
ENGR. MUHAMMAD OSAMA

MECHANICAL ENGINEER

CAD DESIGNER

PORTFOLIO

ABOUT ME

- ➡ 2+ Years of experience as a Mechanical Engineer - specializing in full product development lifecycle, from concept to production.
- ➡ 3+ Years of experience as CAD designer using multiple software especially SolidWorks— part, assemblies or sub-assemblies design, ensuring precision and efficiency.
- ➡ Proven ability to work and manage tasks independently including hands-on tasks.
- ➡ Expertise in Design for Manufacturing and Assembly (DFMA), prototyping and 3D printing for optimized production processes.
- ➡ Skilled in generating BOMs, 2D drawings and technical documentation, supporting seamless project execution.
- ➡ Strong cross-functional collaboration, working effectively with diverse teams to achieve project goals.
- ➡ Experienced in working fast-paced + high level of ambiguity in dynamic start-up environment in short deadlines.
- ➡ Proven ability to deliver multiple customized successful projects.

PORTFOLIO STATEMENT

This portfolio demonstrates a broad range of design and engineering skills that extend beyond UAV projects. It includes expertise in part design, large-scale assembly development, and system integration, with a focus on manufacturability, precision, and compliance with engineering standards. The work reflects proficiency in CAD modeling, prototyping, and technical documentation, showcasing the ability to deliver innovative, production-ready solutions across diverse mechanical and product design applications.

PROJECTS COMPLETED

➡ Loiter Munitions UAVs

- Designed, drafted CAD including installation planning of components, and fabricated UAVs specialized for loitering munitions operations.

➡ VTOL Fixed-Wing UAVs

- Designed, drafted CAD including installation planning of components, and fabricated drones specialized for VTOL UAVs.

➡ Copters (QUAD – HEXA – OCTA – COAXIAL)

- Initiated and extensively worked on designing, drafting and handling CAD assemblies of copters including manufacturable parts and components installation planning for fabrication.

➡ Ground Control Stations (GCS)

- Engineered, developed part lists and installation planning for electrical components for GCS.

➡ Payload Mechanism Attachments

- Created CAD and refined mechanism attachments for various payloads, enhancing operational capabilities.

Pneumatic UAV Launcher (RAIL + TUBE)

- Modelled CAD, selection of materials to ensure optimal design performance and authored, managed technical reports and documentation.

PROJECTS OVERVIEW

DISCLAIMER

All images and information presented in this portfolio are publicly available from online sources, such as social media or company website. No confidential or proprietary data has been included in this presentation.

CONTENTS COVERED

- UAV COPTERS
- FIXED-WING UAVs
- 2D DRAWINGS
- GROUND CONTROL STATION (GCS)
- 3D PARTS
- 3D PRINTING
- TECHNICAL DOCUMENTATION

UAV COPTERS

SKILLS INCLUDES:

- ➔ CONCEPTUALIZATION
- ➔ COMPONENTS SELECTION
- ➔ MATERIAL SELECTION
- ➔ AVAILABILITY IN THE MARKET
- ➔ COMMUNICATION WITH THE SUPPLIERS
- ➔ COST EFFICIENCY
- ➔ 3D MODELLING
- ➔ AVIONICS PLACEMENT IN CAD
- ➔ WEIGHT OPTIMIZATION
- ➔ DFMA
- ➔ BOM
- ➔ 3D PRINTING
- ➔ 2D DRAWING
- ➔ FABRICATION
- ➔ MANUAL ASSEMBLY (by hand)
- ➔ MAKING OF PICTORIAL ASSEMBLY DOCUMENT FOR TECHNICIANS
- ➔ GUIDING THE TECHNICIAN FOR PRODUCTION
- ➔ PRODUCTION



QUAD-COPTER WITH FUEL-CELL PAYLOAD

UAV COPTERS



QUAD-COPTER WITH FUEL-CELL

- ➔ CUSTOMIZED DESIGNED OF COPTER
- ➔ PLATES
- CUSTOMIZED PAYLOAD ATTACHMENTS
- ➔
- CUSTOMIZED DESIGNED TO INCORPORATE:
 - FUEL CELL CYCLINDER*
 - FUEL CELL POWER SUPPLY*
 - SPACERS*
 - MAKING SURE TO HAVE ENGOUGH SPACE FOR SEAMLESS INTERAGRATION OF AVIONICS*
 - ENOUGH AND PROPER SPACE FOR WIRING*
 - CUSTOMIZED DESIGN FOR ARMS HOLDERS*
 - CUSTOMIZED LANGING GEAR*

UAV COPTERS



PAYLOAD RELEASING MECHANISM FOR
MORTAR SHELLS

- ➡ CUSTOMIZED DESIGN OF COPTER
- ➡ PLATES
- ➡ CUSTOMIZED PAYLOAD ATTACHMENTS
- ➡ CUSTOMIZED DESIGN TO INCORPORATE:
 - CUSTOM RELEASING MECHANISM FOR SHELLS*
 - ENOUGH SPACE FOR SEAMLESS INTERAGRATION OF AVIONICS*
 - ENOUGH SPACE FOR WIRING*
 - CUSTOMIZED DESIGN FOR ARMS HOLDERS*
 - CUSTOMIZED LANDING GEAR HOLDERS*
 - CUSTOMIZED MOTOTR MOUNTS*
 - CUSTOMIZED ARM CLAMPERS*

UAV COPTERS



QUAD-COPTER WITH BATTERY
COMPARTMENT AND GIMBAL

- ➡ CUSTOMIZED DESIGN OF COPTER
- ➡ PLATES
- ➡ CUSTOMIZED PAYLOAD ATTACHMENTS
- ➡ CUSTOMIZED DESIGN TO INCORPORATE:
 - CUSTOM BATTERY HOUSING*
 - ENOUGH SPACE FOR SEAMLESS INTERAGRATION OF AVIONICS*
 - ENOUGH SPACE FOR WIRING*
 - CUSTOMIZED DESIGN FOR ARMS HOLDERS*
 - CUSTOMIZED LANDING GEAR*
 - CUSTOMIZED MOTOR MOUNTS*
 - CUSTOMIZED ARM CLAMPERS*
 - CUSTOMIZED DESIGN FOR GIMBAL CAMERA ATTACHMENT*

