Test Project

Industrial Design Technology

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Introduction to Test Project

This Test Project proposal consists of the following documentation/files:

- WSC2026_TP59_Appendix1.pdf
- WSC2026_TP59_Appendix2.pdf

This Test Project proposal consists of the following folders:

- Environment (pictures for user scenario rendering in Module 2)
- Background music (music files for video editing in Module 4)

Introduction

In the field of photography, the integration of unmanned aerial vehicles (UAVs), more commonly known as drones, has revolutionized the way enthusiasts capture and document their surroundings. Specifically designed for aerial photography, these drones offer a unique and captivating perspective that was once reserved for professionals with access to helicopters or airplanes. Today, with the advent of consumer-grade drones tailored for photography enthusiasts, the skies are no longer a limitation but an endless canvas for creativity.

As technology continues to advance, the future of aerial drone design for photography enthusiasts looks promising. Innovations in camera technology, flight algorithms, and connectivity will further enhance the user experience, making it easier and more intuitive to capture breathtaking imagery.

A company named AeroNova, stands as a pioneering enterprise at the forefront of aerial photography drone design and manufacturing. The company is dedicated to catering to the needs of photography enthusiasts, who seeks cutting-edge technology combined with exceptional functionality and user experience. For several consecutive years, AeroNova has maintained a substantial market share within its segment, attributed to our relentless pursuit of innovation and commitment to excellence. Our drones are engineered to deliver unparalleled performance, enabling users to capture stunning aerial footage and stills with ease and precision. By focusing on enhancing both the technical specifications and the overall user journey, we have solidified our position as an industry leader, continually pushing the boundaries of what is possible in the realm of aerial imagery.

Now you are a designer of this company and get the project of a new product design. The design requirements are as below:

The product is a quad-rotor drone, and its appearance should reflect streamlined dynamics and cutting-edge technology.

With four (4) rotors symmetrically distributed in a cross shape, the installation of propellers requires the diagonal propellers to be the same type. (Please refer to *Figure 2. Propellers installation*)

The overall dimensions (except for the propellers) are no more than 150*150*50 mm. (length*width*height).

The wing arm can be folded for portability. After folding, the drone can be put into a portable box, with internal dimensions of 100*80*50 mm (length*width*height).

The drone requires light material, and the total weight of the appearance components should not exceed 300 g.

The drone is equipped with a high-definition camera, which is connected to the gimbals. The camera is designed to rotate 90 degrees vertically and 360 degrees horizontally.

When the drone is running, it is necessary to observe its status from a distance. The four (4) motors need to be designed with indicator lights, and the size of the lights can meet the requirements of long-distance observation.

Ventilation holes should be designed for the main body and motor component to meet the heat dissipation requirements.

Considering the safety and stability of landing, the landing gear should be designed.

To prevent people and objects from being injured by the high-speed rotating propellers, the drone needs to be equipped with propeller guards, which should be designed for easy detachment when the drone is folded and stored.

The battery is replaceable. Please design a battery installation and removal solutions for the replacement.

One (1) power on/off button on the body.

The body will be printed with a pattern based on the brand name graphic design to meet the requirements of promotion.

A type of drone is shown below to demonstrate the structure and components for your reference, and you need to design a new one to meet all the design requirements.

