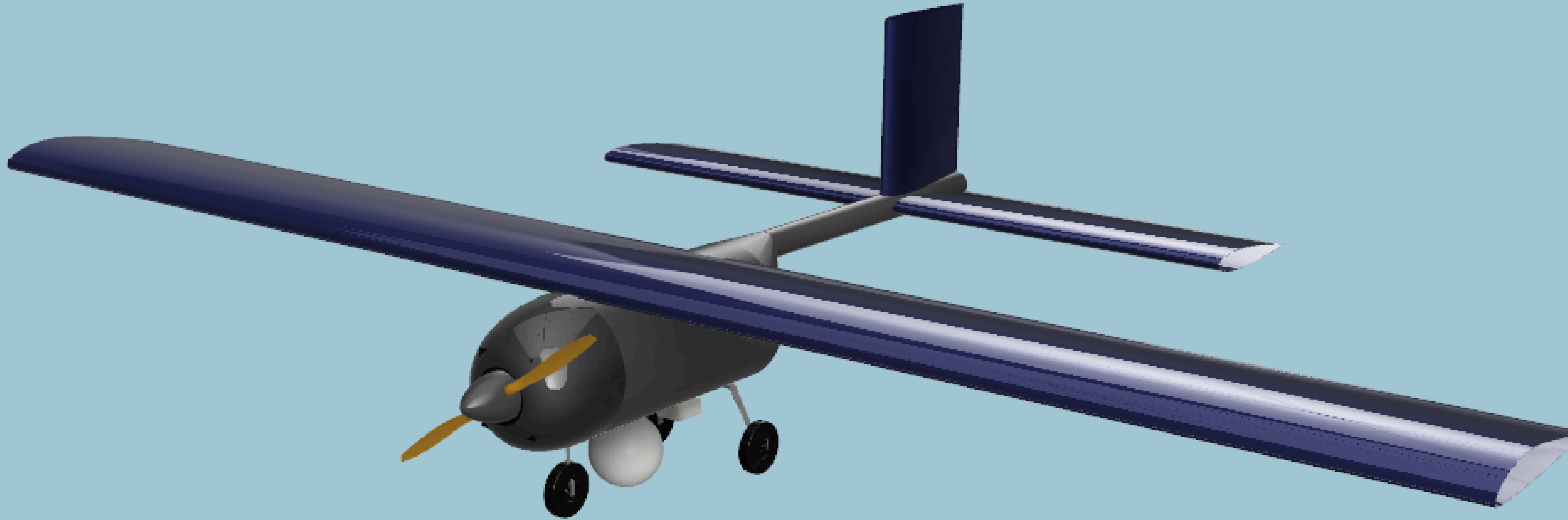


Group 5

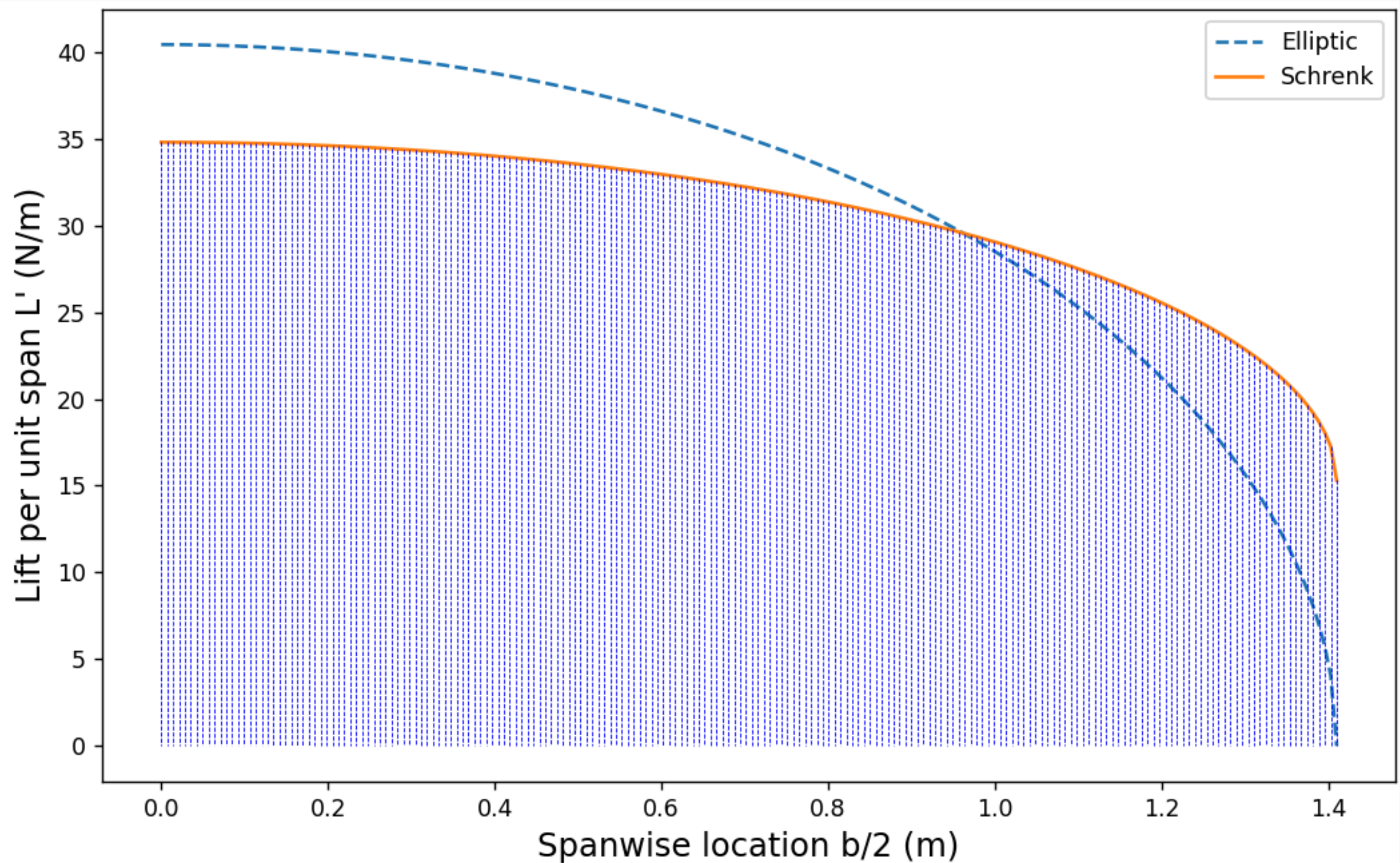
- **AE21B002 : Abhigyan Roy**
- **AE23M004 : Vinu Mathew**
- **AE23M008 : Anish Konar**
- **AE23M014 : Gautham Anil**
- **AE23M006 : Aditya Sai Deepak Rachagiri**
- **AE23M033 : Satyam Chandra**