UAV COPTERS



QUAD-COPTER WITH HAVING PALOAD
RELEASING MECHANISM



QUAD-COPTER WITH GIMBAL

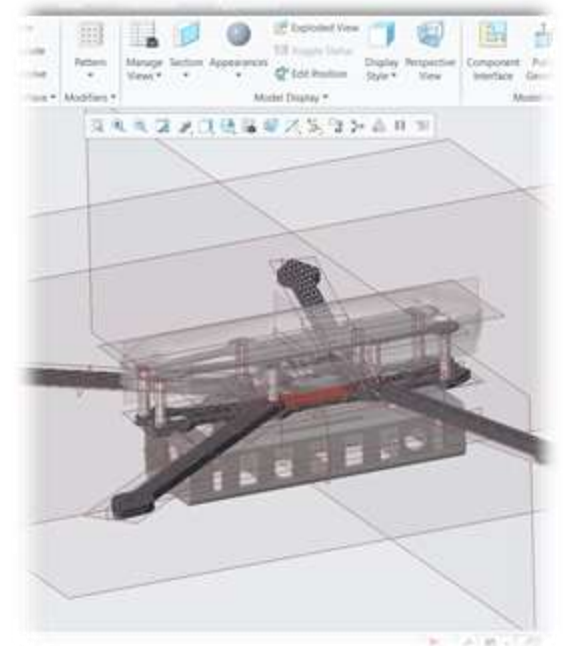
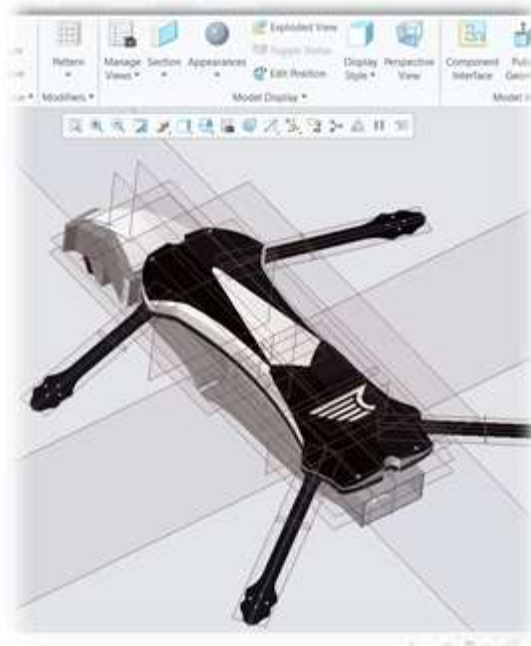
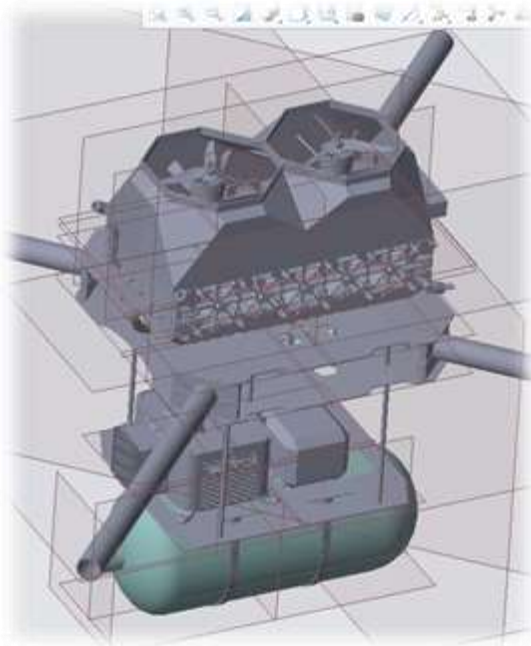
UAV COPTERS



COAXIAL COPTER CUSTOMIZED DESIGN
TO INCORPORATE FUEL CELL AS A
PAYLOAD

UAV COPTERS

A GLIMPSE OF CAD SCREENSHOTS



FIXED WING UAVs

SKILLS INCLUDES:

- ➡ CONCEPTUALIZATION
- ➡ UNDERSTANDING OF CLIENT REQUIREMENTS
- ➡ COMPONENTS SELECTION
- ➡ AVAILABILITY IN THE MARKET
- ➡ COMMUNICATION WITH THE SUPPLIERS
- ➡ 3D MODELLING OF OUTER BODY
- ➡ 3D MODELLING OF INTERNAL STRUCTURE
- ➡ AVIONICS PLACEMENT IN THE CAD
- ➡ WEIGHT OPTIMIZATION
- ➡ DFMA
- ➡ BOM
- ➡ 3D PRINTING
- ➡ 2D DRAWING
- ➡ FABRICATION
- ➡ MANUAL ASSEMBLY (by hand) INCLUDING INTERNAL STRUCTURE ASSEMBLY
- ➡ MAKING OF PICTORIAL ASSEMBLY DOCUMENT FOR TECHNICIANS GUIDANCE
- ➡ GUIDING TECHNICIANS
- ➡ DEALING WITH ASSEMBLY ISSUE IF ARRISES (UNFORESEEN PROBLEMS)
- ➡ PRODUCTION



FIXED WING VTOL UAV

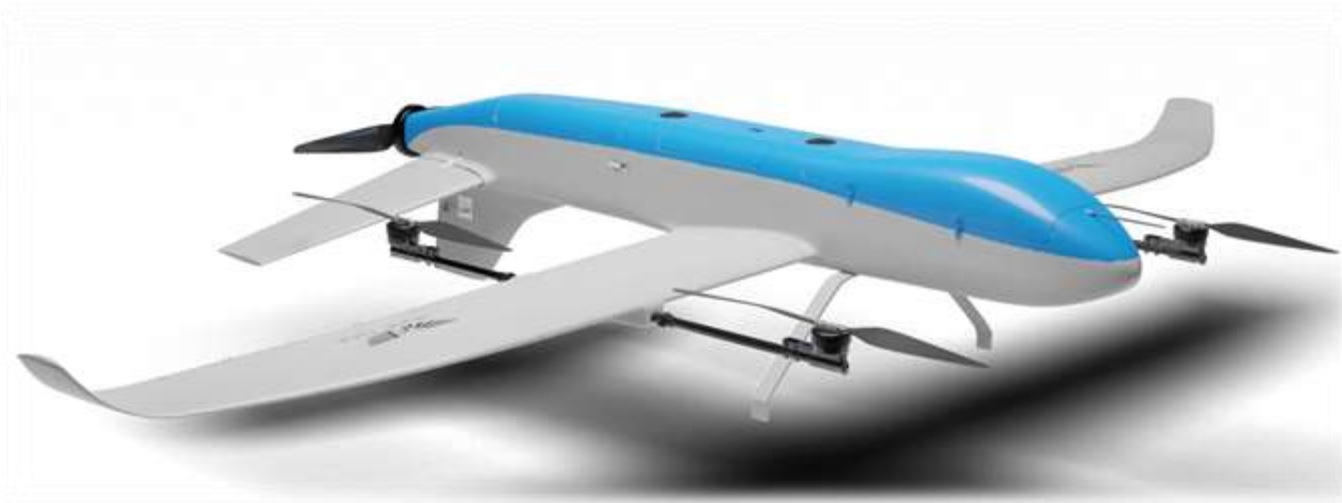
FIXED WING UAVs



FIXED WING UAV (VTOL)

