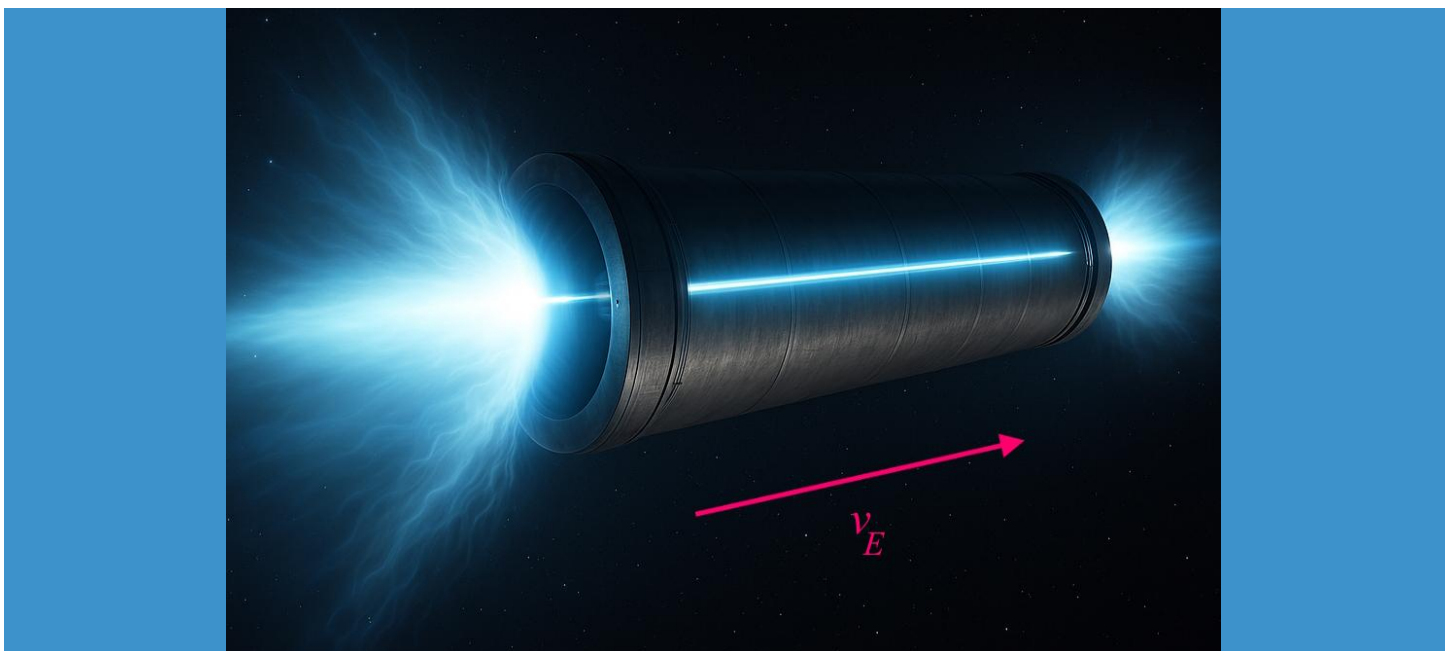




ELECTRIC ENGINE

Newsletter #4

PROGRESS 2Q+ 2026



ENGINE CONTROL

ECAS COMPUTER

Started design of the ECAS to ECD interface board. That takes the engine control signals and sends it to the Electrode Charging Drivers, ECD.

MOSFET CONTROL

EDC PC BOARD

Completed the PC Board design and sent it to be fabricated.

EXPECTED RESULTS

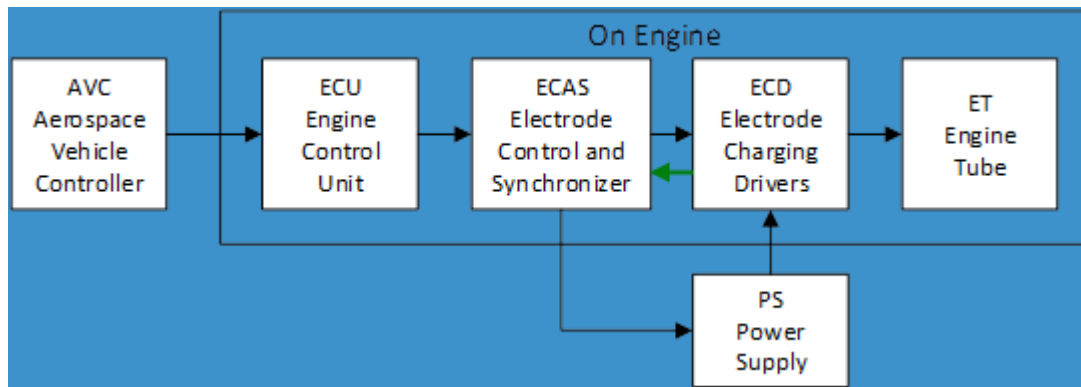
There should be measurable thrust. Then it can be developed further.

