Class One Systems

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UAV TRAINING RESOURCE HANDBOOK

This document is part of our flight training programmes.

Your companion for understanding operations and terms used in the Unmanned Aerial Vehicle (UAV) industry.

UAS SAFETY & OPERATIONAL CHECKLIST

Plan your flight
- Define your flight objectives and map out the area you intend to cover.
- Familiarize yourself with local UAV regulations and airspace restrictions.
- Identify potential hazards and plan alternative routes if necessary.

Check weather conditions
- Assess weather conditions, including rain, wind, fog, and temperature.
- Avoid flying in strong winds (above 10 mph) or low visibility conditions.
- Use weather apps like **Drone Forecast** or **DroneCast** for real-time updates.

Inspect your UAV/UAV
- Examine the UAV for physical damage, such as cracks or loose components.
- Ensure propellers are clean, undamaged, and securely attached.
- Verify that the battery is fully charged and free of swelling or damage.

Choose a safe takeoff and landing spot
- Use flat, stable surfaces for takeoff and landing to avoid dust or debris entering the UAV's vents.
- Avoid areas with loose gravel, sand, or uneven terrain.

Survey the environment
- Observe the surroundings for potential hazards like trees, buildings, and power lines.
- Identify the tallest obstacle in the area and set your Return to Home (RTH) height above it.
- Be mindful of telephone lines and electric poles, which may be less visible from a distance.

Monitor wildlife and people
- Be cautious of birds, as they may perceive the UAV as a threat and attack it.
- Keep a safe distance from animals to avoid startling them.
- Inform nearby individuals about your UAV operation to address any concerns.

Plan your flight path
- Map out your flight path and ensure it avoids restricted areas and obstacles.
- Use GPS-enabled apps to track your UAV's location and flight path in real-time.

Preflight Checklist
- Update the UAV's firmware and ensure the remote controller is functioning properly.
- Calibrate the compass and check the GPS signal strength.
- Test the camera and gimbal for stability and functionality.

Battery management
- Monitor battery levels during the flight and return to home when the battery is low.
- Carry spare batteries for extended operations and store them safely.

Use UAV-specific apps
- Utilize apps like **AirMap**, **UAVCast**, or **UAV Forecast** for airspace information, weather updates, and flight planning.

UAS SAFETY & OPERATIONAL CHECKLIST

Emergency preparedness

- Be ready to execute an emergency landing if necessary.
- Familiarize yourself with the UAV's fail-safe features, such as auto-landing or RTH.

Post-flight maintenance

- Inspect the UAV for any damage after landing.
- Clean the UAV and its components to remove dust or debris.
- Recharge batteries and store them in a cool, dry place.

PRE-FLIGHT & POST-FLIGHT CHECKLIST

Preflight Checklist

Preparation before leaving home

- Ensure all firmware (drone, controller, and app) is up to date.
- Fully charge all batteries (drone, controller, and mobile device).
- Inspect batteries for any damage or swelling.
- Verify that the SD card is inserted and has sufficient storage.
- Check weather conditions and ensure they are suitable for flying.
- Research the flight area for any restrictions or hazards (e.g., No-Fly Zones, NOTAMs).
- Plan the mission and flight path.

On-site setup

- Inspect the UAV for any physical damage or loose components.
- Remove the gimbal cover and check the gimbal's movement.
- Calibrate the compass and IMU if necessary.
- Check the GPS signal strength and ensure a sufficient number of satellites are locked.
- Set the Return-to-Home (RTH) altitude and home point.
- Ensure the propellers are securely attached and undamaged.
- Verify that the takeoff area is clear of obstacles and on a level surface.

Before takeoff

- Power on the drone and controller, then connect the mobile device.
- Open the DJI app and check for any error messages.
- Perform a control check to ensure all inputs respond correctly.
- Hover the drone briefly to observe stability and responsiveness.

Post-Flight Checklist

After landing

- Ensure the landing area is safe and clear of obstacles.
- Power down the drone first, followed by the controller.

Inspection and maintenance

- Remove the battery from the drone and inspect it for any damage.
- Inspect the UAV for any signs of wear, damage, or debris.
- Check the gimbal for smooth movement and reinstall the gimbal cover.
- Clean the drone's sensors and body with a soft, dry cloth.

Storage

- Store the drone, controller, and batteries in a safe, dry place.
- Ensure batteries are stored at an appropriate charge level (not fully charged or depleted).

