DROPS UTM System

User Manual

Version 1.0 February 2026

Table of Contents

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1. Introduction

1.1 What is DROPS UTM?

DROPS UTM (Unmanned Traffic Management) is a comprehensive drone fleet management system designed for organizations operating multiple drones across various locations. The system provides:

- **Real-time drone monitoring** with live telemetry
- **Mission planning** with waypoint-based routes
- **Automated emergency response** protocols
- **Fleet orchestration** for optimal resource allocation
- **Airspace management** with geofencing capabilities
- **Weather integration** for flight safety

1.2 System Requirements

- Modern web browser (Chrome, Firefox, Safari, Edge)
- Stable internet connection
- Screen resolution: 1280x720 minimum (1920x1080 recommended)

1.3 Accessing the System

Navigate to your organization's DROPS UTM URL (e.g., `https://utm.drops.eu`) and log in with your credentials.

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2. Getting Started

2.1 Logging In

1. Open your web browser and navigate to the DROPS UTM URL
2. Enter your email address and password
3. Click **"Sign In"**

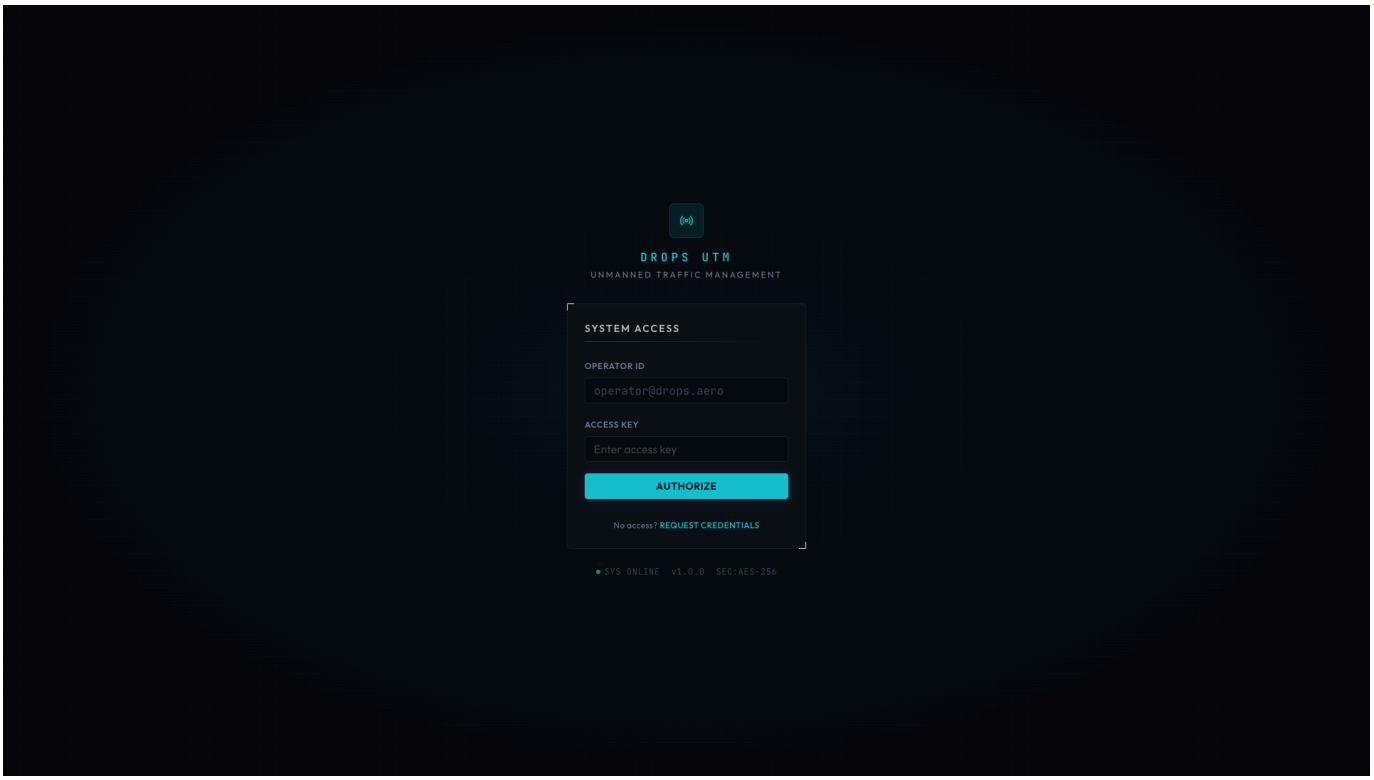

Figure 2.1: DROPS UTM Login Screen

2.2 First-Time Setup Checklist

For administrators setting up a new system:

Step	Action	Required Role
1	Create organization structure	Admin
2	Add hub locations	Admin
3	Register drones	Admin/Hub Operator
4	Define airspace zones	Admin/Hub Operator
5	Configure emergency protocols	Admin
6	Create user accounts	Admin

2.3 Navigation

The sidebar on the left provides access to all system modules:

- **Dashboard** - System overview and statistics

- **Control Center** - Real-time drone monitoring
- **Emergency** - Emergency response management
- **Fleet** - Fleet orchestration settings
- **Connectivity** - Device connection management
- **Missions** - Mission planning and execution
- **Flights** - Flight operations management
- **Drones** - Drone fleet registry
- **Hubs** - Vertiport/hub management
- **Airspace** - Airspace zone configuration
- **Conflicts** - Conflict detection and resolution
- **Weather** - Weather monitoring
- **Settings** - System configuration (Admin only)