OVERALL STATUS

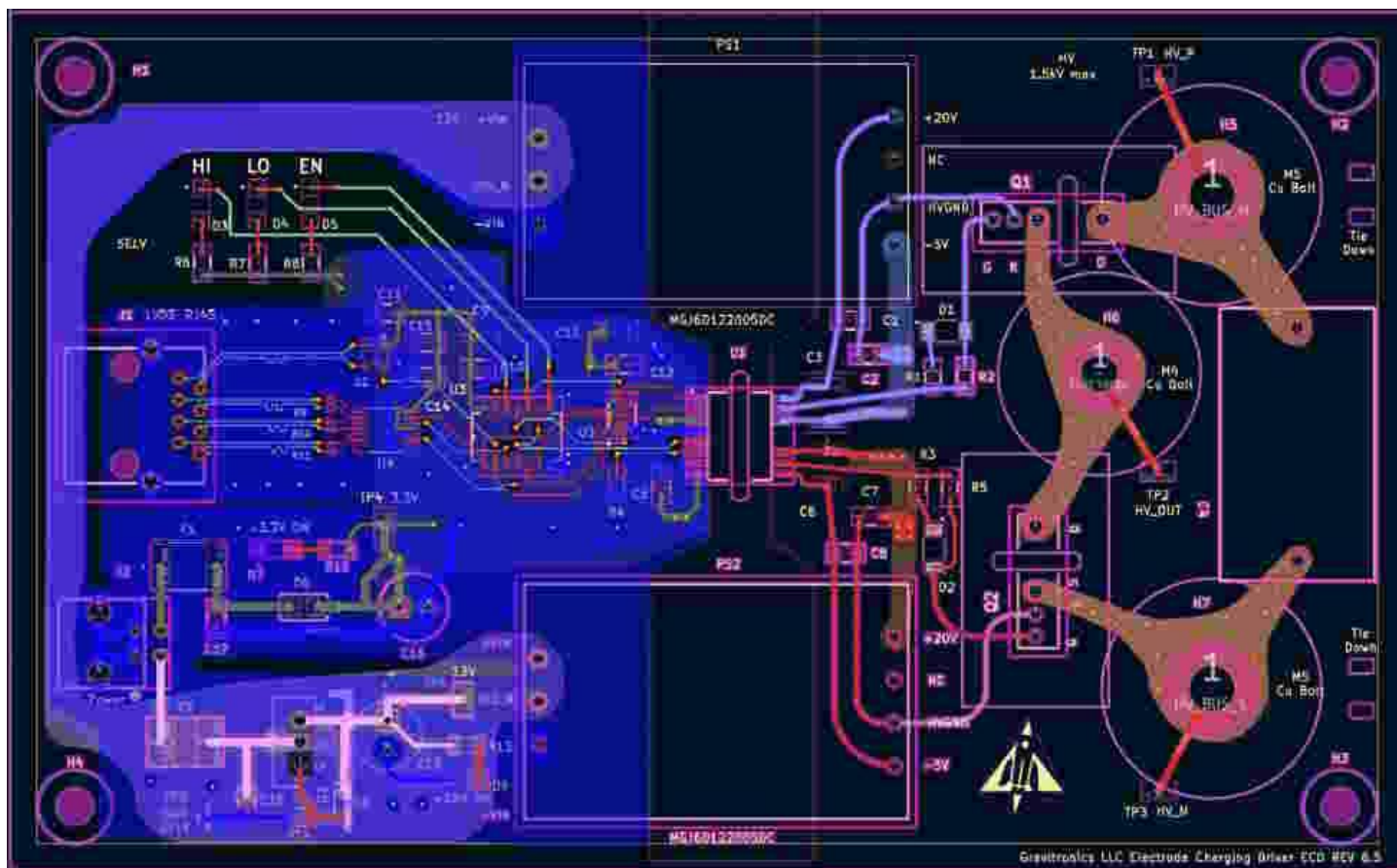
CREATING HARDWARE

This rocket uses electric fields to move, so much of the work is related to controlling those fields and producing them in the rocket. New power electronics are being created and configured on the rocket.

