NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: DRONE PILOT TECHNICIAN

LEVEL: NTA 4

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ABBREVIATIONS

API	Application Programming Interface
CBET	Competency Based Education and Training
DC	Direct Curent
ESC	Electrical Speed Controller
FPV	First Person View
GPS	Global Positioning System
IMU	Inertial Measurement Unit
KV	Kilovolt
Li-po	Li-polymer Battery
MOPP	Maintenance Operation Processes and Procedures
NACTVET	National Council for Technical and Vocational Education and Training
Ni-Cd	Ni-Cd Battery
Ni-Mh	Ni-Mh Battery
NOS	National Occupational Standards
OS	Occupational Standards
PID	Proportional, Integral and Derivative Control
RC	Radio Control
RTK	Real-time Kinematic
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
UAV	Unmanned Aerial Vehicle

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical Education has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupation Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs troubleshooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the occupational standards and the training standards to respond to the demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant occupational standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Drone Pilot Technician Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of expert workers and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The occupational standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, supervisory technicians on the job, and experienced Drone Pilot Technicians were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces

regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of ... online surveys were completed by experts from the labour market across the country. Apart from the surveys aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR DRONE PILOT TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by a Drone Pilot Technician. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Drone Pilot Technicians may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Drone Pilot Technicians shall work under the supervision of senior technicians, plan flight routes for aerial photography, inspection, as well as surveying and mapping, install and debug multi-rotor, fixed-wing and composite-wing UAVs, perform aerial photography, patrol inspection and surveying and mapping, and diagnose and eliminate faults of various unmanned aerial vehicles, power system parts and load equipment during task execution. Generally, the Drone Pilot Technician performs the following responsibilities:

a) General services for aerial photography and inspection surveying and mapping

b) Planning of flighting tasks of multi-rotor, fixed-wing and composite-wing UAVs

c) Assembly, debugging and maintenance of multi-rotor, fixed-wing and composite-wing UAVs

d) Assembly, debugging and maintenance of multi-rotor, fixed-wing and composite-wing UAV power system

e) Assembly, debugging and maintenance of multi-rotor, fixed-wing and composite-wing UAV control system

f) Assembly, debugging and maintenance of multi-rotor, fixed-wing and composite-wing UAV loading system

g) Execution of tests in line-of-sight and flight tasks of all kinds of unmanned aerial vehicles

i) Execution of over-the-horizon tests and flight tasks of all kinds of unmanned aerial vehicles

j) Maintainance of the safety system of all kinds of unmanned aerial vehicles

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR DRONE PILOT TECHNICIAN - NTA 4

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	FLIGHT RECORDING	**DUTY NO.**	401
TASK TITLE	FILLING IN OF THE FLIGHT SCHEDULE	**TASK NO.**	4011
PERFORMANCE CRITERIA	The person performing this task must be able to fill in the flight schedule in accordance with the requirements of the flight task, the requirements of laws and regulations on low-altitude management and the equipment preparation.		
RANGE STATEMENT	The task can be performed indoors or at the flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include; 1. Ground station control system.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the contents of aerial photography task planning books; 2. Abide by the laws and regulations on low-altitude management; 3. Check the flying weather; 4. Check whether the take-off and landing site meets the requirements of vertical take-off and landing, and whether there are obstacles at the cruising altitude; 5. Select the multi-rotor vehicle to perform the task; 6. Plan flight operations; 7. Fill in the flight schedule.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Fill in the flight schedule; 1.2 Investigate the flight environmental conditions of the multi-rotor vehicle; 1.3 Plan the flight route of the multi-rotor vehicle. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The principle of aerial vehicle selection; 2.2 The weather and terrain requirements of the flight task; 2.3 The laws and regulations on low-altitude management. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Factors affecting the flight operation of the multi-rotor vehicle;

	4.0 Essential Skills 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The whole process of a task can be understood by the contents of the flight recording table, including the selection of the aerial vehicle, flight conditions, and flight route planning.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of geographical analysis; 2. Knowledge of flight safety.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND DEBUGGING OF MULTI-ROTOR VEHICLES	**DUTY NO.**	402
TASK TITLE	INSTALLATION OF MULTI-ROTOR VEHICLES	**TASK NO.**	4021
PERFORMANCE CRITERIA	The person performing this task must be able to install the multi-rotor vehicle in accordance with the requirements of the flight task, the requirements of laws and regulations on low-altitude management and the equipment preparation.		
RANGE STATEMENT	The task can be performed indoors or at the flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Screwdrivers; 2. Wire strippers; 3. Inner hexagon wrenches; 4. Multimeters; 5. Electric irons; 6. Air gun welding tables; 7. Hot melt glue guns; 8. Electronic accessories such as motors, electric adjusters, batteries and receivers; 9. Load equipment of aerial photography; 10. Transmission systems.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Observe the precautions of safety operation; 2. Analyse the requirements of the installation manual for rotary wing aerial vehicles; 3. Select appropriate tools and equipment; 4. Install the fuselage section of the multi-rotor vehicle; 5. Install the power system section of the multi-rotor vehicle; 6. Install the flight control system section of the multi-rotor vehicle;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Assemble the multi-rotor UAV platform; 1.2 Connect the UAV power system; 1.3 Install the UAV flight control system; 1.4 Connect the UAV teleequipment. **2.0 Principles** The person performing this task must be able to explain the following principles:

7. Install the remote control device section of the multi-rotor vehicle; 8. Install the section of wireless image transfer equipment of the multi-rotor vehicle; 9. Connect all circuits; 10. Clean the tools, equipment and workplaces; 11. Arrange and store the tools and equipment; 12. Fill in the installation manual.	2.1 The principle of multi-rotor UAV selection; 2.2 Flight control principles of the multi-rotor UAV; 2.3 Operating procedures for aerial vehicle installation. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The composition of UAVs; 3.2 Installation procedures of multi-rotor vehicles; 3.3 Usage of tools and equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer skills; 4.3 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The installation of multi-rotor vehicles is conducted and recorded in the flight task table in accordance with the requirements of the flight schedule and installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe use of electrical equipment and tools; 2. Occupational health and safety; 3. Waste disposal methods.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	INSTALLATION AND DEBUGGING OF MULTI-ROTOR VEHICLES	**DUTY NO.**	402
TASK TITLE	DEBUGGING OF MULTI-ROTOR VEHICLES	**TASK NO.**	4022
PERFORMANCE CRITERIA	The person performing this task must be able to debug the installed multi-rotor according to the task requirements.		
RANGE STATEMENT	The task can be performed indoors or at the flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Balancing tools; 2. Weighing tools; 3. Testing instruments; 4. Full set of UAV installation and debugging toolboxes; 5. Electric welding equipment and heat guns; 6. Different kinds of glue and connecting rods; 7. Charging equipment.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Test the dynamic and static balance of the propellers; 2. Test the electrical circuit; 3. Test the power plant; 4. Test the flight control module; 5. Test the load module; 6. Fill in the flight task table.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Test the balance of the propellers; 1.2 Detect the electrical circuit; 1.3 Test the power system; 1.4 Test the flight control system; 1.5 Test the loading system; 1.6 Use tools and consumables. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of static and dynamic equilibrium of propellers; 2.2 Principle of flight control.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Role of power systems of multi-rotor vehicles; 3.2 Role of flight control systems of multi-rotor vehicles; 3.3 Role of loading systems of multi-rotor vehicles. **4.0 Essential Skills** 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The debugging of multi-rotor vehicles is conducted and recorded in the flight task table in accordance with the requirements of the flight schedule and installation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of tools and instruments; 2. Safety operation of consumables and accessories; 3. Safe connection and use of electricity; 4. Occupational health and safety; 5. Waste disposal methods.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MULTI-ROTOR FLIGHT OPERATION	**DUTY NO.**	403
TASK TITLE	PREPARATION OF MULTI-ROTOR FLIGHT OPERATION	**TASK NO.**	4031
PERFORMANCE CRITERIA	The person performing this task must be able to prepare for the flight operation of multi-rotor UAVs according to the requirements of the task and laws and regulations on low-altitude management of UAVs.		
RANGE STATEMENT	The task can be performed at the outdoor flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Multi-rotor UAVs that have been installed and debugged; 2. Remote controllers; 3. Ground stations.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the contents of task planning books; 2. Abide by the laws and regulations on low-altitude management; 3. Check the flying weather and topography; 4. Plan flight operations; 5. Complete the inspection of multi-rotor vehicles; 6. Complete the inspection of load equipment for multi-rotor flight; 7. Complete the inspection of multi-rotor flight remote controllers; 8. Complete the inspection of multi-rotor flight environment; 9. Fill in the pre-flight checklist.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Determine no-fly zones and restricted flight zones; 1.2 Check the safety of take-off and landing zones; 1.3 Inspect airspace safety visually; 1.4 Fill in the pre-flight checklist. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Basic structure and flight principle of multi-rotor vehicles: 2.2 Principle of data links; 2.3 Safety principles for UAV flying at low altitudes; 2.4 Flying weather and topography for UAVs; 2.5 The laws and regulations on low-altitude management.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 System structure of multi-rotor UAVs. **4.0 Essential Skills** 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The pre-operation preparation of multi-rotor vehicles is conducted and recorded in the flight task table in accordance with the requirements of the flight schedule.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of tools and instruments; 2. Occupational health and safety.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MULTI-ROTOR FLIGHT OPERATION	**DUTY NO.**	403
TASK TITLE	IN LINE-OF-SIGHT MULTI-ROTOR FLIGHT OPERATION	**TASK NO.**	4032
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the flight operation of multi-rotor UAVs according to the requirements of the task and laws and regulations on low-altitude management of UAVs.		
RANGE STATEMENT	The task can be performed at the outdoor flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Multi-rotor UAVs that have been installed and debugged; 2. Ground station radios; 3. Ground station control system.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse the contents of task planning books; 2. Abide by the laws and regulations on low-altitude management; 3. Check the flying weather and topography; 4. Plan flight operations; 5. Complete the vertical take-off and landing of multi-rotor vehicles; 6. Complete the 360° spin of multi-rotor vehicles; 7. Complete the obstacle flight around multi-rotor vehicles; 8. Complete the flight based on recognition of ground icons; 9. Fill in the flight recording table.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the UAV control equipment; 1.2 Control the UAV to take off, fly and land; 1.3 Fill in the flight recording table. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Flight principle of UAVs; 2.2 Flight safety principles of UAVs; 2.3 Control principle of UAVs. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Role of power systems of multi-rotor vehicles; 3.2 Role of flight control systems of multi-rotor vehicles;

