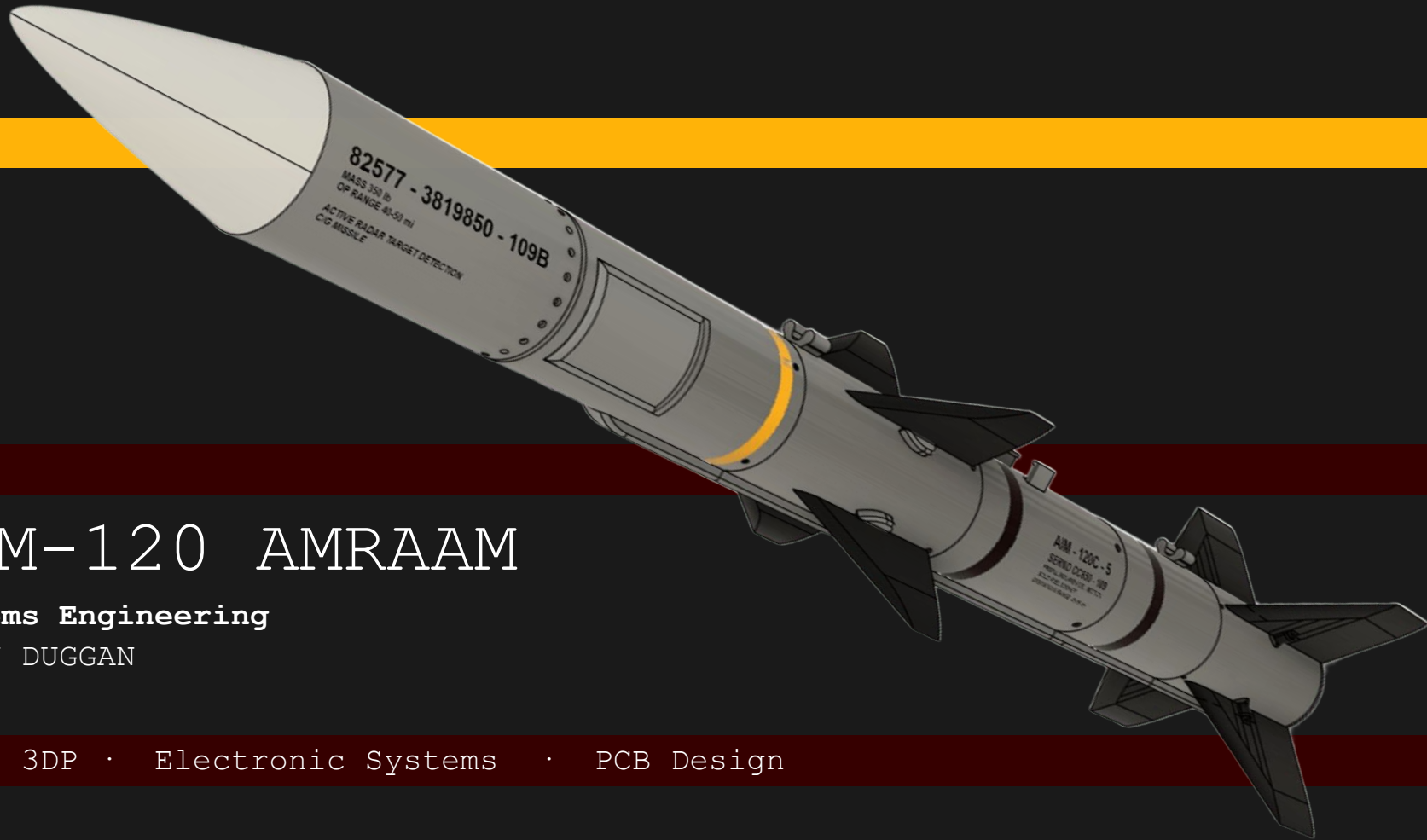


AIM-120 AMRAAM

Systems Engineering

AIDAN DUGGAN

CAD · 3DP · Electronic Systems · PCB Design



PROJECT SCOPE

Mechanical Design

CAD assembly featuring control surface actuation system and menu display for user control