ROLE OF CAAs

Civil Aviation Authorities across the Caribbean play a vital role in ensuring the safety, security, and efficiency of all users of air space including UAVs. Here's an overview of their responsibilities:

- **Regulation and oversight** - They establish and enforce aviation regulations in line with international standards, such as those set by the International Civil Aviation Organisation (ICAO).
- **Safety and security** - These authorities are responsible for maintaining high safety and security standards. They conduct inspections, audits, and investigations to ensure compliance with air safety protocols.
- **Coordination and collaboration** - Regional bodies like the Eastern Caribbean Civil Aviation Authority (ECCAA) and the Caribbean Aviation Safety and Security Oversight System (CASSOS) work to harmonise aviation policies and practices across member states. This helps to ensure a unified approach to safety and security.
- **Economic growth** -By fostering a safe and efficient aviation environment, these authorities support tourism and trade, which are critical to the Caribbean's economy.
- **Environmental responsibility** -They also focus on minimising the environmental impact of aviation activities, aligning with global sustainability goals.

Country/Region	Authority Name	Address	Contact Information
East Caribbean Islands	Eastern Caribbean Civil Aviation Authority (ECCAA)	ECCAA Headquarters, Antigua	Phone: Information not available
Jamaica	Jamaica Civil Aviation Authority	4 Winchester Road, Kingston 10, Jamaica	Phone: (876) 960-3965, Email: info@jcaa.gov.jm
Trinidad & Tobago	Trinidad and Tobago Civil Aviation Authority	Caroni North Bank Rd, Piarco, Trinidad & Tobago	Phone: Information not available
Barbados	Barbados Civil Aviation Authority	Charnocks, Christ Church, Barbados, BB17087	Phone: (246) 535-0001, Email: civil.aviation@bcaa.gov.bb
Guyana	Guyana Civil Aviation Authority	73 High Street, Kingston, Georgetown	Phone: 592-227-8111, Hotline: 592-608-4222
Suriname	Civil Aviation Safety Authority	Information not available	Information not available

TTCAA AWARENESS CHECKLIST

- All drones must have a Certificate of Registration issued by the legal Authority, the TTCAA.
- An Operator/Pilot using a drone for commercial operations shall obtain public liability insurance.
- An Operator/Pilot shall not operate a drone who knows or has reason to believe, that they have an existing medical condition that may interfere with the safe operation of the unmanned aircraft system.
- An Operator/Pilot shall not operate a drone if they are taking medication or receiving treatment for a medical condition or have reason to believe that the medication/treatment may interfere with the safe operation of the unmanned aircraft system.
- An Operator/Pilot shall not operate a drone under the influence of alcohol or any controlled substance that might impair the operator's judgment.
- Drones weighing more than 750g should not be flown more than 120 meters (400 FT) above the ground.
- Drones weighing less than 750g should not be flown more than 30 meters (100 FT) above ground.
- Drone pilots must maintain a direct line of sight.
- Drones may not be flown in any No-Fly Zones (NFZs).
- Never fly over stadiums, crowds, near emergency response efforts, and within the restricted zones of airports.
- TTCAA owns all the airspace above Trinidad & Tobago.
- If drones fly away or crash and you cannot retrieve them, call the control towers at the airport in Piarco Airport in Trinidad or A.N.R. Robinson Airport in Tobago.
- If a helicopter or any manned aircraft flies near you, immediately land your Unmanned Air Vehicle (UAV). Discontinue all flight operations if you have reason to believe that continuing the flight may pose a hazard to other aircraft. All manned aircraft have precedence over unmanned aircraft.
- An Operator/Pilot shall make a report to TTCAA within ten days if any operation has resulted in injury to any person, animal, or damage to the property of another.
- An Operator/Pilot shall not act as an operator or observer for more than one unmanned aircraft system at any time.
- An Operator/Pilot shall not operate an unmanned aircraft system over another person except where that person has consented to participate in the operation.
- An Operator/Pilot shall not operate an unmanned aircraft system over another person unless it is located under a covered structure that provides reasonable protection if the unmanned aircraft were to lose control and is given sufficient notice that an unmanned aircraft is conducting operations in the vicinity.
- An Operator/Pilot of an unmanned aircraft system shall not conduct any operations over or within private property unless he has been granted permission by the owner of the property.

TTCAA AWARENESS CHECKLIST

- An Operator/Pilot of an unmanned aircraft system shall not conduct any operations within, or over public property, unless written permission is sought and obtained before the operation of the unmanned aircraft system from the relevant Authority with responsibility for the area in which the operator wishes to conduct operations.

GLOSSARY

Our glossary of UAV (Unmanned Aerial Vehicle) terms is grouped in the following sections.