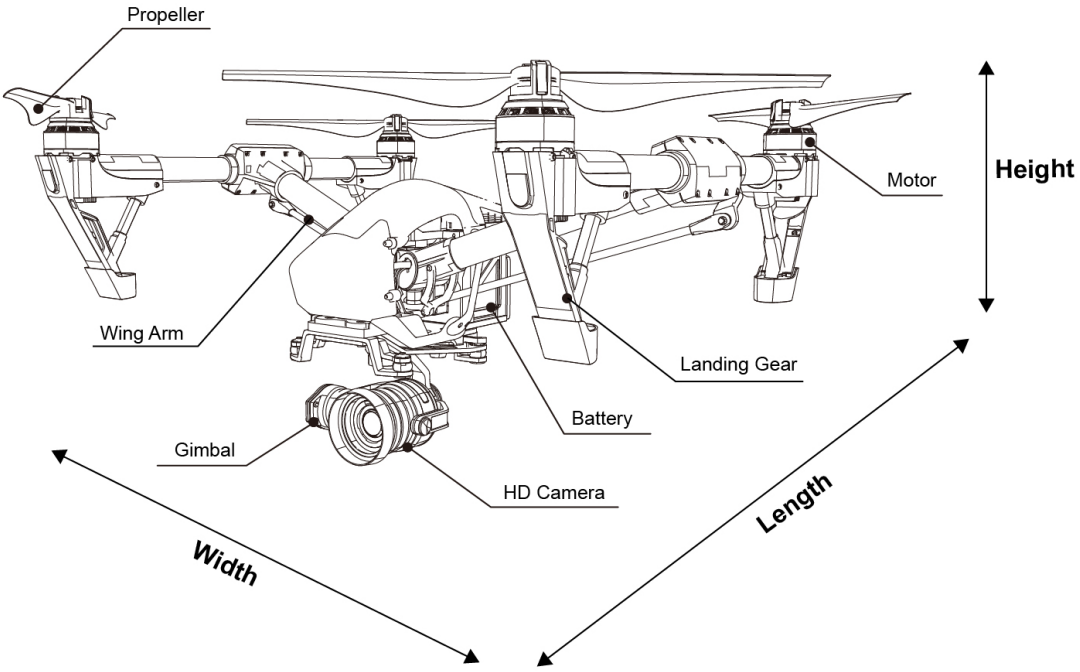


Figure 1. Product structure and components

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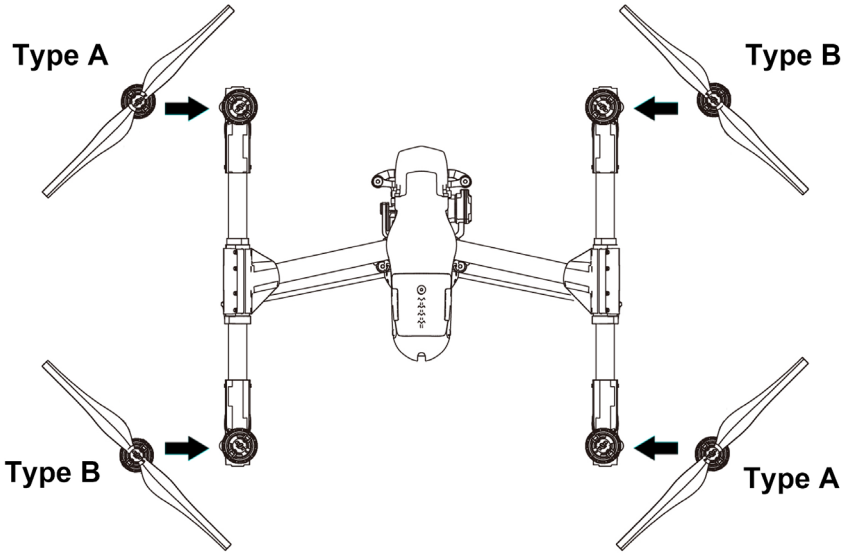


Figure 2. Propellers installation

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Description of project and tasks

Competition Day 1 (6 hours)

Module 1 – Concept design

Materials and tools: A3 and A4 paper, toolbox for paper sketching

Equipment: Workstation, graphics tablet

Software: Translator, AI platform, Adobe Photoshop, Autodesk SketchBook

Design Planning

Before starting the design, you need to make a series of analyses on the basis of background introduction to help you develop a design strategy and make some concept explorations. You should do the following:

- Analysis of brand image
- Analysis of user positioning
- Analysis of aesthetics and visual appeal
- Analysis of Functionality
- Analyse the user experience (physical and psychological), and describe at least two (2) pain points, one is physical and the other is psychological.
- Initial proposal corresponding to the pain points
- Initial CMF plan (Colour, Material and Finish)
- Summarize above and generate the design strategy in the mind-map

Technical requirements

1. Analysis of brand image in the mind-map.
2. Analysis of user positioning in the mind-map.
3. Analysis of aesthetics and visual appeal in the mind-map.
4. Analysis of functionality in the mind-map.
5. Analysis of user experience in the mind-map, including physical and psychological descriptions.
6. At least two (2) initial proposals corresponding to the two (2) pain points described in the mind-map.
7. Initial CMF plan (Colour, Material and Finish) described in the mind-map.
8. Design strategy summarizing including appearance, functionality, CMF, and user experience in the mind-map.
9. Design the layout of mind-map and make it more attractive with colours, lines and icons.
10. The image size of the mind-map file is 1920×1080 px, in landscape mode, with a resolution of 150 dpi, JPG format.

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Design Exploration

You will use an AI platform to generate some concepts for your reference before sketching. Please note that you can not copy the concepts directly as your proposal, and the AI-generated solutions can only be used to broaden your mind.