Manufacturing

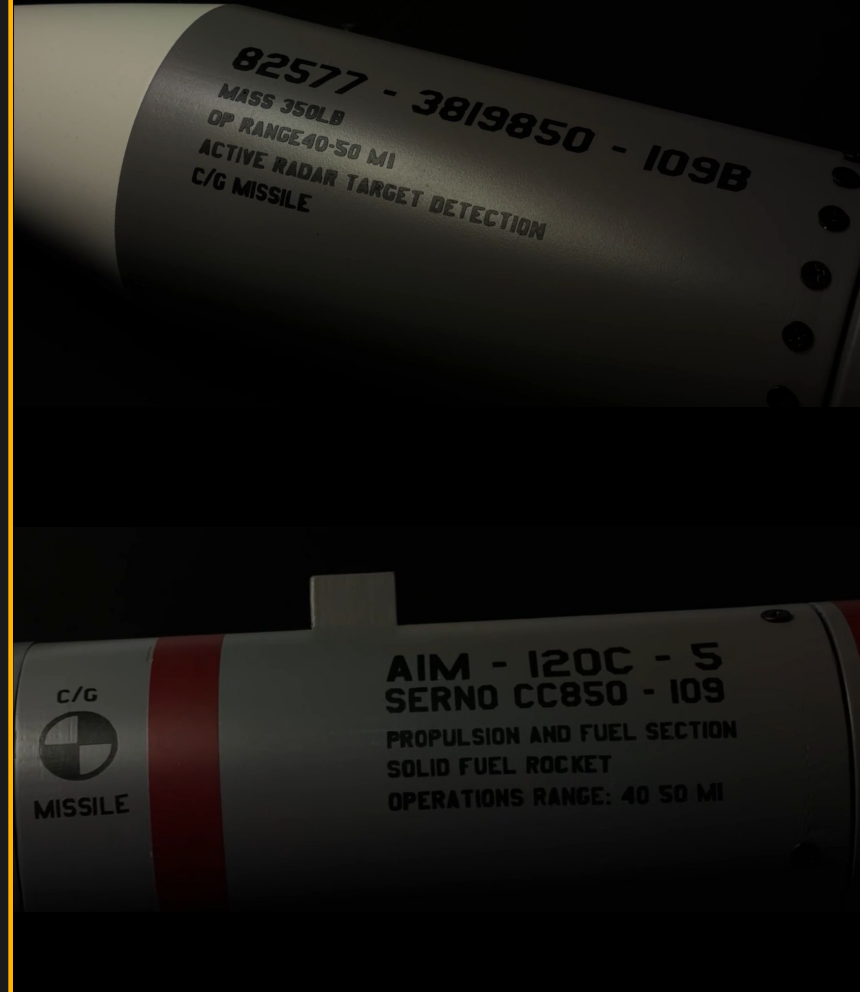
20+ custom 3D-printed components with multi-stage finishing, sanding, painting, and vinyl decal application

Electronics Integration

Custom PCB design, microcontroller programming, servo control system, and real-time display interface

Systems Engineering

Full mechanical-electrical integration with synchronized servo actuation and embedded firmware



CAD DESIGN & MECHANICAL ENGINEERING

Mechanical Features

- Sectional airframe with threaded inserts
- Roller bearing control surfaces
- Magnetic removal panel covers
- Cable routing channels



