Test Project

Module 5 – UAS Prototyping, Modelling and Mounting

3 hours

Unmanned Aerial Systems

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1 Introduction to Test Project

Unmanned Aerial Systems (UASs) are used in multifaceted environments and applications, including military, societal, agricultural, and environmental purposes, disaster recovery, infrastructure assessment, and wildlife monitoring. Their industrial applications are growing rapidly.

3D printing is no longer confined to the prototyping lab—it's now actively reshaping how UAVs (Unmanned Aerial Vehicles) are designed, built, and deployed. Across aerospace, defense, logistics, and agriculture, leading organizations are already embracing additive manufacturing to create high-performance drone components.

The company that you work for has just purchased a new VTOL for surveying and mapping and needs to integrate an existing gimbal camera into the nose of the aircraft.

2 Description of project and tasks

Competitors shall complete the 3D modelling and part installation work for the WSVTOL within 3 hours of total time;

Competitors will design, model, and 3D print a new mounting solution that integrates a gimbal camera onto the existing nose cone mount of the VTOL airframe. The current mount plate was designed for a different payload and camera; your job is to design a purpose-built adapter/bracket that mates to the existing plate while properly carrying the camera.

The camera is a self-contained 3-axis stabilized gimbal camera (it has its own tiny brushless motors and IMU built in). You need to design a rigid mount/bracket that holds the whole unit in the nose, isolates it from airframe vibration, and allows you to route its cables back toto the flight controller. There must also be ease of access to the SD Card slot.

A reference drawing of the existing nose cone mounting plate will be issued separately. In addition, you will receive a 3D cad file of the camera and VTOL nose.

Competitors will ensure that it is mounted and functional on the UAS.

2.1 Assessment Criteria

Module 5 will be scored by Experts during the Competition. Information about specific tasks and required tests will be provided to Competitors in the morning briefing.

Competitors should complete all tasks independently within the time allocated to the Module.

- First, prepare according to requirements.
- Second, complete the tasks listed below

This module assesses Competitors' competence in mechanical design, 3D modelling and a basic understanding of 3D printing practical operations. It does not assess 3D print quality or is it dependent on printing time. It simulates a real operational scenario where UAS components are required for either design modification or emergency repair/mounting. It must be ensured that, after installation, the UAS can perform visual recognition and imaging tasks as required for operation

Workplace safety procedures and protocols must be always demonstrated.

If you are advised of a safety infraction during this module, there will be a percentage of marks deducted for each infraction. On the 3rd infraction, the Competitor will be stopped, and the evaluation will be based on work already completed.

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Experts will not intervene unless there is a safety concern.

2.2 Module Task

Task. Parametric CAD model, fully constrained, with design history intact**:**

In accordance with the requirements the competitor will custom design the 3D model and provide the following required file with the 3D printing completed by the support team.

A USB stick with country folder will be provided to the competitor to save their file to when it is completed.

Mount Design

The mount must be compatible with the nose cone, ensuring that the camera can freely mounted with no obstruction to operations. The mount must have a part the following part number embossed on it in text that is at least 4mm high – 02123. The part number must be readily visible without removing the mount from the nose or camera

Competitor will provide on the supplied USB the following:

DELIVERABLE	FORMAT
3D model for judging/interference checks	.step
Print-ready mesh(es), oriented as intended for printing	.stl

Files will be printed and provided back to competitors as a physical prototype so that they can fit it to the VTOL drone. Time allocation will be randomized and selected at a morning briefing. Each competitor will have the same amount of time to mount the designed prototype.

Physical prototype: printed, cleaned up, test-fitted to a mock or actual nose cone mount and camera	Physical part

Part installation requirements: Complete the installation of the gimbal mount in accordance with the specifications, with accurate fitting after installation without loosening and no impact on the normal work of other UAS components**.**

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3.0 Instructions to the Competitor

Design and Model the Required Components using the supplied software, reference files and sample parts.

3.1 Competition Requirements

Each competitor will receive the following during the event:

Access to an existing nose cone mounting plate — dimensioned drawing (PDF/DXF) and, if available, STEP model of the mating interface.

Access to the camera — manufacturer CAD/STEP model or dimensioned drawing, and datasheet (mass, CG, connector locations, mounting hole pattern).

3D STEP file of the nose cone

Approved material/printer as listed in the infrastructure list.

Instructions

1. Competitors should not bring any device irrelevant to the Competition to the workstation.
2. Tools, electrical components and materials for the Skill are all provided at the workstation or in the shared work area for Competitor access.
3. During the Competition, for matters irrelevant to the Competition contents, such as use of the washroom, or report of equipment, facilities, tooling, or tool faults, Competitors can seek help from the Experts.
4. Competitors may refer to the reference documents for the Skill provided.

Operation Safety Rules

1. Put on proper personal protective equipment according to operation requirements;
2. Take site safety protection measures and confirm them;
3. Before performing operations with power off, confirm that the power is off and batteries are disconnected;
4. Before performing operations with power on, turn on the power after confirming that no safety hazards exist;
5. Do not operate in a violent or an unsafe manner, including but not limited to forcibly pulling, dragging, smashing, throwing, and other violent behaviors, as well as behaviors that may cause personnel injuries or damage to equipment;
6. All the tools or materials used during operations should be placed in the tool trolley or on the rubber tool mat only.

Note: If a competitor fails to comply with the safety rules and is considered to have operated in a dangerous manner or has caused a safety hazard in the workplace, or equipment damage or personal injuries, marks will be reduced until his/her right to participate in the Competition is cancelled.

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4 Equipment, Machinery, Installations, and Materials Required.

4.1 Equipment Provided by the Competition Organizer

One laptop installed with core software and programming tools will be provided for all Competitors on C-2.

All equipment, tools, and materials listed in the Infrastructure List –see the WorldSkills Forum and Technical Description.

Access to the VTOL for fitting and testing, sample files and components.

Measurement Instruments for the module;

Objects required for manipulation during the performance and testing.

Parts and tools required to complete the design and prototyping modules.

Access to 3D printers, slicing software and filament.

4.1.2 Competitor Computer

Competitors must use the software specified by the Competition.

4.2 Equipment and Materials not Permitted

Non-supplied laptops or portable computers.

Tablets, such as Android, IPAD, etc.

Memory sticks/Digital media players/digital storage devices.

Portable radios/Music players.

Electronic organizers/diaries.

Wireless communication devices, including mobile phones.

Any other software not provided by the Competition Organizer without the approval of Experts.

All raw materials, components, parts, purchased items, tools, and equipment not permitted in the Technical Description and the List of Material Allowed and Not Allowed of the skill.

The Skill Management Team could decide on additional prohibited items before or during the Competition, if information is provided to Competitors/Experts.

4.3 Items to be Provided by Teams

Each team must provide and wear team identification indicating their region. These must be always worn during the Competition.
During the Competition, no tools, equipment, stationery, components, parts, raw materials, manuals, drawings, electrical devices, or digital storage devices may be taken out of or brought into the Competition venue without the approval of the SCM. To participate in the Competition after the familiarization day, approval from the SCM is first required, and if approved, the items must be weighed immediately by the Expert responsible.