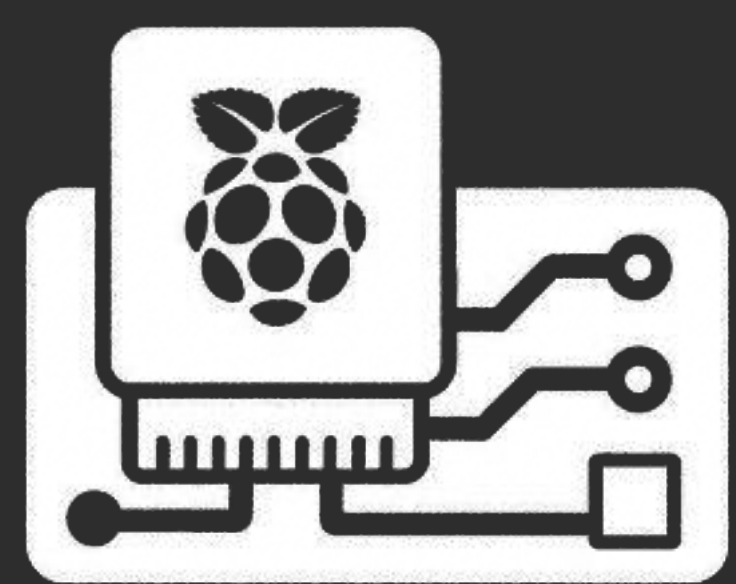




Pi in the Sky

Integrated RPi Companion Computer

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OVERVIEW

AeroVironment's **Varmint Flight Controller** has a native DDR4 SODIMM slot to offload complex compute tasks to a companion computer. Originally designed around an NVIDIA Jetson Orin NX, the **Pi in the Sky** team has developed a complete solution to enable compatibility with a cost-efficient **Raspberry Pi Compute Module 5 (CM5)**. The system centers around a custom high-speed carrier board that facilitates interfaces between supporting firmware and peripherals.