Design Overview

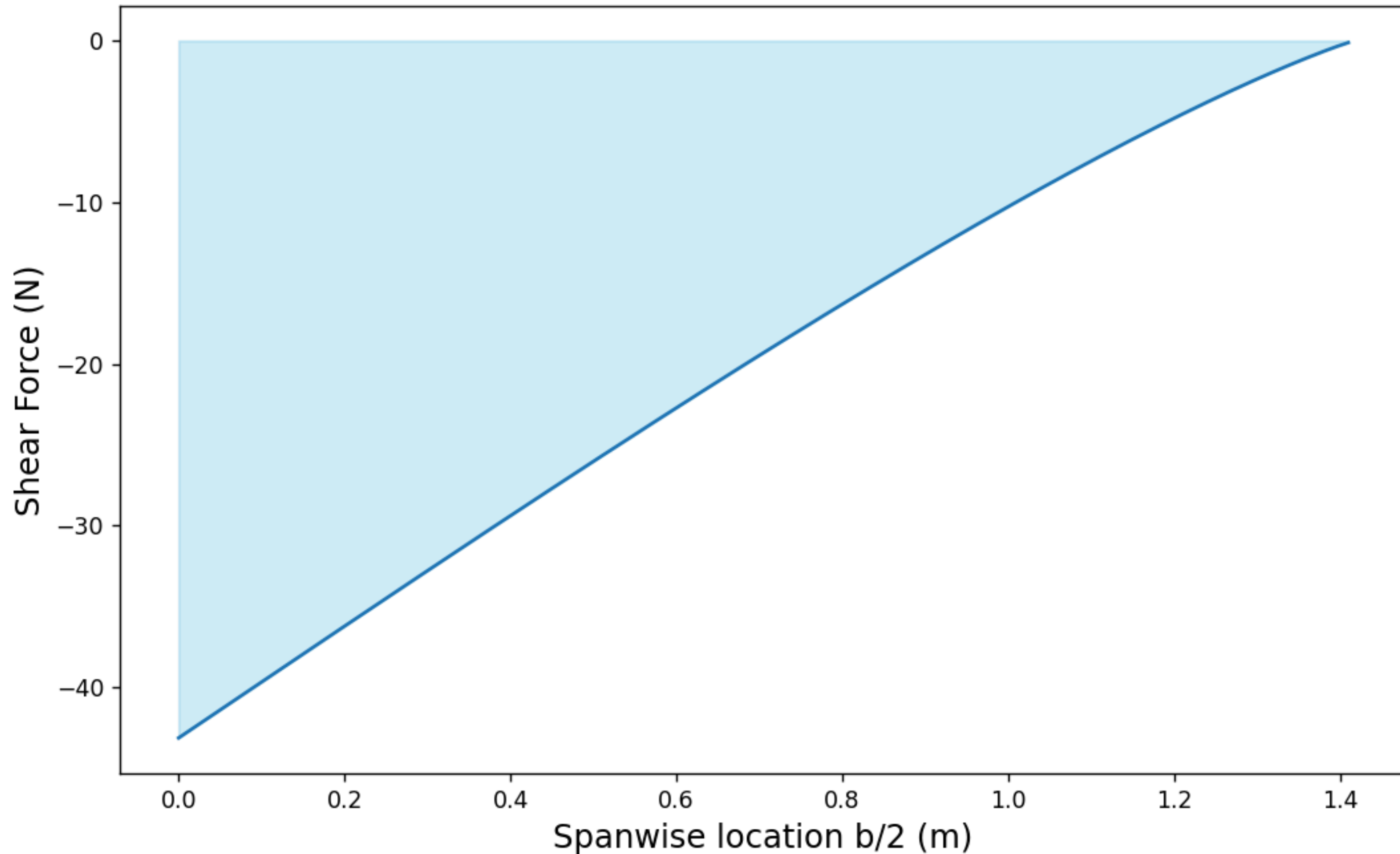


Parameters	Value		
MTOW	8.80 Kg	<div> <div>Horizontal Tail Area</div> <div>0.42 m^2</div> </div> <div> <div>Horizontal Tail Span</div> <div>1.5 m</div> </div> <div> <div>Horizontal Tail Taper Ratio</div> <div>1</div> </div> <div> <div>Horizontal Tail Root Chord</div> <div>0.28 m</div> </div> <div> <div>Horizontal Tail Tip Chord</div> <div>0.28 m</div> </div> <div> <div>Horizontal Tail Aspect Ratio</div> <div>5.0</div> </div> <div> <div>Horizontal Tail Twist Angle</div> <div>0 Deg</div> </div> <div> <div>Horizontal Tail Sweep Angle</div> <div>0 Deg</div> </div> <div> <div>Horizontal Tail Dihedral Angle</div> <div>0 Deg</div> </div> <div> <div>Horizontal Tail Setting Angle</div> <div>2 Deg</div> </div> <div> <div>Horizontal Tail Aerofoil</div> <div>NACA 0014</div> </div> <div> <div>Elevator Area</div> <div>0.105 m^2</div> </div> <div> <div>Elevator Chord</div> <div>0.07 m</div> </div> <div> <div>Elevator Span</div> <div>1.5 m</div> </div>	
Max Payload Weight	2.00 Kg		
Design Payload Weight	1.50 Kg		
Powerplant Weight	2.30 Kg		
CG location (from nose)	0.50 m		
Wing Area	0.96 m^2		
Wing Span	2.80 m		
Wing Taper Ratio	1		
Wing Root Chord	0.34 m		