Types of UAVs

- **UAV**- A generic term for an unmanned aerial vehicle (UAV), operated remotely or autonomously.
- **Fixed-wing UAV**- A UAV design resembling a traditional airplane, ideal for long-distance or high-endurance missions.
- **Fixed-Wing UAVs**- Aircraft with stationary wings, ideal for long-distance and high-endurance missions.
- **Heavy-Lift UAVs**- UAVs designed to carry large or heavy payloads, including industrial equipment or rescue supplies.
- **Hybrid UAVs**- Combines elements of fixed-wing and rotary-wing designs, balancing endurance with versatile flight capabilities.
- **Mapping UAV**- UAV designed for creating detailed surveys and topographic maps using payloads such as cameras and LiDAR.
- **Multirotor UAV**- A UAV type featuring multiple rotors (e.g., quadcopter, hexacopter) for versatile flight capabilities.
- **Nano UAVs**- Compact UAVs used for specialized applications like close-range inspections and confined-space surveillance.
- **Octocopter**- A UAV with eight rotors, offering enhanced stability and higher payload capacity.
- **Quadcopter**- A UAV with four rotors, popular for recreational and commercial uses.
- **Rotary-Wing UAVs**- UAVs with rotating blades, such as quadcopters, providing excellent maneuverability and vertical takeoff/landing.
- **SUAS (Small Unmanned Aircraft Systems)**- UAVs weighing less than 55 pounds, commonly used for commercial and recreational purposes.
- **Tethered UAVs**- UAVs connected to a power source via a tether, enabling extended operation times.
- **Underwater UAV/UAV**- UAVs capable of operating underwater for exploration and research.
- **Urban Delivery UAV/UAV**- UAVs optimized for delivering goods in crowded city environments.
- **VTOL UAVs (Vertical Takeoff and Landing)**- UAVs capable of vertical liftoff while also transitioning to horizontal flight modes.
- **Wi-Fi UAV/UAV**- UAVs using Wi-Fi for communication and real-time video transmission.

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Flight Terms

- **Accelerometer**- A sensor that measures acceleration forces to stabilise the UAV during flight.
- **Aerial Photography**- Capturing high-quality images and videos from the air using UAVs.
- **AGL (Above Ground Level)**- The altitude of a UAV relative to the ground below it.
- **Autonomous Flight**- Flight operations executed by a UAV without manual control, based on pre-programmed instructions.
- **Barometer**- A sensor used to measure air pressure and assist in altitude control.
- **Battery Management System**- A technology to monitor and protect the UAV's batteries for optimal performance.
- **BVLOS (Beyond Visual Line of Sight)**- Operating a UAV beyond the pilot's direct view, typically requiring additional permissions.
- **Camera Gimbal**- A stabilising mount that ensures smooth aerial footage by eliminating vibrations.
- **Collision Avoidance**- Systems using sensors to prevent UAVS from crashing into obstacles.
- **Controller**- The device used by operators to control and navigate a UAV.
- **Endurance**- The maximum flight time a UAV can achieve on a single battery charge.
- **ESC (Electronic Speed Controller)**- A component that regulates the speed and direction of the UAV's motors.
- **Flight Planning**- Pre-programming the UAV's route and tasks for efficient and autonomous operations.
- **FPV (First Person View)**- Real-time video streaming from the UAV's camera to the operator, providing an immersive flying experience.
- **GPS (Global Positioning System)**- A navigation system that enables UAVS to determine precise location and execute autonomous flights.
- **Gyroscope**- A sensor that helps maintain the UAV's stability and orientation during flight.
- **IMU (Inertial Measurement Unit)**- Combines accelerometer and gyroscope data to sense the UAV's orientation and movements.
- **Joystick**- A physical control used to navigate and manoeuvre UAVS during flight.
- **Line of Sight**- Maintaining visual contact with the UAV during flight, often required by regulations.
- **Loiter**- A flight mode or behaviour where the UAV hovers or circles a specific area.
- **Navigation lights**- LEDs on UAVs that improve visibility during night or low-light operations.

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- **Obstacle Detection**- Sensors enabling UAVs to identify and navigate around obstacles.
- **RTH (Return-to-Home)**- An automatic feature that guides the UAV back to its takeoff point.
- **RTK (Real-Time Kinematic)**- GPS technology providing centimeter-level accuracy, critical for mapping and surveying missions.
- **Telemetry**- Data transmitted from the UAV to the operator, including altitude, speed, and battery status.
- **Vertical takeoff**- Capability allowing UAVs to ascend directly from the ground.
- **VLOS (Visual Line of Sight)**- Operating a UAV within the pilot's visual range, often required by regulations.
- **Waypoint Navigation**- Pre-programmed flight routes defined by specific GPS coordinates

Flight Law and Guides

- **Airworthiness certificate**- Documentation certifying that the UAV meets safety and performance standards.
- **Controlled Airspace**- Regions where UAV operations are regulated and require air traffic clearance.
- **No-Fly Zone**- Areas where UAV operation is restricted or prohibited due to safety or legal concerns.
- **No-Fly Zones**- Restricted areas (e.g., near airports, military zones) where UAV operations are prohibited.
- **Operator ID**- A unique identification number required for legally registering UAVs in certain jurisdictions.
- **Part 107 Certification**- A US FAA certification required for commercial UAV operations.