	3.3 System structure of multi-rotor vehicles. **4.0 Essential Skills** 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The in line-of-sight multi-rotor flight operation is completed and recorded in the flight task table according to the requirements of the flight schedule.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of geographical analysis; 2. Flight safety of UAVs; 3. Occupational health and safety.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MULTI-ROTOR FLIGHT OPERATION	**DUTY NO.**	403
TASK TITLE	DATA ACQUISITION OF OVER-THE-HORIZON AERIAL IMAGES	**TASK NO.**	4033
PERFORMANCE CRITERIA	The person performing this task must be able to conduct flight operation according to the task requirements and the installed and debugged multi-rotor UAVs, and complete the data acquisition of over-the-horizon aerial images.		
RANGE STATEMENT	The task can be performed at the outdoor flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Ground station radios; 2. Ground station computers; 3. Ground station software; 4. Radio communication systems.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Operate the ground station and monitor the flight status of the UAV in real time to identify emergency through the feedback from flight status monitoring; 2. Change load parameters according to actual operation requirements, control load equipment to acquire data, and monitor the operating state of loads; 3. Fill in the flight task table.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Monitor the flight status of the UAV; 1.2 Manipulate the load to acquire image data. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of aerial data acquisition. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operation methods of the load control system; 3.2 Types of aerial data.

	4.0 Essential Skills 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The over-the-horizon multi-rotor flight operation is completed and recorded in the flight task table according to the requirements of the flight schedule.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe connection and use of electricity; 2. Occupational health and safety; 3. Waste disposal methods.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	EQUIPMENT MAINTENANCE	**DUTY NO.**	404
TASK TITLE	CLEANING OF THE FUSELAGE AND PROPELLER OF THE AERIAL VEHICLE	**TASK NO.**	4041
PERFORMANCE CRITERIA	The person performing this task must be able to detect the parts of the power system of the multi-rotor vehicle according to the overhaul manual.		
RANGE STATEMENT	The task can be performed at the indoor or outdoor flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Full set of aerial vehicle equipment; 2. Full set of installation tools for the aerial vehicle; 3. Engine test benches; 4. Blade balancers.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Refer to the instructions in the overhaul manual and select operating tools and equipment for tasks according to different equipment; 2. Detect the integrity of the fuselage, monitor whether the fastening screws are loose, whether the structural parts are deformed and loose, and whether there are cracks or deformations on the exterior of the fuselage; 3. Detect whether there is any lag or abnormal noise in motor operation; 4. Detect whether the propeller is damaged and fixed firmly; 5. Fill in the component inspection list; 6. Arrange and store the tools and equipment; 7. Clean the workplace; 8. Fill in the flight task table.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Detect the motor, fuselage, blades and their accessories. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of static and dynamic equilibrium of propellers; 2.2 Principle of safe battery charging; 2.3 Safety operation procedure for tools. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Component inspection procedures; 3.2 Structure and principle of the multi-rotor vehicle.

	4.0 Essential Skills 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The fuselage and propeller of the aerial vehicle are cleaned according to the requirements of the flight schedule, and the contents of equipment maintenance in the flight task table are filled in.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Waste disposal methods.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	EQUIPMENT MAINTENANCE	**DUTY NO.**	404
TASK TITLE	REPLACEMENT OF DAMAGED PARTS OF THE AERIAL VEHICLE	**TASK NO.**	4042
PERFORMANCE CRITERIA	The person performing this task must be able to replace the damaged parts of the multi-rotor vehicle according to the overhaul manual.		
RANGE STATEMENT	The task can be performed at the indoor or outdoor flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Full set of aerial vehicle equipment; 2. Full set of installation tools for the aerial vehicle; 3. Engine test benches; 4. Blade balancers.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Refer to instructions in the overhaul manual; 2. Choose operating tools and equipment; 3. Replace the fuselage; 4. Replace the propeller; 5. Replace the motor; 6. Fill in the component inspection list; 7. Clean the workplace; 8. Arrange and store the tools and equipment; 9. Fill in the flight task table.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Replace the fuselage; 1.2 Replace the motor; 1.3 Replace the blade; 1.4 Replace accessories. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Motor steering principle; 2.2 Site safety principle; 2.3 Safety operation procedure for tools. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Component replacement procedures; 3.2 Structure and principle of the multi-rotor vehicle.