You will make some design concept explorations by paper sketches in accordance with the design strategy. You should provide three (3) draft concepts, and draw in three (3) pieces of A3 paper, landscape format, and each one requires the following aspects:

- One (1) overall perspective view with colours
- One (1) function demonstration of component with colours

Technical requirements

1. Generate no more than twenty (20) pieces of concepts by AI platform.
2. Provide three (3) pieces of A3 paper with sketches.
3. Each paper in landscape format, including project name, one (1) overall perspective view with colours, and one (1) function demonstration with colours.

Concept Initial

Based on the concept explorations, you will choose one (1) of them to develop the details of the product. You need to submit three (3) pictures of digital sketches to demonstrate every detail of your design. Create a separate file in Adobe SketchBook for each picture, which is saved in JPG format with a resolution of 1920x1080 px, in landscape mode, and 150 dpi. The digital sketches require the following aspects:

- Overall perspective view of selected concept with colours
- Perspective views of details with colours
- Colour schemes
- Exploded diagram with colours
- Projection views with overall dimensions
- CMF demonstration (annotations for CMF solutions)
- User scenarios

Technical requirements

1. The first picture of digital sketches should contain the following elements:

- Project name
- One (1) perspective view sketch of the chosen concept, with colours and material expression
- Two (2) perspective views of details with colours
- Three (3) colour scheme proposals for the concept (three small perspective view images)

2. The second picture of digital sketches should contain the following elements:

- Exploded diagram (separated view) of the object parts with colours
- Marking of each part's name on the exploded diagram
- Marking of colours, materials and finishes for each part on the exploded diagram
- Three (3) projection views (Front View, Top View, Left View) with overall dimensions of the object with no colour

3. The third picture of digital sketches should contain the following elements:

- At least four (4) scenario sketches with user interaction and colour
- Explanations of the functionality on the scenario sketches

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Required deliverable for Module 1

- No more than twenty (20) AI-generated concepts.
- One (1) jpg format picture named “Mind-map”, and one (1) “.psd” working file named “Mind-map”
- Three (3) pieces of A3 paper with sketches for concept explorations
- Three (3) pictures of digital sketches for the selected concept expression, jpg format, named “Digital sketch 1”, “Digital sketch 2”, “Digital sketch 3”.

Note

1. Competitors cannot use the browser to search for information during Module 1, and they can use the translator to make some descriptions and use AI platform to explore some ideas.
2. The Workshop Manager will scan the A3 sheets and save the scanned copies on your desktop after Module 1. Please write down your participant number at the bottom right corner of the paper.
3. Create a folder titled with “M1_Concept Design” in the folder named by your participant number on your desktop and save all the files of Module 1 in it.
4. Clean your table and keep your workplace tidy after the Module work.

Competition Day 2 (6 hours)

Module 2 – CAD Modelling and 3D Printing

Materials and tools: A3 and A4 paper, Toolbox for 3D printing

Equipment: Workstation, 3D printer

Software: Translator, Fusion 360, 3D printing slicer, Adobe Photoshop, Microsoft Word

Based on the previous developments, it is necessary to prepare a three-dimensional model for the design and some technical documents in Fusion 360.

Technical requirements

1. Measurement unit of the object is mm.
2. All sketches are determined.
3. Construction with surface and solid modelling tools.
4. All surfaces are merged and transformed into solids.
5. No breaks in details.
6. The number of parts in the general assembly is at least ten (10).
7. Fillet for all parts.
8. All part names should be given in the "construction tree".
9. No errors in the "construction tree"and the bottom history bar.
10. Thickness of the shells are set, which are not less than 2 mm and not more than 5 mm.
11. Materials and colours are assigned to all parts in accordance with the selected concept.
12. The types of connections are defined in the general assembly.
13. No overlap in the general assembly.
14. All datum planes are hidden.
15. Streamlined design with a sense of technology.
16. The installation of propellers is correct.
17. The overall dimensions comply with the requirement.
18. The folded dimensions comply with the requirement.
19. The weight of the total appearance components cannot exceed the limit.
20. There is a camera on the model, and the mechanism of the camera gimbals can meet the requirements.
21. Component design with landing stability.
22. Indicator light design for remote observation.
23. With reasonable ventilation design to meet the heat dissipation requirements.
24. Reasonable battery detachable design.
25. One (1) power on/off button design.
26. Propeller guards design for easy detachment.
27. Presence of brand name graphics on the model.
28. Two (2) perspective renderings, one (1) from the front and one (1) from the back, JPG format, resolution 1920x1080 px, file name "Perspective 1","Perspective 2".
29. Six (6) orthographic renderings, JPG format, resolution 800x600 px, named "Front View","Back View", "Top View", "Bottom View", “Left View”and “Right View”.
30. Three (3) colours variation renderings, JPG format, resolution 1280x720 px, file name"Colour Scheme 1", “Colour Scheme 2”, “Colour Scheme 3”.
31. Three (3) renderings to show the functional details (foldable wings, rotation of gimbals, etc.), JPG format, resolution 1280x720 px, file name "Detail 1", “Detail 2”, “Detail 3”.