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3. User Roles & Permissions

DROPS UTM implements role-based access control (RBAC) with three distinct roles:

3.1 Role Comparison Matrix

Feature	Admin	Hub Operator	Pilot
Dashboard	✓ Full	✓ Full	✓ Full
Control Center	✓ Full	✓ Full	✓ Full
Emergency Response	✓ Full	✓ Full	✓ View/Respond
Fleet Orchestration	✓ Full	✓ View	✕ Hidden
Connectivity	✓ Full	✓ Register/Command	✕ Hidden
Missions	✓ All	✓ All	✓ Own
Flights	✓ All	✓ All	✓ Own
Drones - View	✓	✓	✓
Drones - Register	✓	✓	✕
Drones - Edit	✓	✓	✕
Drones - Delete	✓	✕	✕
Hubs - View	✓	✓	✓
Hubs - Create	✓	✕	✕
Hubs - Edit	✓	✓	✕
Hubs - Delete	✓	✕	✕
Airspace - View	✓	✓	✓
Airspace - Create	✓	✓	✕
Airspace - Delete	✓	✕	✕
Users Management	✓	✕	✕
Settings	✓	✕	✕

3.2 Admin Role

Purpose: Full system administration and oversight

Responsibilities:

- System configuration and maintenance
- User account management
- Hub creation and management
- Fleet-wide policy enforcement
- Emergency protocol configuration
- Audit and compliance monitoring

Sidebar Access: All menu items visible including Settings

Best Practices:

- Limit admin accounts to essential personnel
- Review audit logs regularly
- Maintain backup admin credentials securely

3.3 Hub Operator Role

Purpose: Day-to-day operations management at assigned hubs

Responsibilities:

- Drone registration and maintenance tracking
- Flight authorization and monitoring
- Mission planning and execution
- Emergency response coordination
- Device connectivity management

Sidebar Access: All items except Settings

Best Practices:

- Monitor drone health metrics daily
- Verify weather conditions before authorizing flights
- Maintain communication with pilots

3.4 Pilot Role

Purpose: Flight execution and mission completion

Responsibilities:

- Mission creation and execution
- Pre-flight checks
- Real-time flight monitoring
- Emergency response for assigned flights
- Flight documentation

Sidebar Access: Basic operations only (no Fleet, Connectivity, Settings)

Best Practices:

- Complete pre-flight checklists
- Monitor weather updates
- Report anomalies immediately

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4. Dashboard Overview

The Dashboard provides a comprehensive system overview at a glance.