- ➡ MODELLED FIXED WING OUTER BODY + WINGS + TAILS
- ➡ MODELLED INTERNAL STRUCTURE
- ➡ CUSTOMIZED INTERNAL STRUCTURE INCLUDES
 - *ENOUGH TOLERANCE BETWEEN SKIN AND STRUCTURE FOR SEAMLESS PLACEMENT AND BOND IN MOLD*
 - *PLACEMENT OF AVIONICS ON DESIRED SPOT*
 - *ENOUGH SPACE FOR HAND OR TOOLS FOR MANUAL ASSEMBLY*
 - *ENOUGH SPACE FOR WIRING*
 - *SERVO HOUSING IN THE WING / TAIL TO FIT FOR CONTROL SURFACES*
 - *MOTOR MOUNTS*
 - *HATCHES*

FIXED WING UAVs



FIXED WING UAV (VTOL)

- ➔ MODELLED FIXED WING OUTER BODY + WINGS + TAILS
- ➔ MODELLED INTERNAL STRUCTURE
- ➔ CUSTOMIZED INTERNAL STRUCTURE INCLUDES
 - *ENOUGH TOLERANCE BETWEEN SKIN AND STRUCTURE FOR SEAMLESS PLACEMENT AND BOND IN MOLD*
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 - *ENOUGH SPACE FOR HAND OR TOOLS FOR MANUAL ASSEMBLY*
 - *ENOUGH SPACE FOR WIRING*
 - *SERVO HOUSING IN THE WING / TAIL TO FIT FOR CONTROL SURFACES*
 - *MOTOR MOUNTS*
 - *HATCHES*

LOITER MUNITION UAVs



DOUBLE FOLDING
MECHANISM FOR WINGS
+ TAILS

LOITER MUNITION UAV

- ➔ MODELLED OUTER BODY + WINGS + TAILS
- ➔
- MODELLED INTERNAL STRUCTURE
- ➔
- EXTENSIVELY WORKED ON FOLDING
- ➔ MECHANISM

CUSTOMIZED INTERNAL STRUCTURE
INCLUDES

- ENOUGH TOLERANCE BETWEEN SKIN AND STRUCTURE FOR SEAMLESS PLACEMENT AND BOND IN MOLD*
- PLACEMENT OF AVIONICS ON DESIRED SPOT*
- ENOUGH SPACE FOR HAND OR TOOLS FOR MANUAL ASSEMBLY*
- ENOUGH SPACE FOR WIRING*