Flight Principles and Movement

- **Drag**- Air resistance that opposes UAV motion.
- **Hover**- The ability of a UAV to remain stationary in the air without drifting.
- **Lift**- The upward force counteracting gravity, allowing the UAV to fly.
- **Pitch**- Tilting of the UAV forward or backward.
- **Roll**- Tilting the UAV from side to side alters lateral movement.
- **Throttle**- Controls to adjust the UAV's speed and altitude.
- **Thrust**- The forward force generated by propellers or engines.
- **Yaw**- The rotation of the UAV around its vertical axis (side-to-side movement)..

GLOSSARY

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Flight Modes

- **Altitude hold mode**- Maintains a consistent altitude without pilot input.
- **Attitude mode** - A flight mode where the UAV holds its altitude but allows manual control for pitch and roll.
- **Follow-Me mode**- The UAV tracks and follows a designated moving subject.
- **GPS Mode**- Enables position hold and precise navigation using GPS signals.
- **Headless mode**- Simplifies controls by orienting the UAV relative to the pilot, regardless of the UAV's direction.
- **Manual mode**- Full control of the UAV, with no stabilisation or autopilot features.
- **X-Mode**- Flight mode for specialised manoeuvres or extreme conditions.

Payload Information

- **Cargo payload**- Refers to the weight of goods carried by a UAV, such as medical supplies or deliveries.
- **Data payload**- The information collected by a UAV's sensors, such as environmental or survey data.
- **Delivery mechanisms**- Custom attachments used for transporting and delivering goods.
- **Inspection payload**- Cameras or sensors designed specifically for industrial inspections, such as thermal imaging cameras.
- **Kilogram payload**- The maximum weight capacity a UAV can carry, often critical for delivery or industrial missions.
- **LiDAR (Light Detection and Ranging)**- A remote sensing technology used for 3D mapping and obstacle detection.
- **LiDAR**- Light detection and ranging sensors for high-precision 3D mapping.
- **Multispectral sensors**- Cameras that collect data in multiple spectral bands for applications like agriculture and vegetation analysis.
- **Payload capacity**- The maximum weight a UAV can carry without compromising performance.
- **Payload**- Equipment or cargo carried by a UAV, including cameras, sensors, or goods.
- **Quick release mechanism**- A Design feature for fast attachment or removal of payloads or accessories.
- **RGB cameras**- Standard cameras for capturing high-resolution color images and videos.
- **Stabilization technology**- Systems like gimbals or sensors ensure smooth flight and steady imagery.

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- **Survey payload**- Cameras and sensors for land, environmental, or construction surveys.
- **Thermal Imaging camera**- A payload used to capture heat signatures for inspections or search and rescue.
- **Thermal sensors**- Devices that detect and visualise heat signatures for inspections or search-and-rescue.
- **Waypoint Navigation**- Autonomous flight mode where UAVs follow pre-programmed paths.
- **Zero-pressure payloads**- Payloads designed to minimise impact on UAV stability and performance.
- **Zoom camera**- Adjustable focal length cameras for close-up inspections or surveillance.

UAV Photography Terms

- **Aerial panoramas**- Wide-angle images captured from above, often stitched together digitally.
- **FPV (First-Person View)** - A live video feed from the UAV's onboard camera.
- **Gimbal** - A stabilisation mechanism ensuring steady footage.
- **HDR (High Dynamic Range)**- A technique that enhances image quality by capturing a broader range of light intensities.
- **Orthomosaic Mapping**- The process of stitching UAV-captured images into a single high-resolution map.

Weather and Meteorology Terms

- **Wind Shear**- Sudden changes in wind speed or direction that can destabilise UAVS.
- **Thermal Currents**- Rising columns of warm air that may affect UAV stability.
- **Barometric Altimeter**- Measures atmospheric pressure to determine altitude.
- **Anemometer**- A device for measuring wind speed, critical for safe UAV operation.
- **Visibility**- A key metric determining whether UAV operations can be conducted safely.

UAV Data Collection and Analysis

- **Data logging**- The process of recording UAV flight data for performance evaluation and compliance.
- **Geotagging**- Embedding location data into photos or datasets collected by UAVs.
- **GIS Integration (Geographic Information Systems)**- Using UAV-captured data to build detailed geospatial datasets.

GLOSSARY

Our glossary of UAV (Unmanned Aerial Vehicle) terms is grouped in the following sections.

- **Photogrammetry**- The science of using UAV images to create maps or 3D models.
- **Sensor fusion**- Combining data from multiple UAV sensors (e.g., LiDAR, cameras) for advanced analysis.