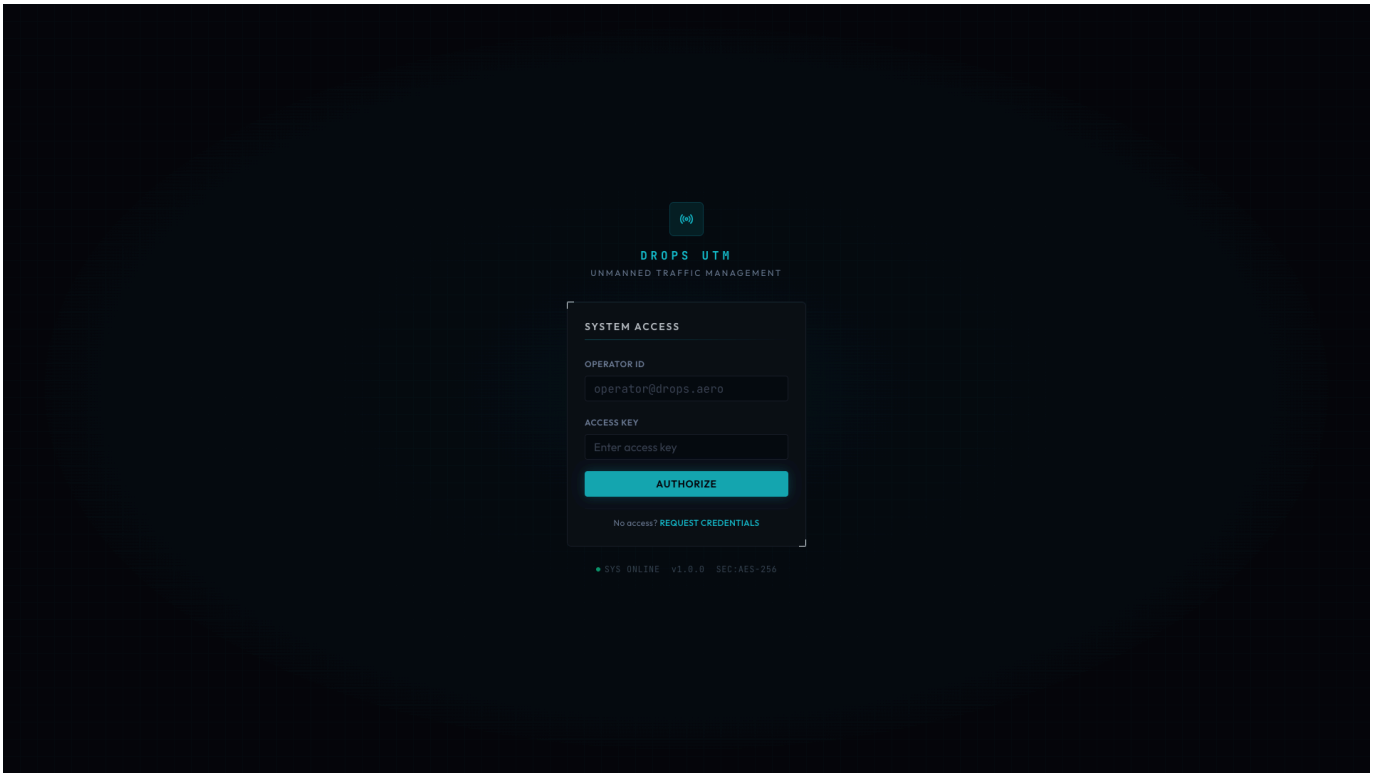

Figure 4.1: Main Dashboard View

4.1 Key Metrics

Metric	Description
Active Drones	Drones currently airborne
Active Flights	Ongoing flight operations
Active Missions	Missions in execution
Pending Alerts	Unacknowledged system alerts

4.2 Quick Status Cards

- **Fleet Status**: Overview of all drones by operational status
- **Hub Status**: Status of all vertiports
- **Recent Flights**: Latest flight activities
- **Weather Summary**: Current conditions at primary hubs

4.3 Activity Feed

Real-time feed showing:

- Flight departures and arrivals
- Mission completions
- System alerts

- User activities

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5. Control Center

The Control Center is the operational heart of DROPS UTM, providing real-time monitoring and control of all drone operations.