Wing Tip Chord	0.34 m		
Wing Aspect Ratio	8.34		
Wing Twist Angle	0 Deg		
Wing Sweep Angle	0 Deg		
Wing Dihedral Angle	2 Deg		
Wing Setting Angle	1 Deg		
Wing Aerofoil	GOE 553	<div> <div>Vertical Tail Area</div> <div>0.14 m^2</div> </div> <div> <div>Vertical Tail Span</div> <div>0.4 m</div> </div> <div> <div>Vertical Tail Taper Ratio</div> <div>1</div> </div> <div> <div>Vertical Tail Root Chord</div> <div>0.35 m</div> </div> <div> <div>Vertical Tail Tip Chord</div> <div>0.35 m</div> </div> <div> <div>Vertical Tail Aspect Ratio</div> <div>1.14</div> </div> <div> <div>Vertical Tail Twist Angle</div> <div>0 Deg</div> </div> <div> <div>Vertical Tail Sweep Angle</div> <div>0 Deg</div> </div> <div> <div>Vertical Tail Dihedral Angle</div> <div>0 Deg</div> </div> <div> <div>Vertical Tail Setting Angle</div> <div>0 Deg</div> </div> <div> <div>Aerofoil</div> <div>NACA 0014</div> </div> <div> <div>Rudder Area</div> <div>0.042 m^2</div> </div> <div> <div>Rudder Chord</div> <div>0.105 m</div> </div> <div> <div>Rudder Span</div> <div>0.4 m</div> </div>	
Aileron Area	0.05 m^2		
Aileron Chord	0.09 m		
Aileron Span	0.56 m		
Fuselage Length	1.20 m		
Fuselage Diameter	0.25 m		
Fuselage Width	0.20m		