The overall description of the rocket can be found in the American Institute of Astronautics and Aeronautics (AIAA) [paper](#) listed on the last page.



Overall System Architecture

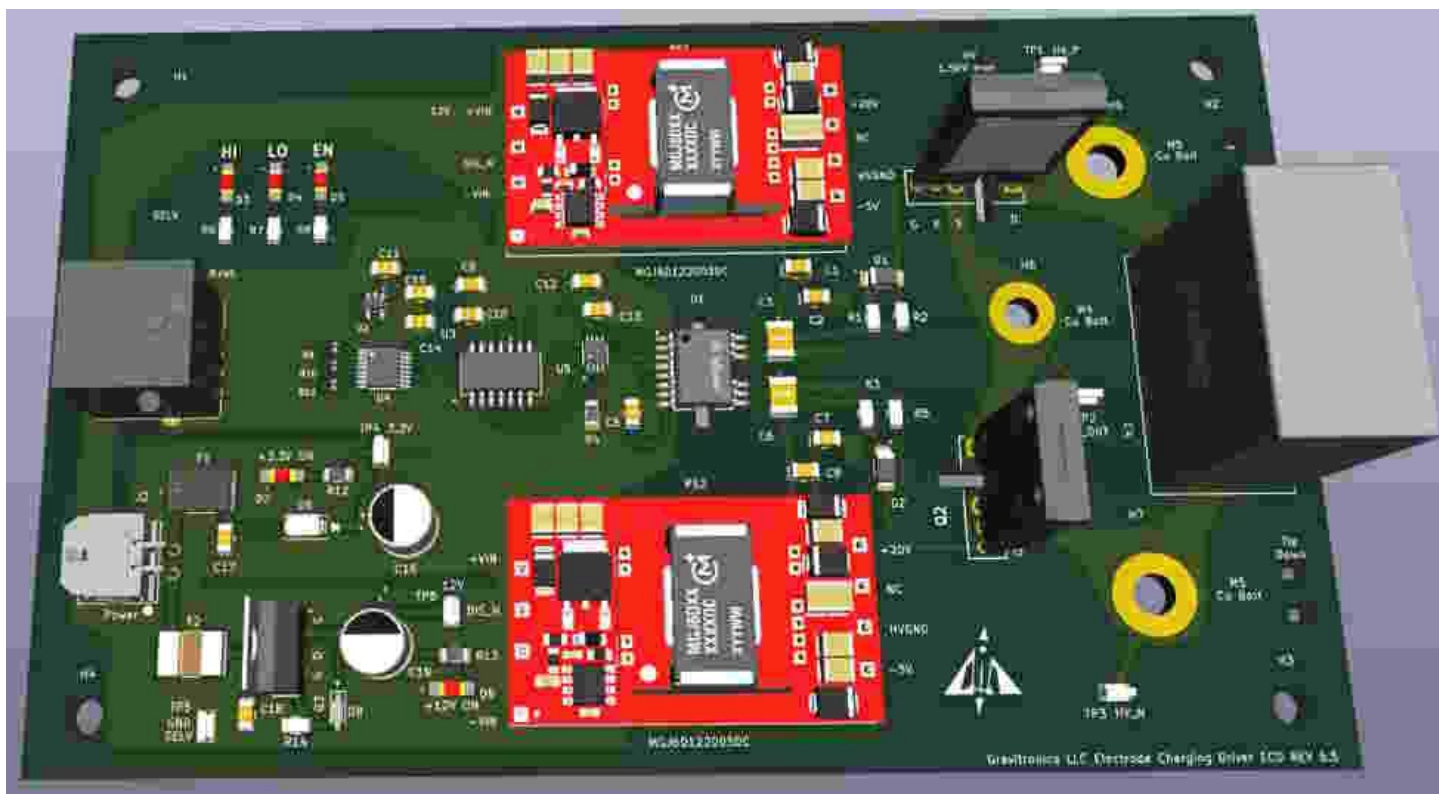


The Electrode Charging Driver (ECD) board accepts low voltage control signals on the left and produces the switched high voltage signals (1500 VDC) on the right of the board.