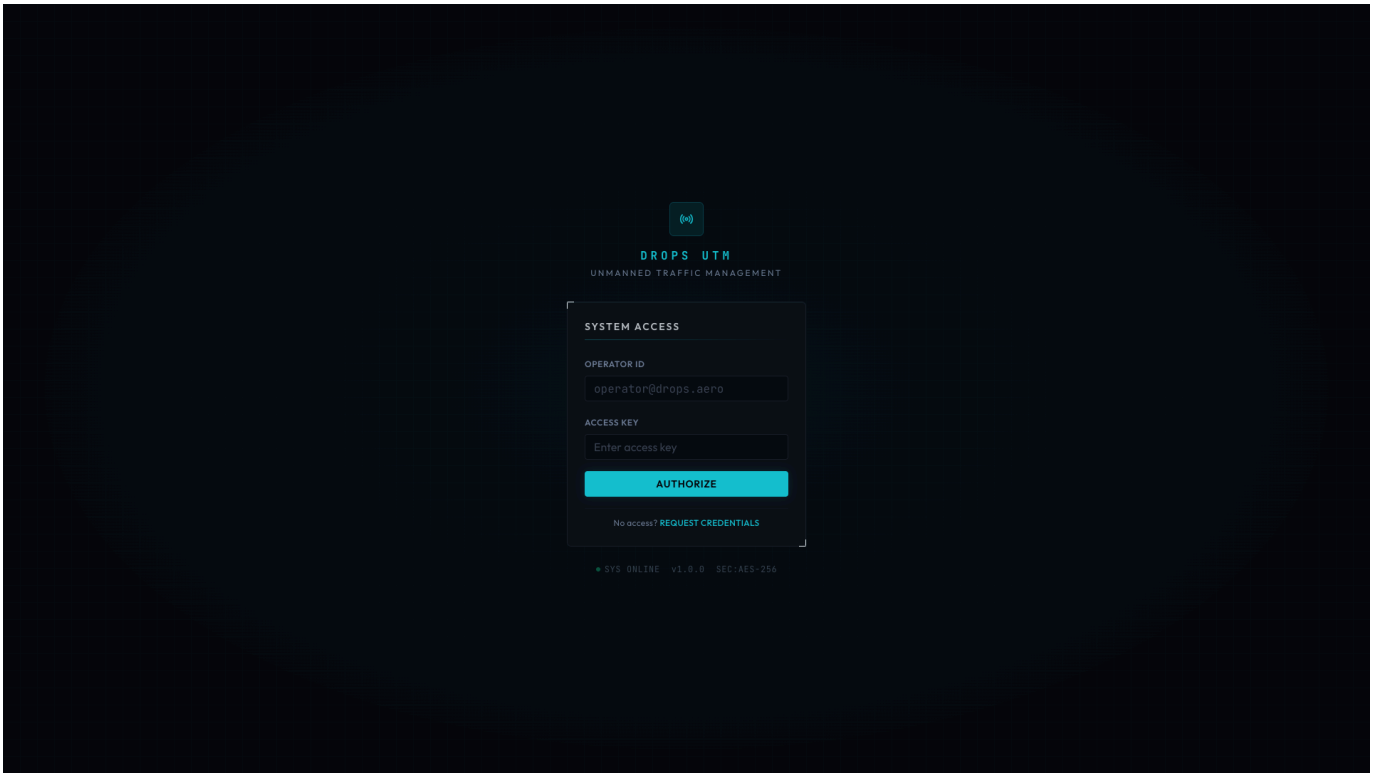

Figure 5.1: Control Center with Map View

5.1 Map View

The interactive map displays:

- **Drone positions** (real-time tracking)
- **Hub locations** (with status indicators)
- **Airspace zones** (color-coded by type)
- **Flight paths** (planned and actual)
- **Weather overlays** (optional)

Map Controls

Control	Function
Scroll	Zoom in/out
Click + Drag	Pan the map
Click Drone	Select and view details
Click Hub	View hub information

5.2 Drone List Panel

Shows all registered drones with:

- Registration number
- Current status (idle, flying, charging, maintenance)
- Battery level
- Current location or assigned hub
- Active mission (if any)

Status Indicators

Color	Status
🟢 Green	Operational/Flying
🟡 Yellow	Idle/Standby
🟠 Orange	Low Battery/Warning
🔴 Red	Emergency/Offline
⚪ Gray	Maintenance

5.3 Telemetry Panel

When a drone is selected, view real-time telemetry:

- **Position**: Latitude, longitude, altitude
- **Speed**: Ground speed and vertical speed
- **Heading**: Current direction
- **Battery**: Percentage and estimated flight time
- **Signal**: Communication signal strength
- **Satellites**: GPS satellite count

5.4 Command Interface

Send commands to selected drones:

Command	Description	Use Case
RTH	Return to Home	Recall drone to home hub
LAND	Land Immediately	Emergency landing at current position
HOVER	Hold Position	Pause and hover in place
PAUSE	Pause Mission	Temporarily stop mission execution
RESUME	Resume Mission	Continue paused mission