Lift Distribution

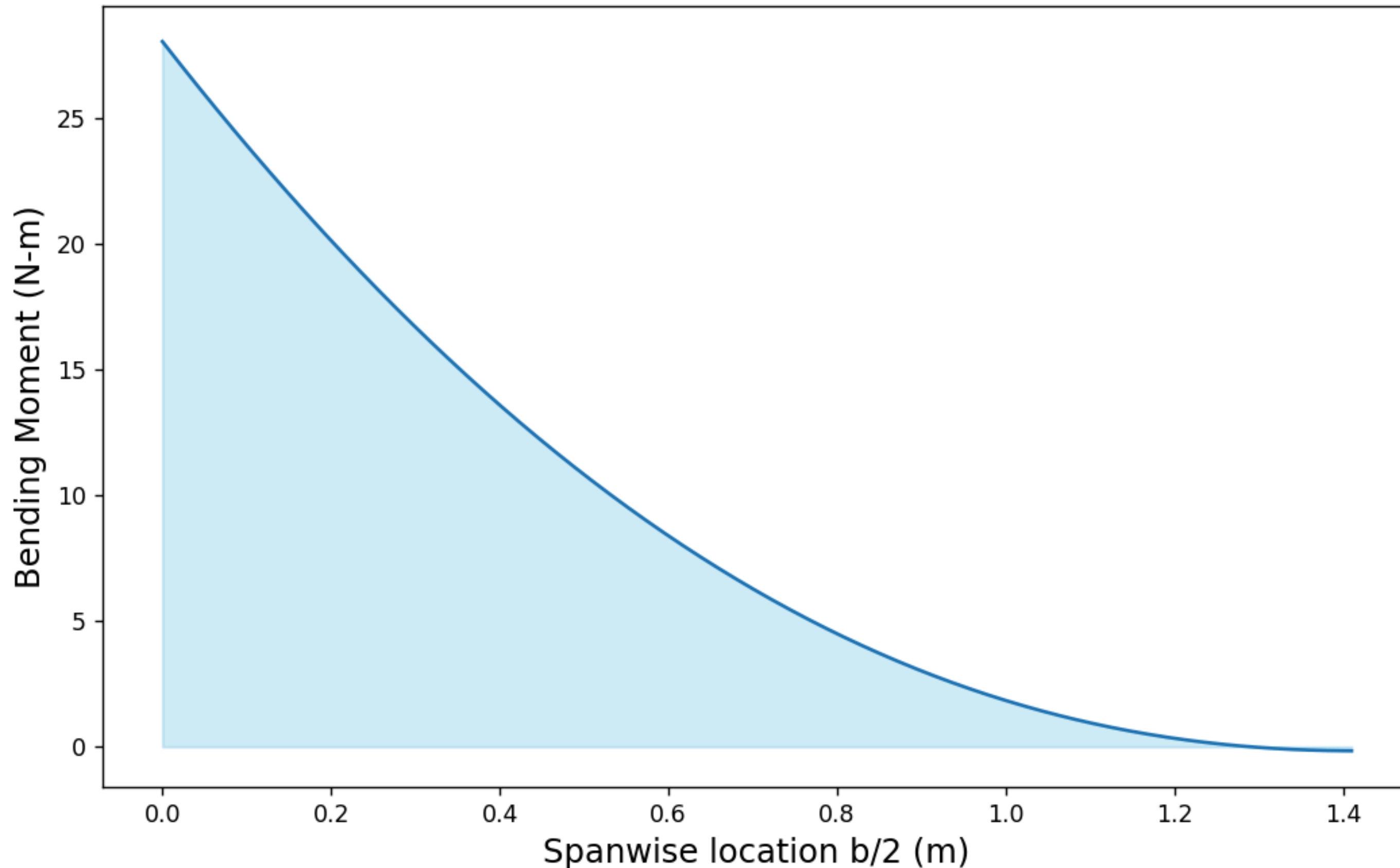


Shear Force Diagram



**Maximum shear
force = 43N**

Bending Moment Diagram



**Maximum
bending moment
= 27 Nm**

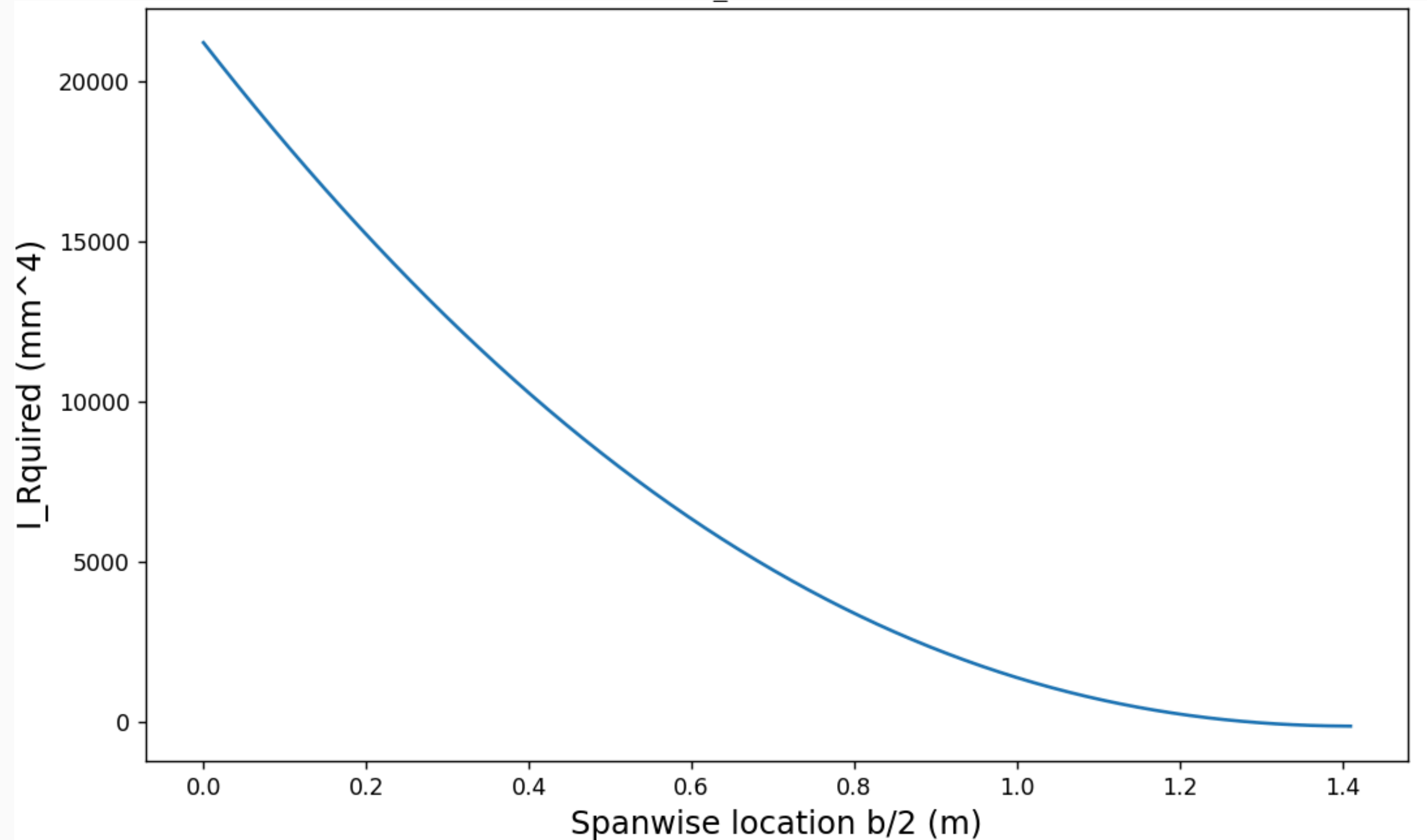
Spar Design

- Stress Concentration Factor ($k = 3$)
- Fatigue Factor ($f = 1.5$)
- Factor of Safety ($m = 1.15$)
- Maximum Load Factor ($n = 3$)
- $\sigma_{\text{yield}} = 290 \text{ MPa}$