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32. Three (3) user scenario renderings with the environment (the environment pictures have been placed in a folder named “Environment” on your desktop), PNG format, resolution 1920x1080px, file name "Scenario 1", "Scenario 2", "Scenario 3". One (1) of them should demonstrate the wing folded scenario. You can use Adobe Photoshop to refine the renderings.
33. One (1) general assembly drawing (orthographic projections, basic view with cross-section, principal dimensions, filled-in title block, and the projection layout referring to the Appendix 1, scale in accordance with the sheet format, file name “General assembly drawing”, A3 landscape mode, PDF format.
34. One (1) explosion diagram with a BOM list (referring to the Appendix 2, scale in accordance with the sheet format, file name “Explosion diagram”, A3 landscape mode, PDF format.
35. At least three (3) part drawings (orthographic projections, principal dimensions, filled-in title block, and the projection layout referring to the Appendix 1), scale in accordance with the sheet format, file name “Part_1”, “Part_2”,”Part_3”(…), A4 landscape mode, PDF format.
36. Analysis of Static Stress of the wing arm in Fusion 360, calculate the scope of the lifting force the arm can bear, generate a report including the diagrams and data, “.docx” format.
37. Files of the components ready for 3D printing named"Part 1_Print", "Part 2_Print", etc., with .stl extension, saved in the folder named “3D printing”, and put it in this Module folder.
38. 3D printing setup files with “.GCode” extension, saved in the “3D printing” folder.

You will create some animation clips for the design demonstration on the basis of the 3D model, which should reveal the detail design and prepare for the video presentation.

The animation should include the information as below

Clip1: Video shots from the camera fly-through the object and the camera shots around the object.

Clip 2: Detail demonstrations, process at the Competitor's discretion.

Clip 3: Object disassembly and assembly demonstrations.

Clip 4: Folded demonstration of the wings.

Clip 5: Take-off, landing and flight demonstrations.

Clip 6: Camera gimbals rotation demonstration (90 degrees vertically and 360 degrees horizontally)

Clip 7: Indicator lights demonstration.

Clip 8: Battery replacement demonstration.

Clip 9: Propeller guards and detachment demonstration.

Note

1. Please use the WorldSkills drawing template which has been installed into Fusion 360 for drawings generation.
2. The screen resolution of all the animation clips is 1920x1080 px, with 72 dpi, avi format, named “Clip_1”, “Clip_2”, “Clip_3”, etc..

Required deliverable for Module 2

- The general assembly 3D model, with ".f3d" extension
- Two (2) perspective view renderings
- Six (6) orthographic renderings
- Three (3) colour variation renderings
- Three (3) design details renderings
- Three (3) user scenario renderings
- One (1) general assembly drawing
- One (1) exploded drawing
- Three (3) parts drawings
- One (1) report for Static Stress Analysis
- A set of files for 3D printing slicing, with .STL extension
- A set of files for 3D printing, with .GCode extension
- Nine (9) animation clips

Note

1. The images of the user scenario environment are located in the"Environment" folder on your desktop.
2. Create a folder named "M2_Technical Process" in your participant number folder and save all the Module 3 files in it.
3. Create a folder named "3D printing" in this Module folder and save 3D printing files in it.
4. You are allowed to use 3D printer from the beginning of this Module and let the 3D printer continue working during lunch time, but you will take full responsibility for the result. If the process goes wrong, the Workshop Manager is allowed to stop the 3D printer, but your time will not be extended.

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Competition Day 3 (6 hours)

Module 3 – Prototyping

Materials and tools: A3 and A4 paper, Toolbox for prototyping

Equipment: 3D printer

Your task is to continue working on your project and create a prototype of the design. During the process, you cannot use the computer, and you have to finish the colour prototype within the limited time.