LOITER MUNITION UAVs



FOLDABLE LOITER MUNITION UAV IN
PNEUMATIC TUBE LAUNCHER

→ MODELLED OUTER BODY + WINGS +
TAILS

→
MODELLED INTERNAL STRUCTURE

→
EXTENSIVELY WORKED ON FOLDING

→ MECHANISM

DESIGNED AND MODELLED PNEUMATIC
TUBE LAUNCHER

LOITER MUNITION UAVs

DOUBLE FOLDABLE LOITER MUNITION
UAV



→ MODELLED OUTER BODY

→ MODELLED INTERNAL STRUCTURE

→ EXTENSIVELY WORKED ON DOUBLE FOLDING
MECHANISM

→ DESIGNED FOLDING MECHANISM FOR
STABILIZERS



DOUBLE FOLDING
MECHANISM FOR WINGS
+ TAILS



FOLDABLE STABILIZERS

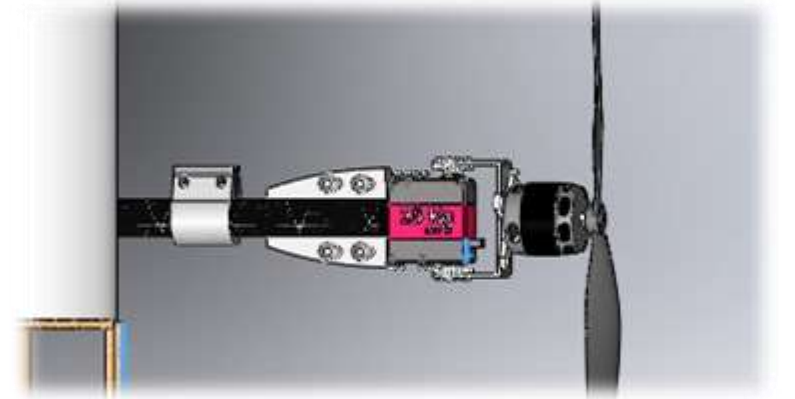
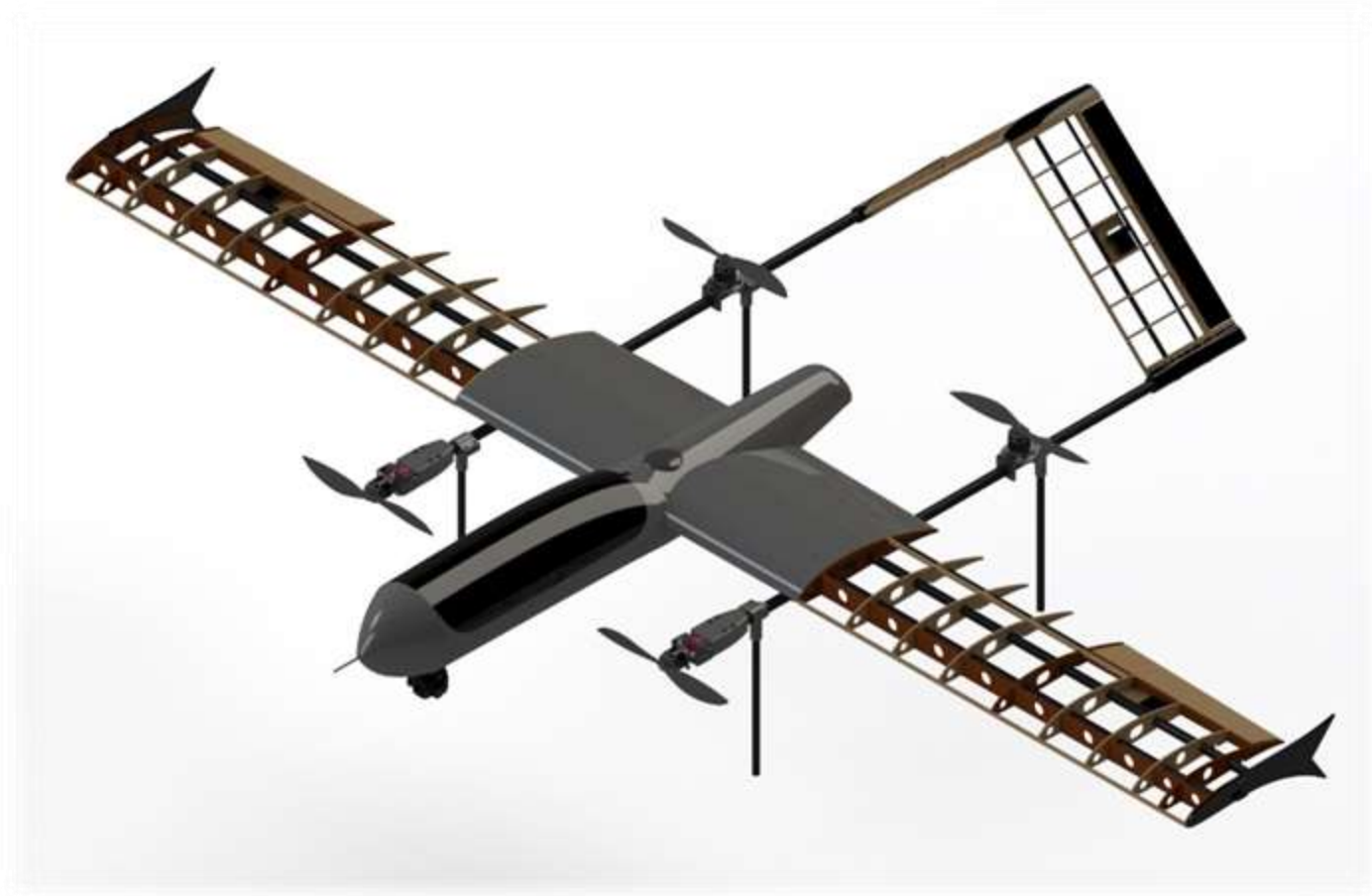
LOITER MUNITION FIXED-WING UAV

- ➡ FULLY DESIGNED AND MODELLED
- ➡ MODELLED RIGID MOTOR MOUNTS
- ➡ CUSTOMIZED INTERNAL STRUCTURE INCLUDES
 - ENOUGH TOLERANCE BETWEEN SKIN AND STRUCTURE FOR SEAMLESS PLACEMENT AND BOND IN MOLD
 - PLACEMENT OF AVIONICS ON DESIRED SPOT
 - ENOUGH SPACE FOR HAND OR TOOLS FOR MANUAL ASSEMBLY
 - ENOUGH SPACE FOR WIRING
 - SERVO HOUSING IN THE WING / TAIL TO FIT FOR CONTROL SURFACES
 - RIGID MOTOR MOUNT TO WITHSTAND MOTOR POWER



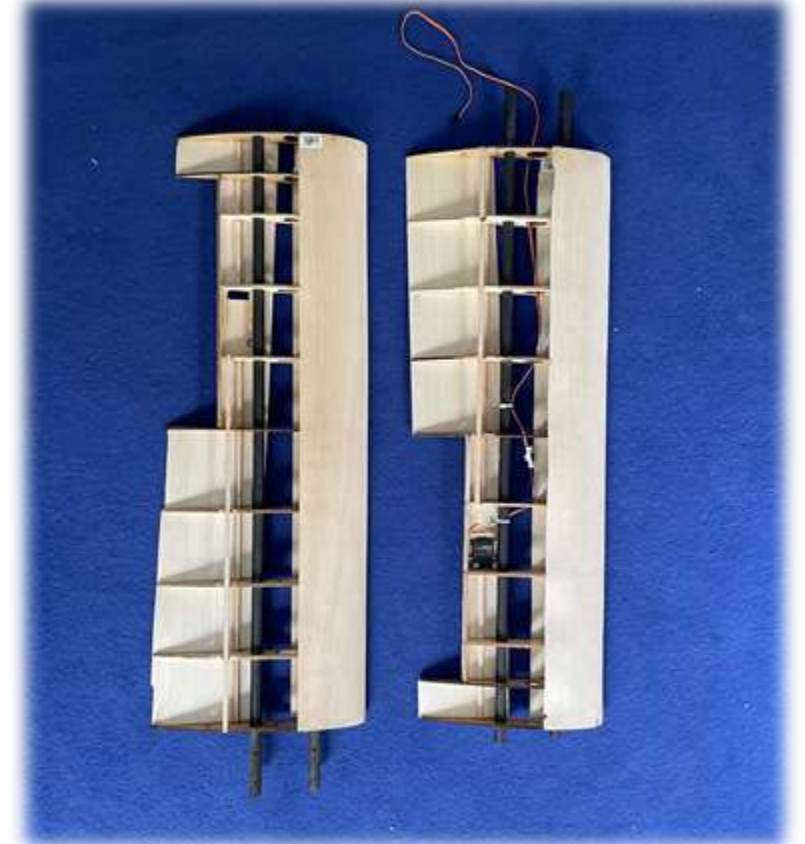
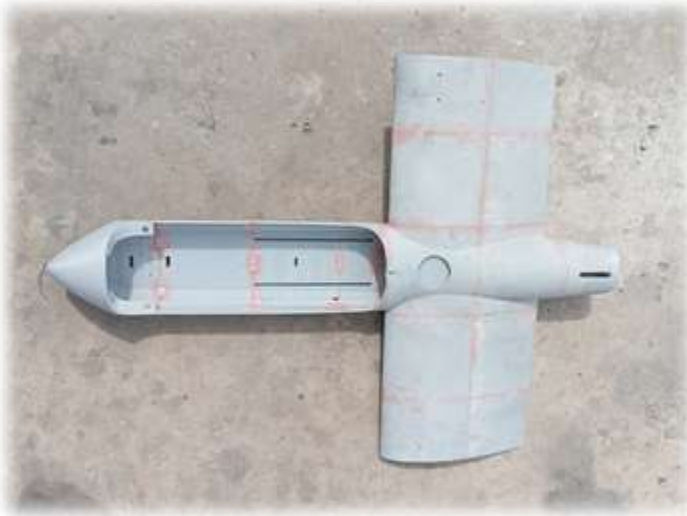
FIXED WING UAV LOITER MUNITION UAV