SHOWCASE

CM5 mounted on Varmint using Pi in the Sky Carrier Board



Hardware mounted on Holybro X500 Drone

HARDWARE STACK

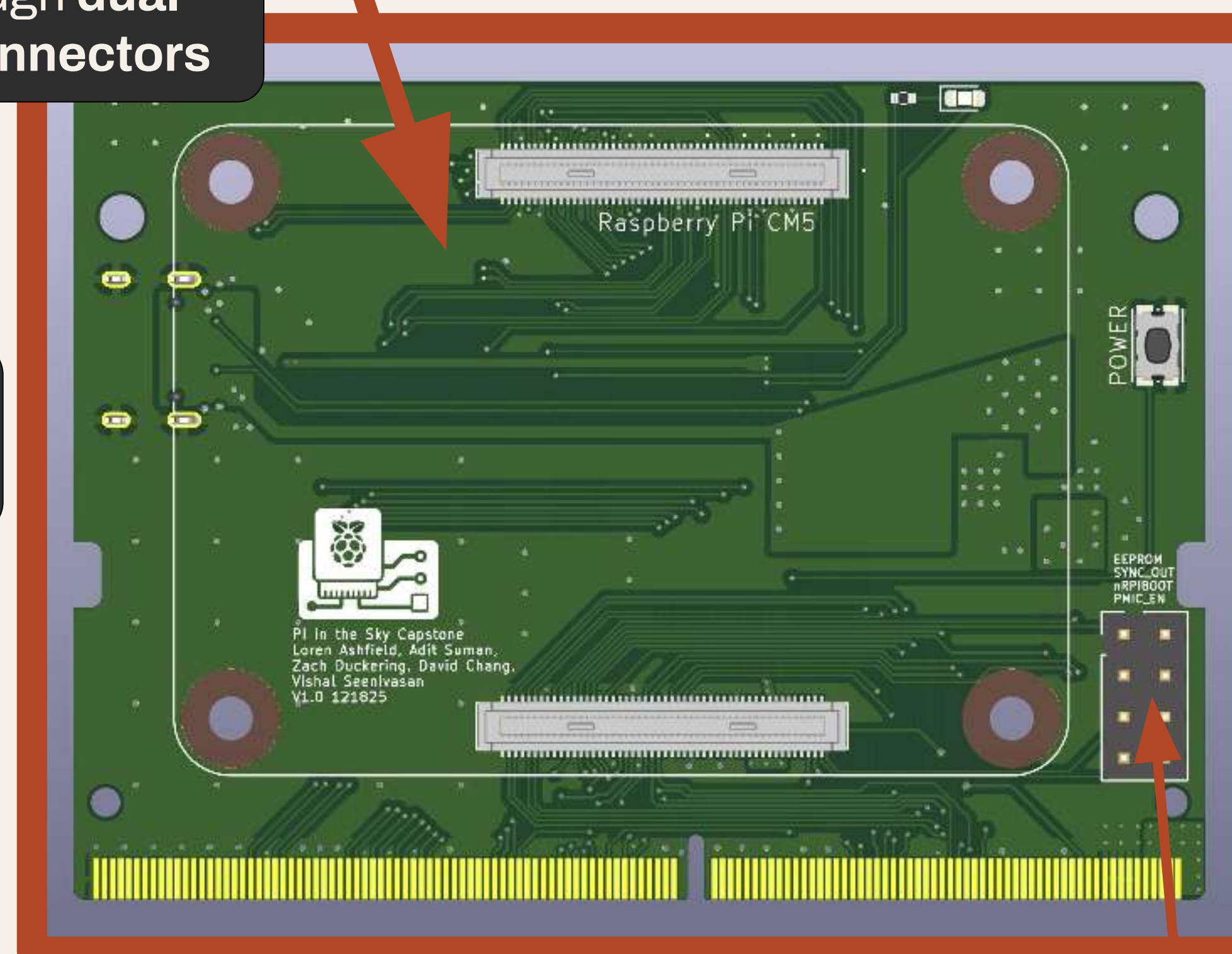


Raspberry Pi Compute Module 5

- Autopilot
- Image Processing
- State Estimation
- Data Analysis

Interfaces through dual high-density connectors

Carrier Board FRONT



Power Supply
Camera Port

Power and CM5 Debug

microSD Slot

USB-C and Alternate Power

Carrier Board BACK

Interfaces through DDR4 SODIMM

- USB, HDMI, M.2, GbE
- GPIO, SPI, I2C, UART

Contains HDMI, USB, M.2, and GbE ports for passthrough to CM5



AeroVironment Varmint

- Motor, Gyroscope, Sensor, Radio Interface
- Reports data to CM5

CM5 SOFTWARE

To enable the drone, **Robot Operating System (ROS)** based software is used. **ROSflight**, a set of software and firmware libraries built on ROS, facilitates communication between the CM5 and the Varmint. **ROSflight software** runs on the CM5. It receives raw data from the Varmint and interprets it to set PID controller gains, create mixer matrix for motor voltages, and power autopilot.

COMMANDS to Drone

```
[INFO] [1779842297.465883244] [rosflight_io]: Received all parameters
[INFO] [1779842297.466311084] [rosflight_io]: Mixer output channel types: 2 2 2 0 0 0 0 0
[INFO] [1779842297.466499876] [rosflight_io]: Primary mixer:
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
-5814.79 -5814.79 0 -5814.79 -5814.79 0 0 0
-25303.7 -25303.7 0 25303.7 25303.7 0 0 0
25303.7 -25303.7 0 25303.7 -25303.7 0 0 0
267066 -267066 0 -267066 267066 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
[INFO] [1779842297.466735646] [rosflight_io]: Secondary mixer:
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
-5814.79 -5814.79 0 -5814.79 -5814.79 0 0 0
-25303.7 -25303.7 0 25303.7 25303.7 0 0 0
25303.7 -25303.7 0 25303.7 -25303.7 0 0 0
267066 -267066 0 -267066 267066 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
[INFO] [1779842298.467927129] [rosflight_io]: ROSflight/firmware version: 2.0
```

DATA from Drone

Mixer Matrix for Motor Voltages set by CM5

VARMINT FIRMWARE

ROSflight firmware is flashed on the Varmint to interface with the drone and send data to the CM5. This data includes IMU measurements, state readings, and signals from the remote control. Incoming commands from the CM5 are used to control motors.