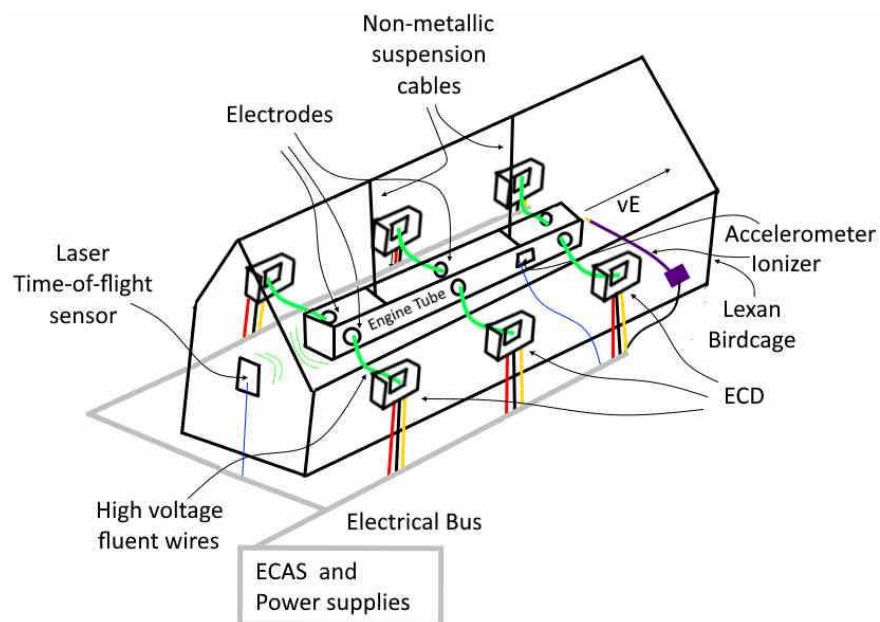
This is a hybrid High Voltage / Low Voltage printed board, using standards-based design so that the parts don't emit sparks or fry the board. The high voltage signals connect with special wiring and ring lugs to copper bolts on the printed board.

It is a four-layer board, with a low voltage and a high voltage side. The high voltage side has a pair of high-voltage SiCFETs, (Silicon-carbide MOSFETS) as part of the H-bridge, and is driven by distributed LVDS (Low Voltage Differential Signaling) communication wires that provide the two MOSFET Hi-ON, and Lo-ON signals, and take back a pulse from the ON signal on the board, back to the ECAS (Electrode Control and Synchronizer).