CAD GLIMPSE OF FIXED WING UAVs



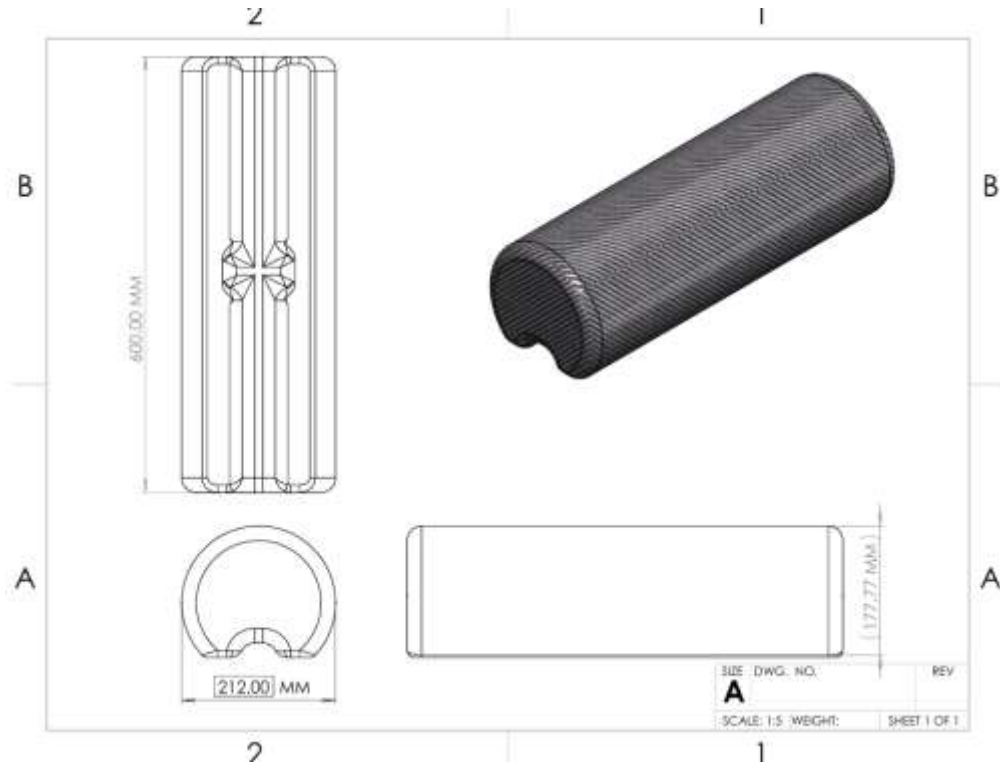
UAV PICTORIAL VIEW OF CAD

FIXED WING UAVs



OVERVIEW OF UAV IN 3D PRINTED SPLITED PARTS ASSEMBLED TOGETHER (FIRST 2 PICTURES) AND A VIEW OF INTERNAL STRUCTURE OF WING HAVING SERVO AND SPARS ASSEMBLED (3RD PICTURE)