	4.0 Essential Skills 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The damaged parts of the aerial vehicle are replaced according to the requirements of the flight schedule, and the contents of equipment maintenance in the flight task table are filled in.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Waste disposal methods.

OCCUPATION	DRONE PILOT TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	EQUIPMENT MAINTENANCE	**DUTY NO.**	404
TASK TITLE	REPLACEMENT AND CHARGING OF LITHIUM BATTERIES	**TASK NO.**	4043
PERFORMANCE CRITERIA	The person performing this task must be able to replace and charge the lithium batteries of the multi-rotor vehicle according to the overhaul manual.		
RANGE STATEMENT	The task can be performed at the indoor or outdoor flight site under the supervision of senior drone pilot technicians. The tools and equipment to be used include: 1. Multimeters; 2. Electricity measurers; 3. Chargers; 4. Lithium batteries; 5. Battery storage boxes.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Refer to instructions in the overhaul manual; 2. Choose operating tools and equipment; 3. Check the battery level; 4. Replace the battery; 5. Replace the motor; 6. Charging the battery; 7. Store the battery in the storage box; 8. Clean the workplace; 9. Arrange and store the tools and equipment; 10. Fill in the flight task table.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the battery; 1.2 Measure the electricity quantity; 1.3 Replace the battery; 1.4 Store the battery; 1.5 Connect and use electricity. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of battery charging and discharging; 2.2 Principle for the safe use of batteries; 2.3 Safety operation procedure for tools. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Procedures for the battery replacement. **4.0 Essential Skills** 4.1 Reading comprehension skills; 4.2 Communication skills; 4.3 Computer skills; 4.4 Teamwork skills; 4.5 Writing skills. **5.0 Math Skills** 5.1 Examination skills; 5.2 Computing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The lithium batteries are replaced and charged according to the requirements of the flight schedule, and the contents of equipment maintenance in the flight task table are filled in.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Waste disposal methods.

TABLE 1: DACUM CHARTS FOR DRONE PILOT TECHNICIAN - NTA 4

DUTIES	TASKS	ENABLERS
1.0 Task analysis	1.1 Filling in of the flight schedule.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of the manufacturer's manual · Environment and flight safety · Flight task flow · Operation of ground station software **Tools and equipment** · Ground control stations **Materials** · Documents and tables **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
2.0 Installation and debugging of multi-rotor vehicles	2.1 Installation of multi-rotor vehicles. 2.2 Debugging of multi-rotor vehicles.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of the manufacturer's manual · Environment and flight safety · Skills in aerial vehicle installation and debugging · Interpretation of technical documents **Tools and equipment** · Full set of installation and debugging tools for the aerial vehicle · Flight control software · Ground control stations **Materials** · Multi-rotor propeller

		· Multi-rotor landing gear · Multi-rotor reinforcing screws, straps, glue, etc. **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
3.0 Multi-rotor flight operation	3.1 Preparation of multi-rotor flight operation. 3.2 In line-of-sight multi-rotor flight operation. 3.3 Data acquisition of over-the-horizon aerial images.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of the manufacturer's manual · Environment and flight safety · Flight task flow · Operation of ground station software **Tools and equipment** · Ground control stations **Materials** · Multi-rotor propeller · Multi-rotor landing gear · Multi-rotor reinforcing screws, straps, glue, etc. **Requirements for employees** · Teamwork spirit, integrity, time management and commitment
4.0 Equipment overhaul	4.1 Cleaning of the fuselage and propeller of the aerial vehicle. 4.2 Replacement of damaged parts of the aerial vehicle. 4.3 Replacement and charging of lithium batteries.	**General skills and knowledge** · Cooperation with others using communication skills and submission of reports to the superiors · Use of the manufacturer's manual · Environment and flight safety · Flight task flow · Skills in installation and debugging of the load equipment in the aerial vehicle · Interpretation of technical documents

		Tools and equipment · Full set of installation tools for the aerial vehicle · Ground control stations **Materials** · Multi-rotor propeller · Multi-rotor landing gear · Multi-rotor reinforcing screws, straps, glue, etc. **Requirements for employees** · Teamwork spirit, integrity, time management and commitment