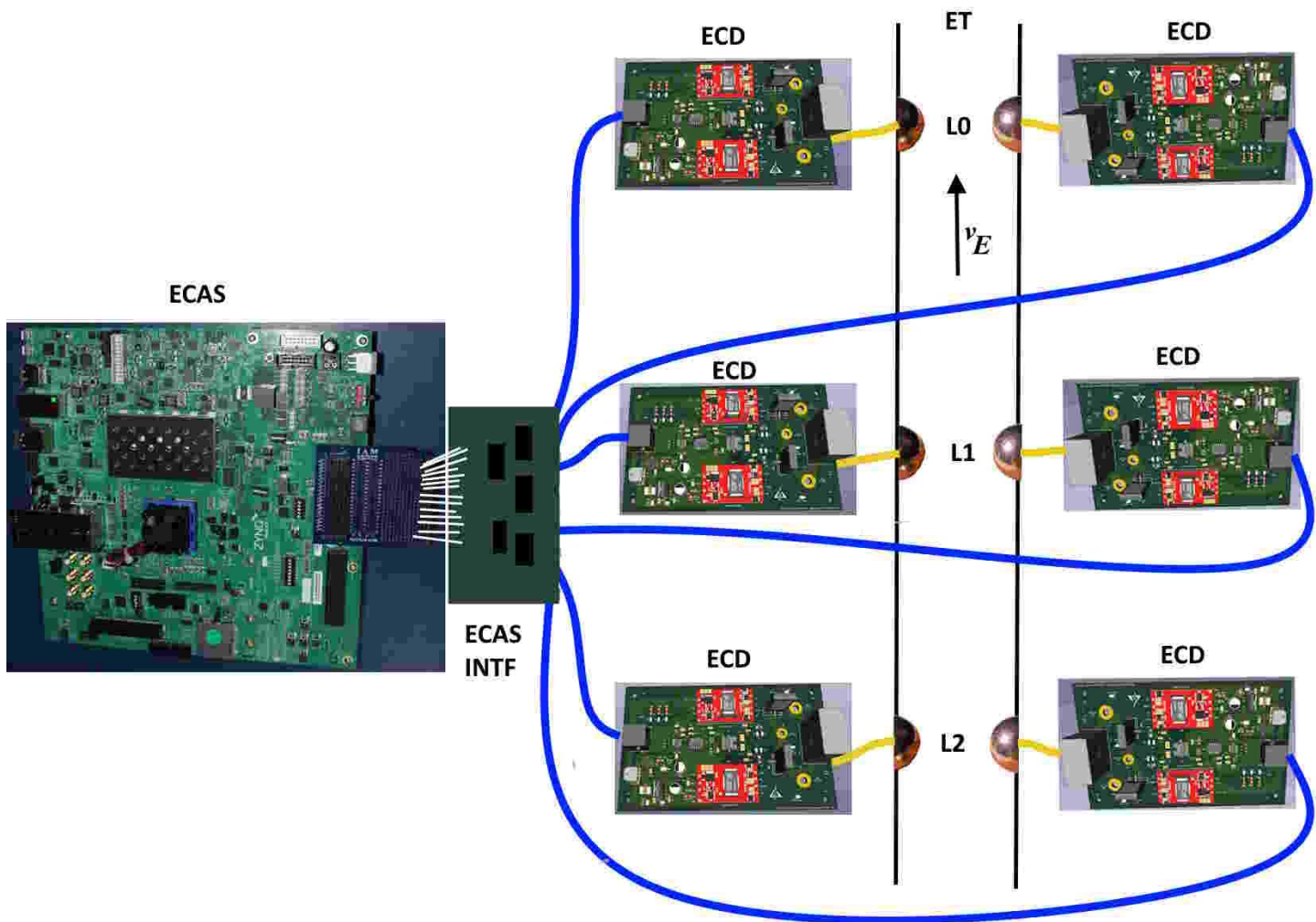
The LVDS signaling runs on normal ethernet cabling with RJ-45 jacks. There are six ECDs in the experimental prototype. They tie together at the FPGA input board, into the Engine Control Unit (ECU) running on Zynq FPGA fabric and the embedded AIM CPUs.



There will be six ECDs, and six electrodes in the Engine Tube (ET) for the prototype. This is a 3D virtual ECD board image; the actual ECD boards are currently being manufactured.



The ECDs switch electrodes on or off in response to a 'fluent' that is running on the rocket, producing a moving electric field down the rocket tube that uses the momentum of the ionized molecules in the tube to pull the rocket forward using the Coulomb forces of electrical attraction.



The ECAS Interface board will connect the Electrode Control and Synchronizer (ECAS) to the individual Electrode Charging Drivers (ECD) over ethernet cables running Low Voltage Differential Signaling (LVDS). The ECDs connect to the half-sphere electrodes, at levels L0 - L2 in the Engine Tube (ET) using flexible High Voltage wires.

‘SCRUM’ STATUS

COMPLETED

Completed the ECD circuit board design. Sent to manufacturing.

UPCOMING PLANS

Assemble the parts onto the ECD boards and test them.

Create the ECAS to ECD interface board that sends the control signals to each of the six ECD boards.

Design the Lexan housing and get it on order with the outside-mounted ECD holders.

Rehost the previous fluent code onto the UltraScale+ FPGA architecture.

Wire the system together.

Run the experiment.

BLOCKERS

None currently.

CONCLUSIONS

EXPERIMENT

The project is moving forward, one more board to design, and the boards have to be assembled. Then it can be wired up and the experiment performed. If it works, then it shows that the concept produces thrust, and more experimenters and developers may want to make their own versions, until the goal of a high-thrust, multi-domain engine is achieved. Massive amounts of thrust, far greater than the Saturn V at liftoff is predicted on paper for an optimized, one-meter-long engine, so it is expected that this experiment will produce a few Newtons at least.

More information can be found at <https://gravitronics.space> including the rocket technical paper, and previous progress newsletters.

THANK YOU

Please direct any questions and suggestions to:



Dr. Gregory A. Harrison
GRAVITRONICS LLC
Chief Technical Officer
gharrison2@cfl.rr.com
[Gregory Harrison | LinkedIn](#)