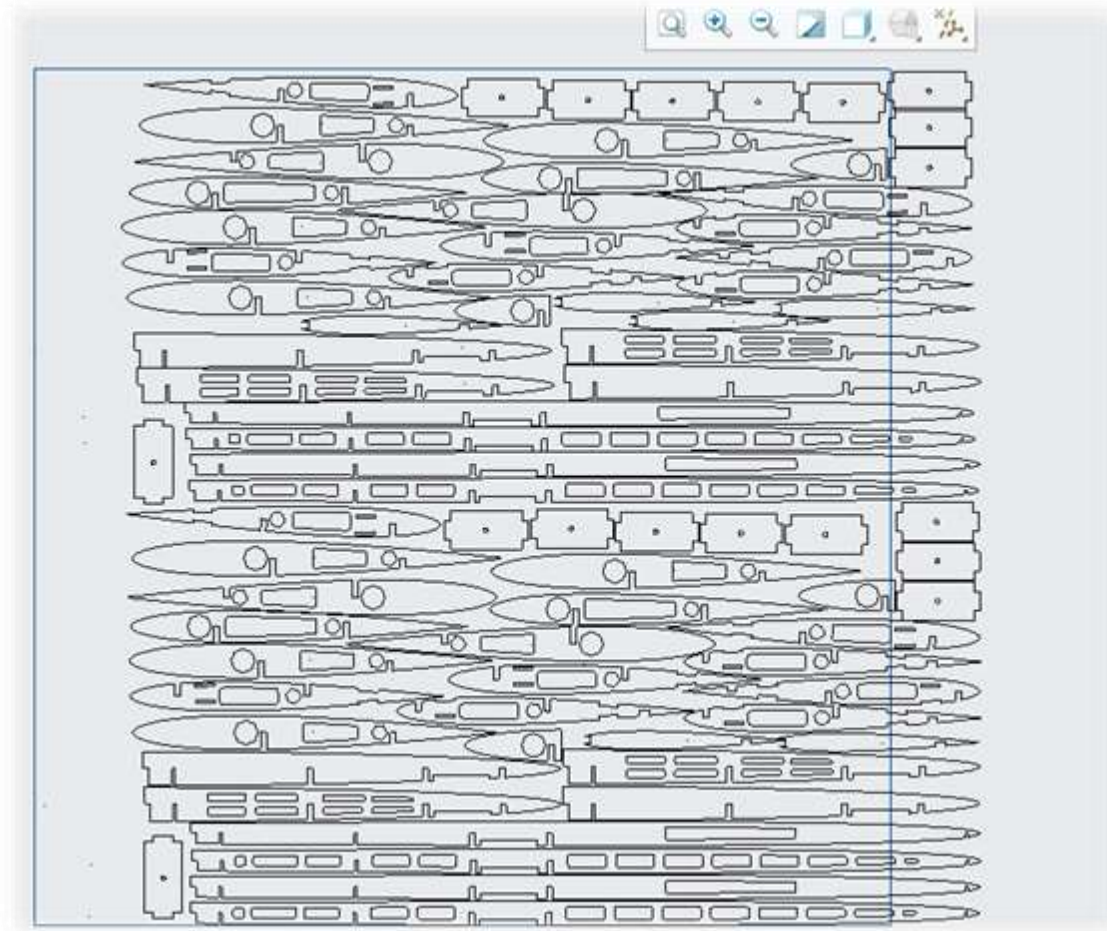
2D DRAWINGS



PART DRAWING

- ➡ CREATED PART / ASSEMBLY DRAWINGS FOR SEAMLESS PRODUCTION
- ➡ CREATED 2D DRAWINGS (DXF) FOR MACHINING (CNC LASER + CNC ROUTER)
- ➡ CREATED 2D DRAWINGS FOR LOCAL AND CHINEESE MANUFACTURERS
- ➡ CREATED 2D DRAWINGS FOR TECHNICIANS FOR SEAMLESS PRODUCTION

2D DRAWINGS



VECTOR DRAWING/2D DRAWINGS FOR
CNC LASER CUTTING

GROUND CONTROL STATION

SKILLS INCLUDES:

- ➡ CONCEPTUALIZATION
- ➡ UNDERSTANDING OF CLIENT REQUIREMENTS
- ➡ COMPONENTS SELECTION
- ➡ AVAILABILITY IN THE MARKET
- ➡ COMMUNICATION WITH THE SUPPLIERS
- ➡ AVIONICS PLACEMENT IN THE CAD
- ➡ DFMA
- ➡ BOM
- ➡ 3D PRINTING
- ➡ 2D DRAWING FOR PLATE
- ➡ FABRICATION
- ➡ MANUAL ASSEMBLY
- ➡ DEALING WITH ASSEMBLY ISSUE IF ARRISES
- ➡ PRODUCTION



**GROUND CONTROL STATION
(CAD)**

GROUND CONTROL STATION



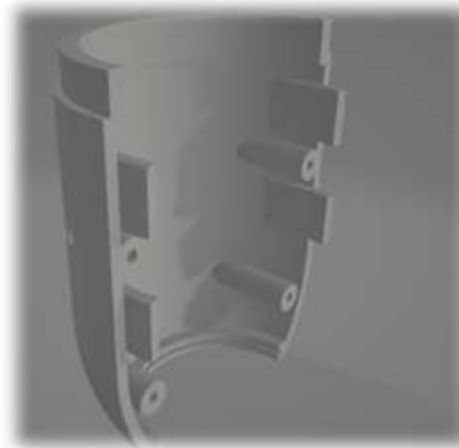
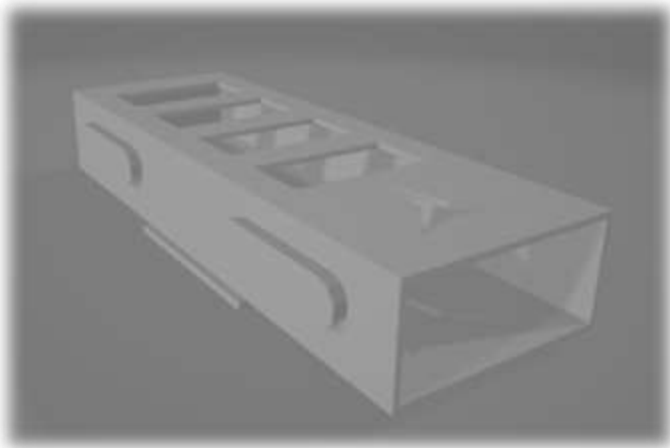
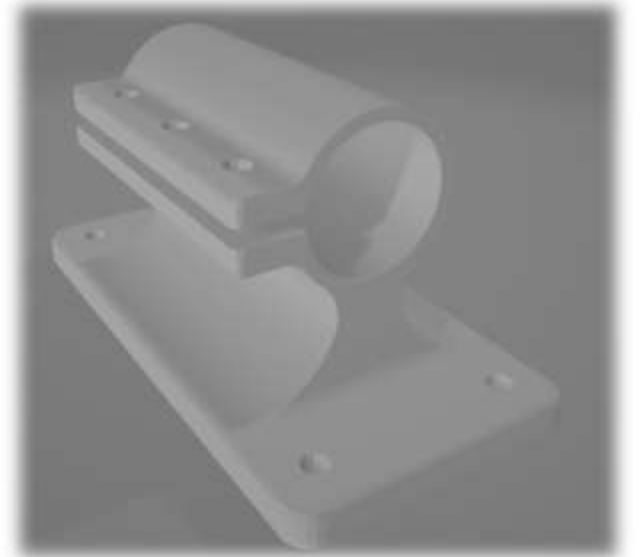
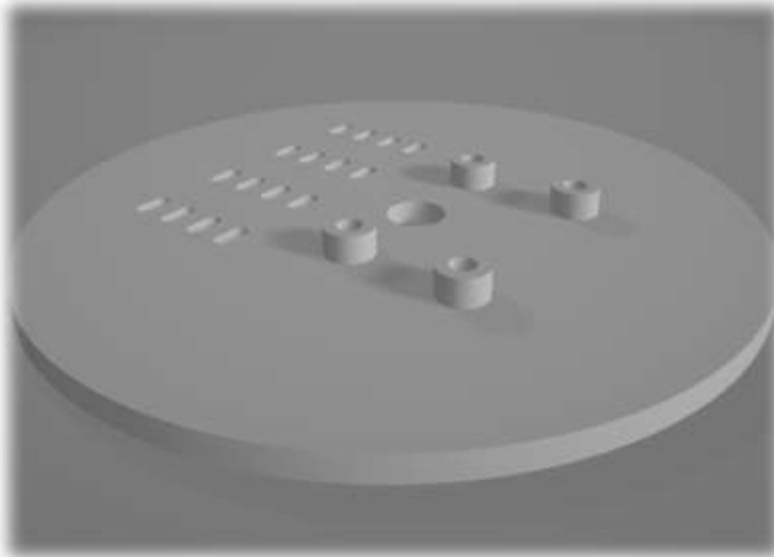
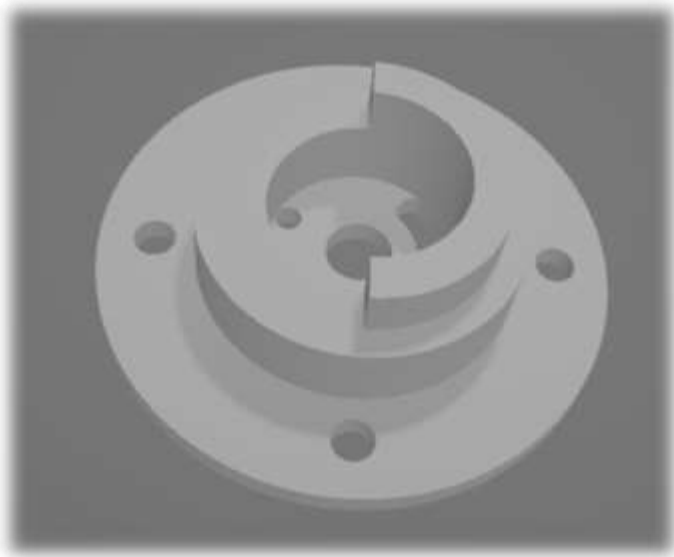
GROUND CONTROL STATION