ELECTRONIC INTERFACE

Microcontroller Platform

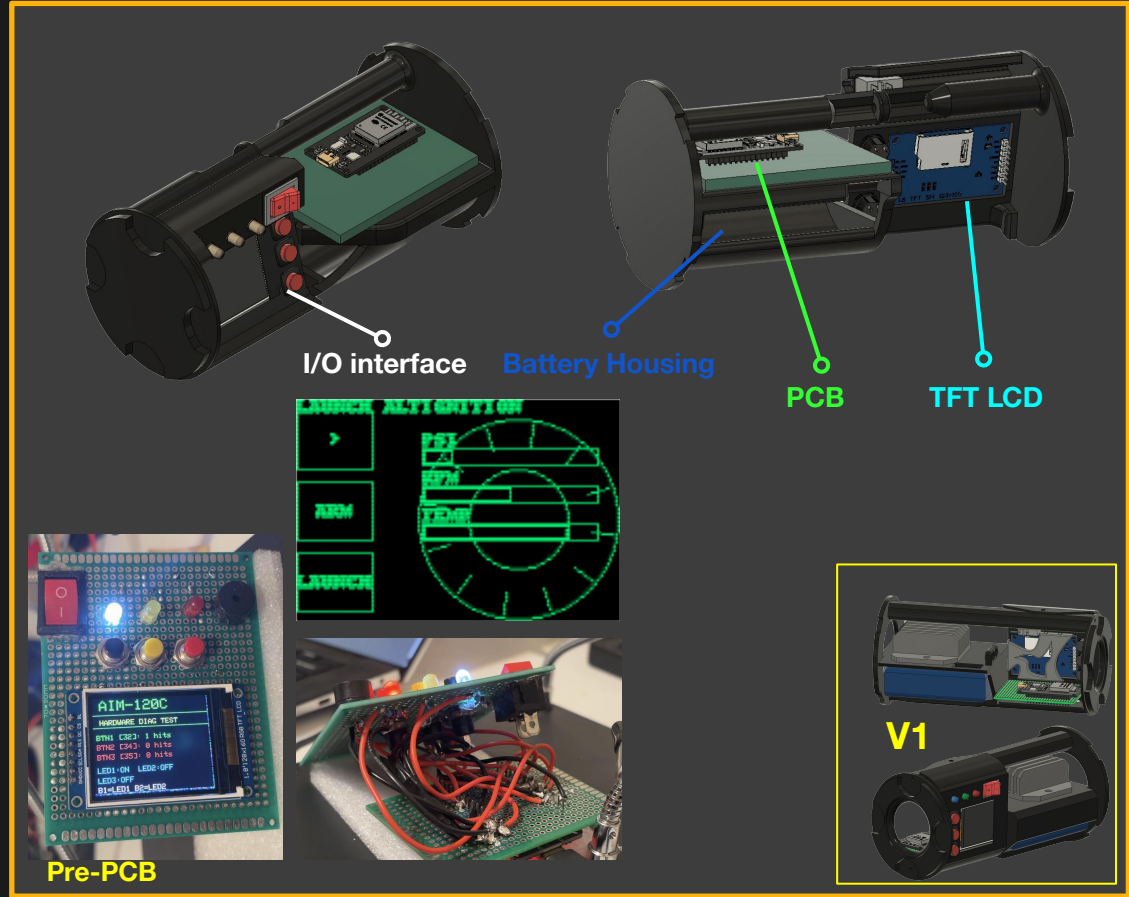
- ESP32 dual-core, custom PCB design
- PCA9685 PWM driver (fin actuation)

Display & User Interface

- 1.8" ST7735 TFT
- Custom C++ firmware menu
- 3-button input with LED feedback

Power Management

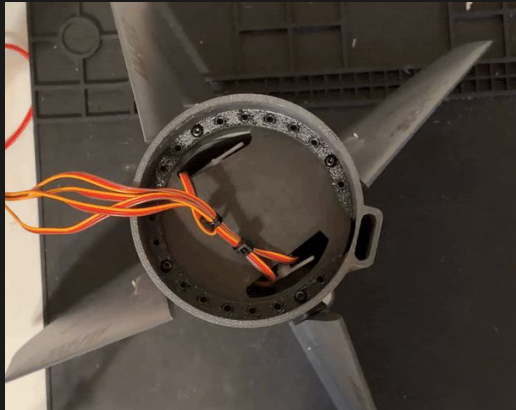
- Kill switch on I/O interface
- 20,000 mAh USB-C PD bank