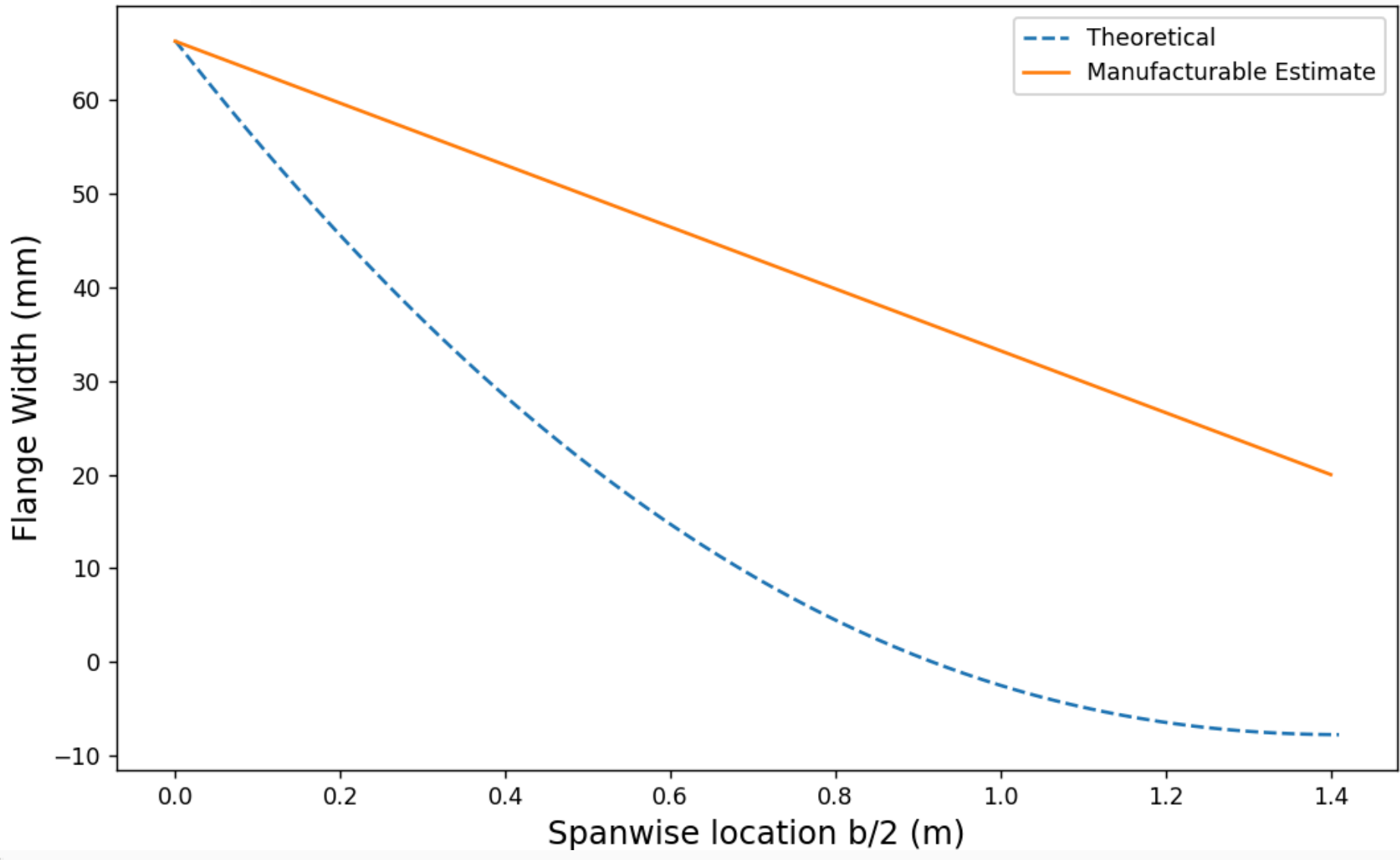
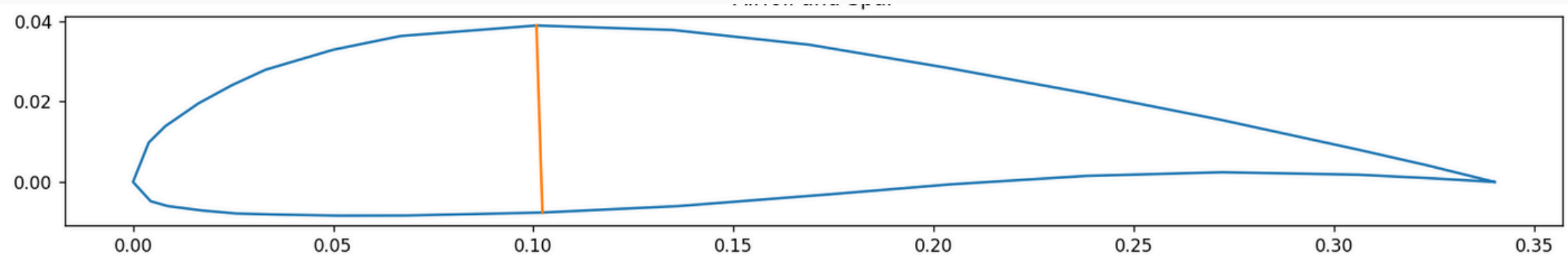
$$\sigma_{\text{allowable}} = \frac{\sigma_Y}{n \times f \times k \times m}$$

The centroid of the skin panel was calculated, and the moment of inertia calculation was performed with the centroid as the origin.

$$I_{\text{skin}} = \int_A y^2 dA = 56300 \text{ mm}^4$$



$$I_{\text{spar}} = \frac{th^3}{12} + w \times t \times \left(\frac{h}{2}\right) \times 2 = \frac{M_{\text{max}} \cdot y}{\sigma_{\text{allowable}}} - I_{\text{skin}}$$



Bill of Materials

Structural Components				
Component	Specification	Quantity (kg or pc)	Total (Rs.)	Lead time (days)
Aluminum sheets	5052 Aluminum Sheet Metal 12 x 12 x 1/64 (0.02") Inch Thickness Aluminum Plate Covered with Protective Film Heat Treatable Aluminum Metal Plate	72	67260	21
Landing Gear Assy	Aluminum Main Landing Gear Wheel Kit RC Airplane	1	3863	21 days
Engine mouting brackets	RC Airplane Motor Mount, Aluminium Alloy Motor Support Universal Motor Bracket for RC Plane Motor	1	3123	21 Days
Nuts & bolts	Slotted M3 nut bolt pair with washers	50	250	1 day
Rivets	.2mm X 20mm Steel Aluminium (1/8" X 3/4" inch) Blind Rivets (POP Rivets)	200	398	7 Days
Tyres	3.5 Inches 89mm PU Wheels	3	2700	3 Days
Servo	Metal Gear Digital 12G Servo	7	6860	3 Days
Control rods	0.047x10.24 Steel Pushrods, Nylon 0.79x0.43 Lock on Control Horns 4 Holes	10	2823	21 Days
Link mechanisms	Adjustable Pushrod Connector Linkage Stopper 1.3mm, Nylon Control Horns 21x10 mm, 1.2 x 210mm Z Push Rods Parts Compatible for RC Airplane	1	2996	21 Days