GROUND CONTROL STATION

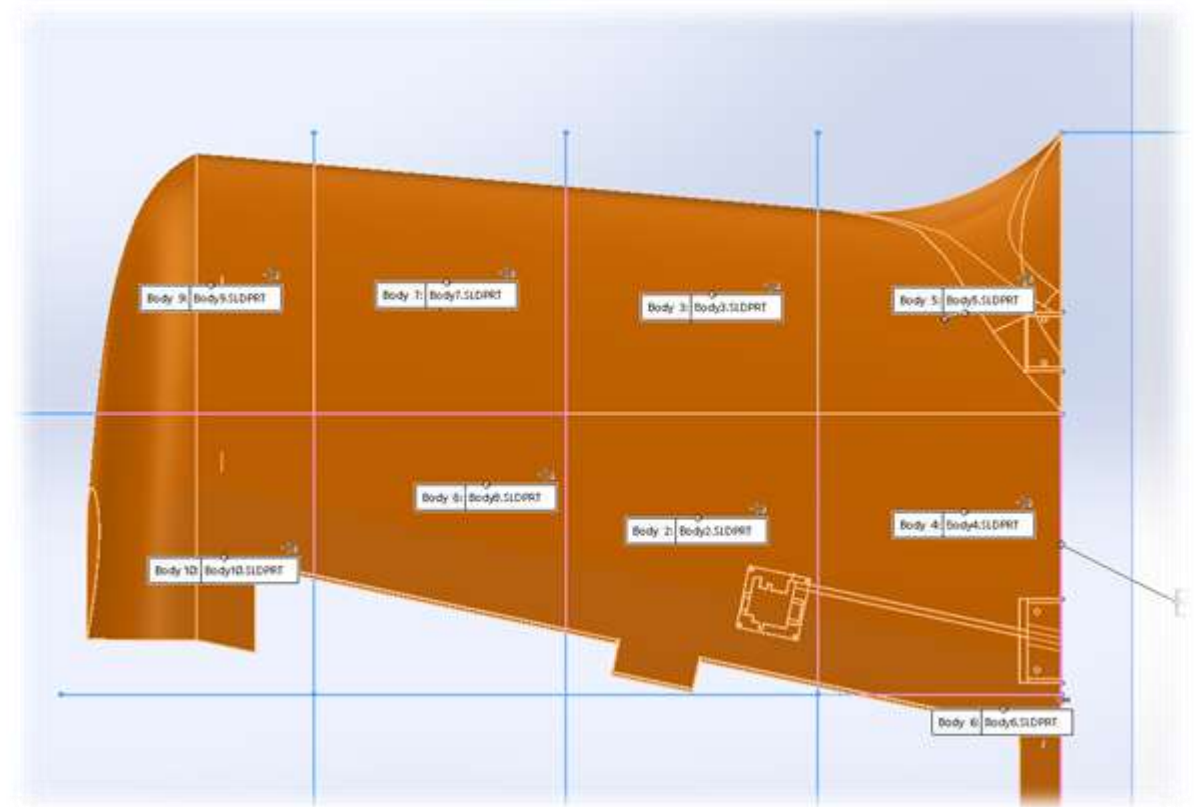
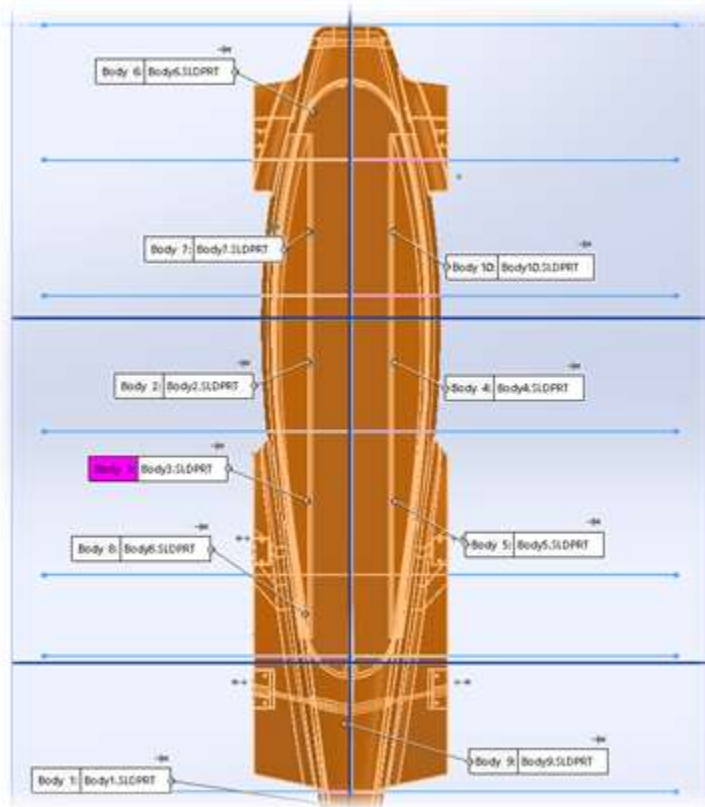