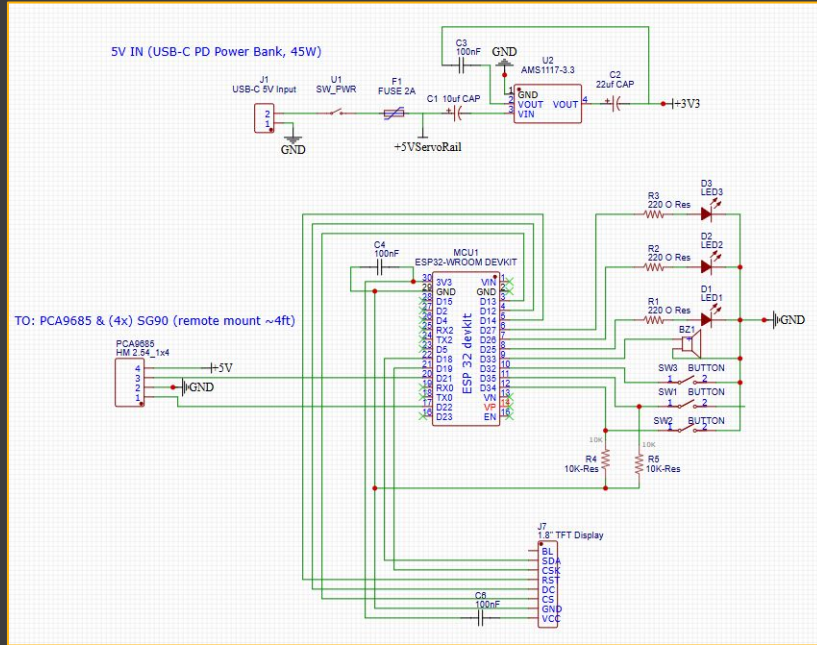
ACTUATION SYSTEM

Servo Control Architecture

- 4× 9g servo motors
- 40° control surface travel range
- Custom mechanical linkage (paperclip)
- Synchronized multi-servo control
- I2C bus interface



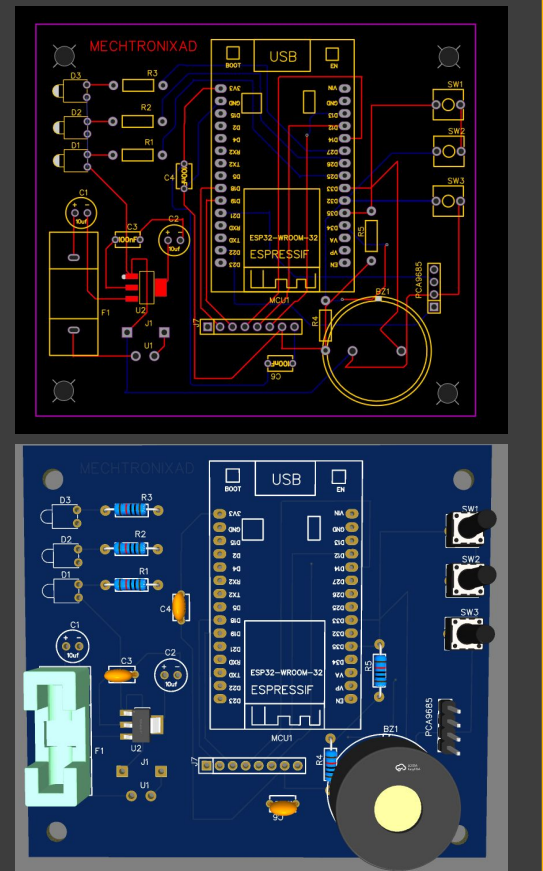
CIRCUIT & PCB DESIGN



PCB (WIP)

Stay tuned.

9x8
cm



DECALS, MARKING & SURFACE FINISHING

Vinyl Decal Design

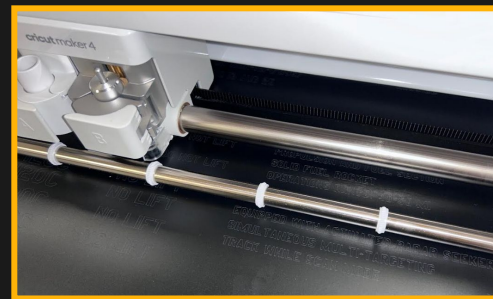
- Military designation: AIM-120C-5
- Operational specifications markings
- Serial numbers and part numbers
- Safety warnings and handling instructions

Decal Application

- Cricut precision cutting on vinyl
- Transfer tape alignment
- Protective clear coat layering

Authenticity Details

- Manufacturer markings (Raytheon)
- MFG dates and inspection stamps
- C/G missile center-of-gravity markings
- Lift points and warning labels



82577 - 3819850 - 109B

MASS 350 lb
OP RANGE 40-50 mi

ACTIVE RADAR TARGET DETECTION
C/G MISSILE

AIM - 120C - 5

SERNO CC850 - 109

PROPULSION AND FUEL SECTION
SOLID FUEL ROCKET
OPERATIONS RANGE: 40-50 mi



MISSILE

PN 82577-3819850-109B
MFD 04 JUN 25
MFG RAYTHEON

SN AMR-AD-173867
INS 13 AUG 25

TECHNICAL SPECIFICATIONS

60"

Length

4"

Diameter

<10 lbs

Weight

100+

Print Hours

20+

Unique Custom Components

6

Months Build Time

MISSION COMPLETE

Systems Engineering Project

Mechanical Design · 3D Printing · Electronics Integration · Embedded Firmware

Fall 2025 - Spring 2026