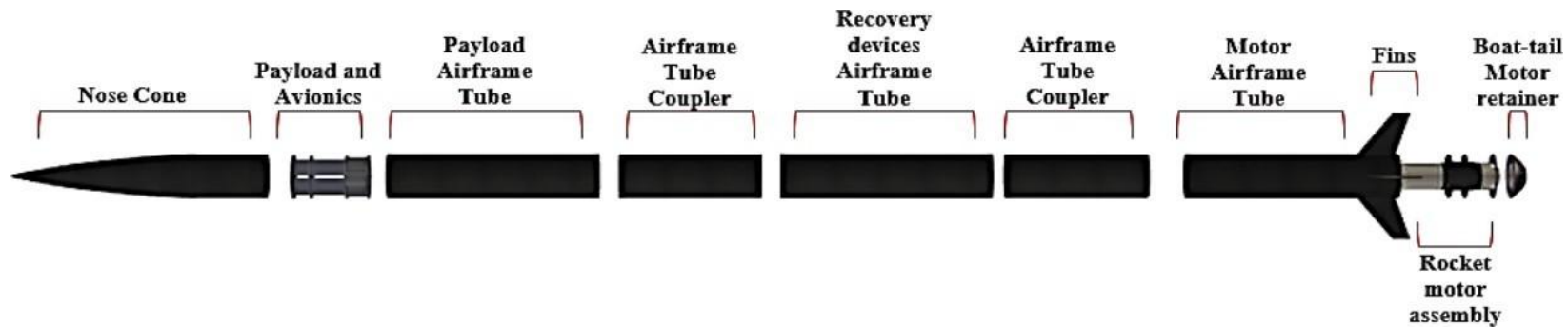
Embry-Riddle Aeronautical University has launched several suborbital scientific payloads aboard Blue Origin's New Shepard in 2017 and 2019. Students continue gaining hands-on experience in rocket design and construction, and payload integration, and testing of future and more mature payloads to be launched into space.

This research project funded by the College of Aviation Department of Applied Aviation Sciences and ERAU Ignite research grants, a Level 3 Rocket is being designed and developed at ERAU to serve as a scaled-down model research platform for launching and testing of payloads that will be later flown in commercial suborbital platforms such as Blue Origin's New Shepard and PLD space Miura 1 rockets. Computer simulations were conducted to calculate the key parameters such as flight trajectory profiles, stability, and flight velocities for different rocket motors configurations. A preliminary design of the rocket was developed using Computer-Aided Design (CAD) software. The rocket will accommodate multiple payloads (Cubesats, NanoLabs, TubeSats) designed and developed in the Payload Applied, Technology and Operations (PATO) laboratory. The rocket is primarily constructed of carbon fiber composite as it has a high strength-to-weight ratio. Monte Carlo simulations are used to select a suitable motor for the rocket according to the flight requirements and landing restrictions.

Images below: Level 1 and Level 2 rockets







Images below: Construction of level 3 rocket. Payload bay housing several CubeSats, NanoLabs and TubeSats.



Research Dates

01/01/2017 to 12/31/2020

Researchers



Sathya Gangadharan

Mechanical Engineering Department

Ph.D., Virginia Polytechnic Institute and State University

M.S., Memorial University of Newfoundland



Pedro LLanos

Applied Aviation Sciences Department

Ph.D., M.S., University of Southern California

M.S., University of Oklahoma Norman Campus

Tags: **Rockets** , **Suborbital Space** , **Blue Origin**

Categories: **Faculty-Staff**