GROUND CONTROL STATION

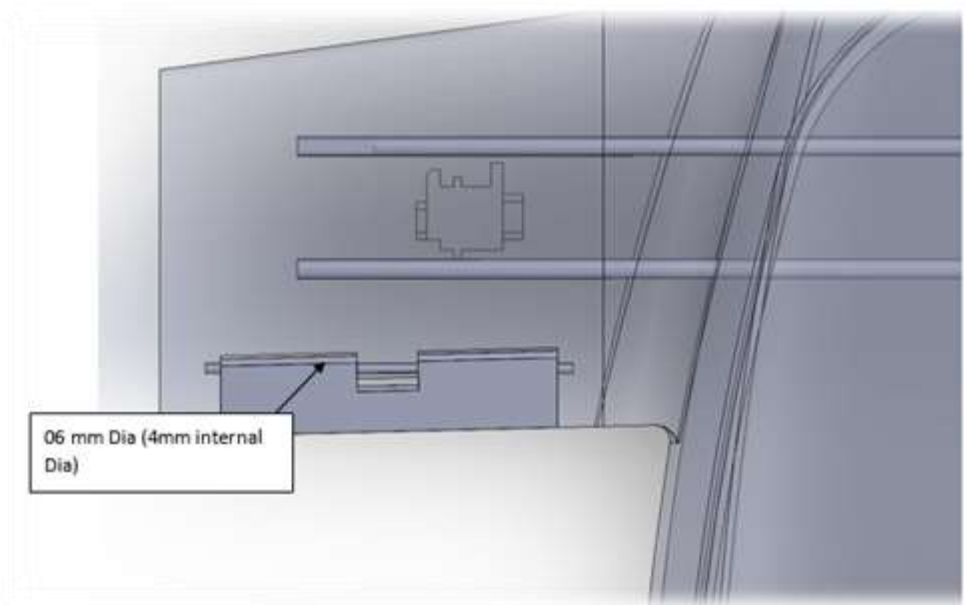
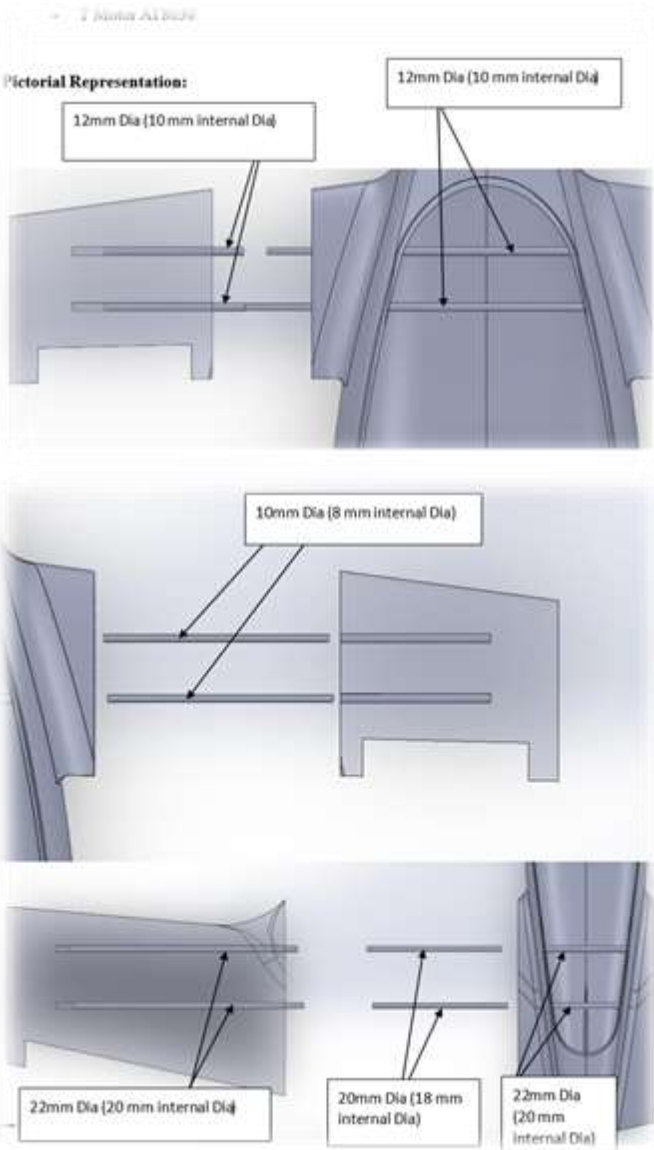
3D PARTS



3D PRINTING



TECHNICAL DOCUMENTATION

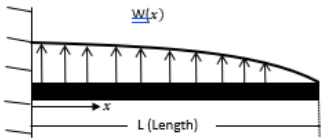
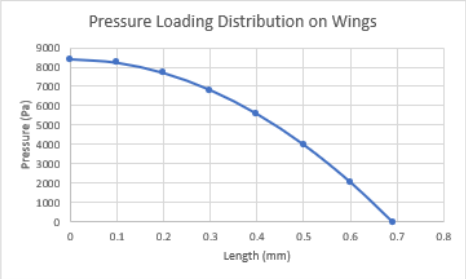


STRUCTURAL ANALYSIS ON WINGS

AT 2.4G:

Pressure Distribution along the spar.

X(mm)	P (Pa)
0	8405.000
0.1	8229.053
0.2	7699.399
0.3	6816.643
0.4	5580.784
0.5	3991.823
0.6	2049.760
0.69	0



Equation for Elliptical Load on Wing:

$$W = W_0 \left(1 - \left(\frac{x}{L}\right)^2\right)$$

Where;

x is location

W_0 is maximum load applied.

L is the length of the cantilever beam (i.e., spar)

FORCE ON EACH WING:

$W = 50.4 \text{ N}$

FORCE ON EACH TAIL:

$W = 33.6 \text{ N}$

Note:

For Wing;

$$W = 7 \times 0.6 \times 0.5 \times 2.4 \times 10$$

$$W = 50.4 \text{ N}$$

For Wing;

$$W = 7 \times 0.6 \times 0.5 \times 2.4 \times 10$$

$$W = 33.6 \text{ N}$$

THANK

YOU