Bill of Materials

Component	Specification	Quantity (kg or pc)	Total (Rs.)	Lead time (days)
PLA for 3D printer	eSun PLA+ 1.75mm 3D Printing Filament 1kg-Cold White	1	1299	11 days
Stainless steel sheet	Stainless Steel Shim Sheet Grade SS 304	25	55000	10 Days
Hinges for door	PVC Pinned Hinges for RC Hobby Model Plane	10	468	21 Days
Locking wire	Aviation Metal & Alloys Pure Titanium Wire	5m	660	10 Days
Foam filling	EPE Foam Sheet 12 Inches X 12 Inches 15 MM Thickness	3	1107	10 Days
Cable ties	Cable Ties (300mm x 7.6 mm)(12 Inch),Heavy Duty Zip Ties Self Locking Strength up to (60 KGS)	100	986	10 Days

Bill of Materials

Propulsion Components				
Component	Specification	Quantity (kg or pc)	Total (Rs.)	Procurement time (days)
Motor	T Motors AT7215 30CC KV220	1	23869	14 Days
Propellor	TF 16 * 8 Propellor	1	3500	14 Days
ESC	T-Motor AT 115A 14S ESC	1	11195	25 Days

Bill of Materials

Avionics Components				
Component	Specification	Quantity (kg or pc)	Total (Rs.)	Procurement time (days)
Flight Controller	FMS RC Airplane Gyro Reflex Flight Control System	1	2160	21 Days
Transmitter & Receiver with camera and display	SIYI MK15 Smart Agriculture FPV Combo	1	44779	25 Days
Cables	High Quality Ultra Flexible 14AWG Silicone Wire – Red	1	66	10 Days
Range extending Antenna	SIYI MK15 MK32 Long Range Antenna 14dB Directional Patch Antenna with SMA Connector	1	3250	25 Days
Battery	22.8v Tattu Battery 6s 22.2v 18000mah Lipo Battery, Operating Temperature Range: 15-65C, Battery Type: Lithium-Polymer	1	23500	21 Days
Navigation lights	3PCS/Set RC Plane LED Light Kit for Helicopter Airplane Aircraft, Wireless Red Green White LED Flashing Lights	1	4361	21 Days
Battery Charger	Tattu TA1000 G-Tech Dual-Channel Charger 25A*2 1000W For 1S-7S Drone Battery	1	23689	25 Days

Bill of Materials

Tools				
Component	Specification	Quantity (kg or pc)	Total (Rs.)	Procurement time (days)
Spanner multi size	SPARTAN Carbon Steel Open Jaw Spanner Set/Wrench Set/Tool Kit Multipurpose Home Use and Professional Spanners, Corrosion Resistant Chrome Plating DOE Jaw Spanners (10 Piece)	1	599	7 Days
Screw driver Set	amazon basics 51-Piece Precision Screwdriver Bit Set, 17.1 X 9.7 X 2.8 Cm, Black	1	599	2 Days
Riveting tool	Rivet Gun 10" Hand Riveter, Standard Hand Pop Riveter Gun Professional Pop Rivet Gun, for Metal, Wood and Plastic for Aluminium Blind Pop Rivets for Rivet Sizes 2.4mm/3.2mm/4.0mm & 4.8mm	1	299	2 Days
Drilling machine	STANLEY SDH550KP 550W 10mm Corded Single Speed Hammer Drill Machine and Hand Tool Kit (120-Pieces) - Includes Hammer Drill, Measurement Tape, Drill Bits, Hammer, 1 Year Warranty	1	2989	2 Days
Twister	WIRE TWISTER PLIER 6"	1	2299	7 Days
DMM	Themisto TH-M98 Digital Multimeter (Black 2000 Counts)	1	798	5 Days

Thank You