Technical requirements

1. Prototype made in 1:1 scale.
2. Polish the 3D printed parts and paint them with the selected colour scheme.
3. Assemble all parts together, and make it as a complete model, and the overall size within the limit.
4. The wings can be folded, and the overall size of the folded model within the limit.
5. The form of camera can be seen on the model and gimbals can meet the requirements of rotation.
6. The propellers can rotate and the installation is correct.
7. The battery model can be detached and installed.
8. There is an on/off power button on the model.
9. The propeller guards can be detached and installed.
10. Presence of brand name graphics on the model.

Required deliverable for Module 3

1. One (1) scale prototype

Note

1. You are allowed to use 3D printer from the beginning of this Module and let the 3D printer continue working during lunch time, but you will take full responsibility for the result. If the process goes wrong, the Workshop Manager is allowed to stop the 3D printer, but your time will not be extended.
2. After finishing the prototype, please put it on your desk.
3. Clean your table and keep your workplace tidy after the Module work.

Competition Day 4 (4 hours)

Module 4 – Design proposal (2 hours)

Materials and equipment: A3 and A4 paper, workstation

Software: Translator, Microsoft PowerPoint, Adobe Photoshop, Adobe Premiere Pro

The Competitor should develop a demo video on the basis of clips from Module 2. The video should be interesting and grab the audience's attention.

The Competitor should develop a PowerPoint file (PPT) for the final design proposal and insert the demo video in it. The PPT file should reveal the ideas, the concept of the project, and the work carried out to highlight your design.

The final design proposal should be understandable for the audience without additional information. The proposal should be a complete conceptual composition with fully developed artistic aspects. At the very least, the following should be included (the sequence of slides is implemented at the Competitor's discretion); the PPT file can contain more information than those listed):

1. Cover and end page with design.
2. Project name, design research, sketches, overall renderings, detailed renderings, colour schemes, user scenarios, technical drawings should be shown in ppt.
3. Animation of the design demonstration with background music.

Technical requirements of video development

1. Synchronicity of the sound track and visuals.
2. Combine all clips from Module 2 into a demonstration video, the duration at least 60 seconds.
3. At least two (2) different special effects of Adobe Premiere used in the video, and the time of each special effect is not less than 2 seconds.
4. Video rendering parameters: mp4 format, resolution 1920×1080 px, file named “Demonstration Video”.
5. The size of the video should be under 100 M.
6. The video working file titled "Project", size of the file should be under 100 M.

Technical requirements of PPT file development

1. The ratio of the page is 16:9.
2. Design the layout of the pages to make it visually appealing.
3. Insert the demonstration video into one (1) of the slides and set it to play automatically.
4. Save the PPT file with “.ppsx” extension.

Required deliverable for Module 4

1. The working file of the video.
2. The demonstration video.
3. The PPT file of design proposal.

Note

1. All background music files have been put in the “Background Music” folder on your desktop.

2. Create the “M4_Design Proposal” folder in your participant number folder on your desktop and save all files of this Module in it.

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Module 5 – Design promotion (2 hours)

Materials and equipment: A3 and A4 paper, workstation

Software: Translator, Adobe Photoshop

In the final Module, the Competitor will design a poster to promote his design to the customers. The poster should include demonstrations of concept sketch, overall rendering, functional details, (foldable wings, rotation of gimbals, etc.), and user scenario. You can select the materials from the outcomes of previous Modules.

Technical requirements

1. Two (2) pieces of poster with layout design to make it visually appealing, and each one should show the project name.
2. The first one should include concept sketches, overall rendering, user scenario, and technical drawings with main dimensions.
3. The second one should include an explosion diagram, detail renderings with some design explanations.
4. Save the posters with jpg format, resolution 1920×1080 px, in landscape mode, file name “Poster 1”, “Poster 2”.
5. Save the working files with “.psd” extension, file named “Poster_1”, “Poster_2”.

Required deliverable for Module 5

1. Two (2) pieces of design promotion posters.
2. The working file of two (2) posters.

Note

1. Create the "M5_Design Promotion" folder in your participant number folder on your desktop and save all files of this Module in it.

Instructions to the Competitor

Each Module has specific requirements for the usage of software and devices and is unable to carry out tasks assigned to other Modules or utilize software and devices that do not meet the requirements of that Module.

Other

Works will be collected from folder directory on your workstation at each Module deadline. Ensure you save your work with the correct path and filenames.

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