Module 5 UAS Prototyping, Modelling and Mounting

1. SCENARIO

Your VTOL airframe needs a nose-mounted gimbal camera for a survey mission. You are provided with a SIYI A8 mini-3-axis gimbal camera and a sample of mounting kit currently used to fit it (a camera-side plate and a frame-side plate). Your task is to design, and 3D print a mount that allows the camera to be attached to the existing mounting plate.

2. FIXED INTERFACES

Two interfaces are fixed and must be replicated exactly. Everything between them is open design space. Measure both directly from the camera and sample plates provided using calipers or use the provided CAD files.

Interface A — Camera side:

- The SIYI A8 mini's top mounting plate.
- Clearance for the gimbal's full range of motion — do not let your design intrude into the pitch, yaw, or roll envelope.
- Clearance/routing for the camera's cabling (power/video/data) and SD Card slot.

Interface B — Airframe side:

- The hole pattern on the frame-side plate, which mates to the nose bulkhead plate of the VTOL airframe.
- The available envelope inside the nose cone — check for clearance against the airframe shell before finalizing your design.

3. REFERENCE HARDWARE

Camera	SIYI A8 mini — 3-axis gimbal, 4K/8MP, 6X digital zoom
Camera size	55 × 55 × 70 mm (approx.)
Camera weight	≈ 95 g
Gimbal range	Pitch –135°…+45° • Yaw ±160° • Roll ±30°
Camera power	11–25.2 V DC
Camera I/O	Video: Ethernet / HDMI / CVBS • Control: S.Bus / UART / UDP
Stock mount (baseline)	Two-piece plate set — camera-side plate + nose mounting plate, bolted together around a shared bolt pattern

4. DESIGN CONSTRAINTS

- Weight: minimize mass — this is a flight-critical nose component. Designed component should be at or below the cameras weight.
- Material: PLA using the default settings unless otherwise specified.
- Print orientation: mating faces (both interfaces) must print without requiring support material where practical.
- Rigidity: the mount must not flex enough under normal flight vibration to affect gimbal stabilization.
- Cable routing: camera cabling must be able to be run cleanly without pinching, sharp bends, or interference with the gimbal's movement.
- Serviceability: the camera should be removable/replaceable without disassembling the mount from the airframe, if practical.

5. DESIGN REQUIREMENS (Must be met)

- Avoid sharp internal corners; use generous fillets (0.5–1mm minimum)
- Screw bosses/holes are sized and reinforced appropriately for the supplied fasteners; no cracking or stripping during assembly. Thicken the wall around the hole so there is more material to spread the stress. A rough rule: keep at least 1.5–2x the hole diameter as wall thickness around it (so ~3-4mm of material surrounding a 2mm hole).
- Allow for dimensional accuracy - FDM holes typically print 0.1–0.3mm undersized due to how the nozzle traces circles. For a 2mm hole meant to fit a screw, model it slightly oversized (2.2–2.3mm).
- Keep wall thickness uniform (avoid thin-to-thick transitions) to reduce differential shrinkage and residual stress.
- Minimum feature size: stay above ~0.8–1.2mm for walls and ribs printed in these high-viscosity, high-temp materials; thinner features can under-extrude or warp badly.

6. QUESTION TO ANSWER (Complete on this document and had in with your USB stick)

Given the following choice of materials and critical requirements of the design what would be the best material to choose tor the actual production of the designed part.

Material	Reason Selected
TPU95A	
PLA	
Nylon	
PETG	
ABS	

Competitor Name and Country: _____