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6. Mission Planning

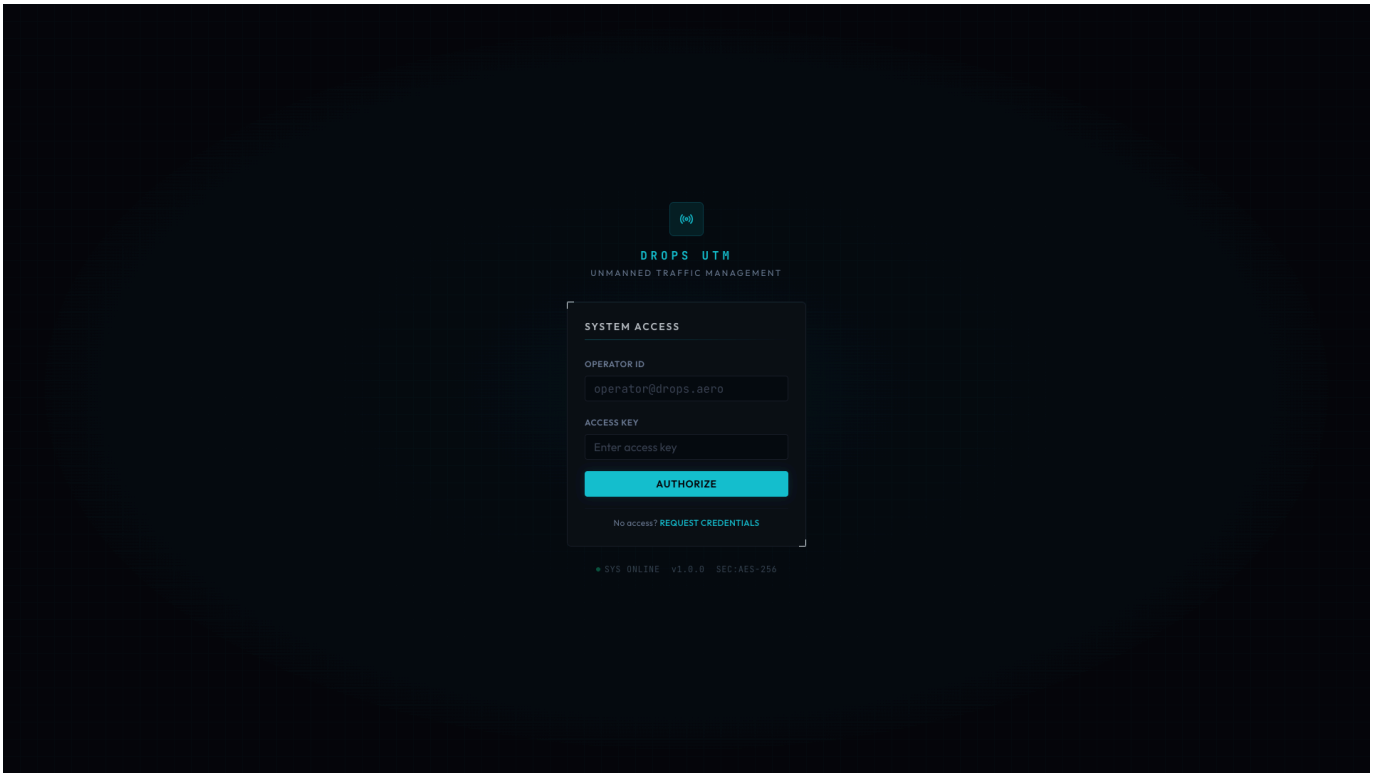

Figure 6.1: Missions List View

6.1 Creating a New Mission

1. Navigate to **Missions** → Click **"New Mission"**
2. Enter mission details:
   - **Mission Name**: Descriptive identifier
   - **Description**: Purpose and notes
   - **Departure Hub**: Starting location
   - **Arrival Hub**: Destination (can be same as departure)
   - **Assigned Drone**: Select from available drones

6.2 Waypoint Editor

Adding Waypoints

1. Select **"Add Point"** mode in the toolbar
2. Click on the map to place waypoints
3. Waypoints are automatically connected in sequence

Waypoint Properties

Property	Description	Default
Altitude	Flight altitude in meters	50m
Speed	Speed to this waypoint	12 m/s
Hover Duration	Time to hover at waypoint	0s
Actions	Actions to perform (photo, video, etc.)	None

Editing Waypoints

- **Move**: Drag waypoint marker on map
- **Edit**: Click waypoint, modify in side panel
- **Delete**: Select waypoint, click delete
- **Reorder**: Drag in waypoint list

6.3 Altitude Profile

The altitude profile chart shows:

- Planned altitude at each waypoint
- Terrain elevation (if available)
- Airspace ceiling limits

6.4 Mission Scheduling

Schedule Type	Description
Manual	Start manually when ready
Scheduled	Automatic start at specified time
Event Triggered	Start based on external trigger

6.5 Starting a Mission

Prerequisites:

- ✓ Drone assigned
- ✓ At least one waypoint defined
- ✓ Weather conditions acceptable
- ✓ Airspace clear

Process:

1. Review mission details
2. Click **"Start Mission"**
3. Confirm in dialog
4. Monitor progress in Control Center

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7. Flight Management

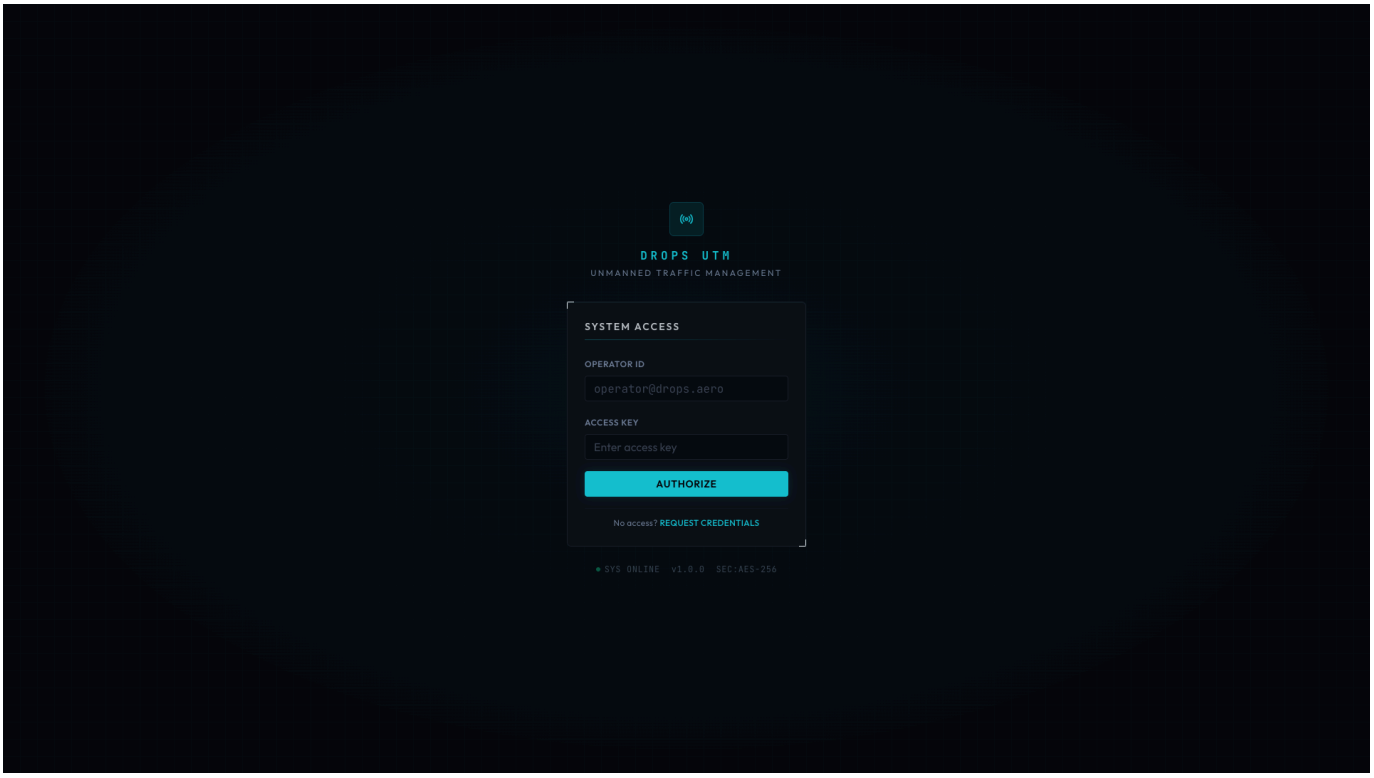

Figure 7.1: Flights Management View

7.1 Flight vs Mission

Concept	Description
Mission	Pre-planned route with waypoints
Flight	Actual flight operation (may or may not follow a mission)

7.2 Creating a Flight

1. Navigate to **Flights** → Click **"New Flight"**
2. Fill in flight details:
   - **Drone**: Select aircraft
   - **Departure Hub**: Origin
   - **Arrival Hub**: Destination
   - **Flight Type**: Cargo, Inspection, Survey, etc.
   - **Operation Mode**: Autonomous, Supervised, Manual
   - **Planned Departure**: Scheduled departure time

7.3 Flight Lifecycle

```
PLANNED → AUTHORIZED → ACTIVE → COMPLETED
                ↓          ↓
            CANCELLED   ABORTED
```

Status	Description	Actions Available
Planned	Flight created, awaiting authorization	Edit, Authorize, Cancel

Authorized	Approved for operation	Start, Cancel
Active	Currently in progress	Monitor, Complete, Abort
Completed	Successfully finished	View logs
Aborted	Terminated early	View logs
Cancelled	Cancelled before start	-

7.4 Flight Authorization

Flights require authorization before execution:

1. Review flight plan
2. Check weather conditions
3. Verify airspace availability
4. Click **"Authorize"**

7.5 Flight Monitoring

During active flights:

- Track position on map
- Monitor telemetry
- View estimated arrival time
- Receive alerts for anomalies

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8. Drone Fleet Management

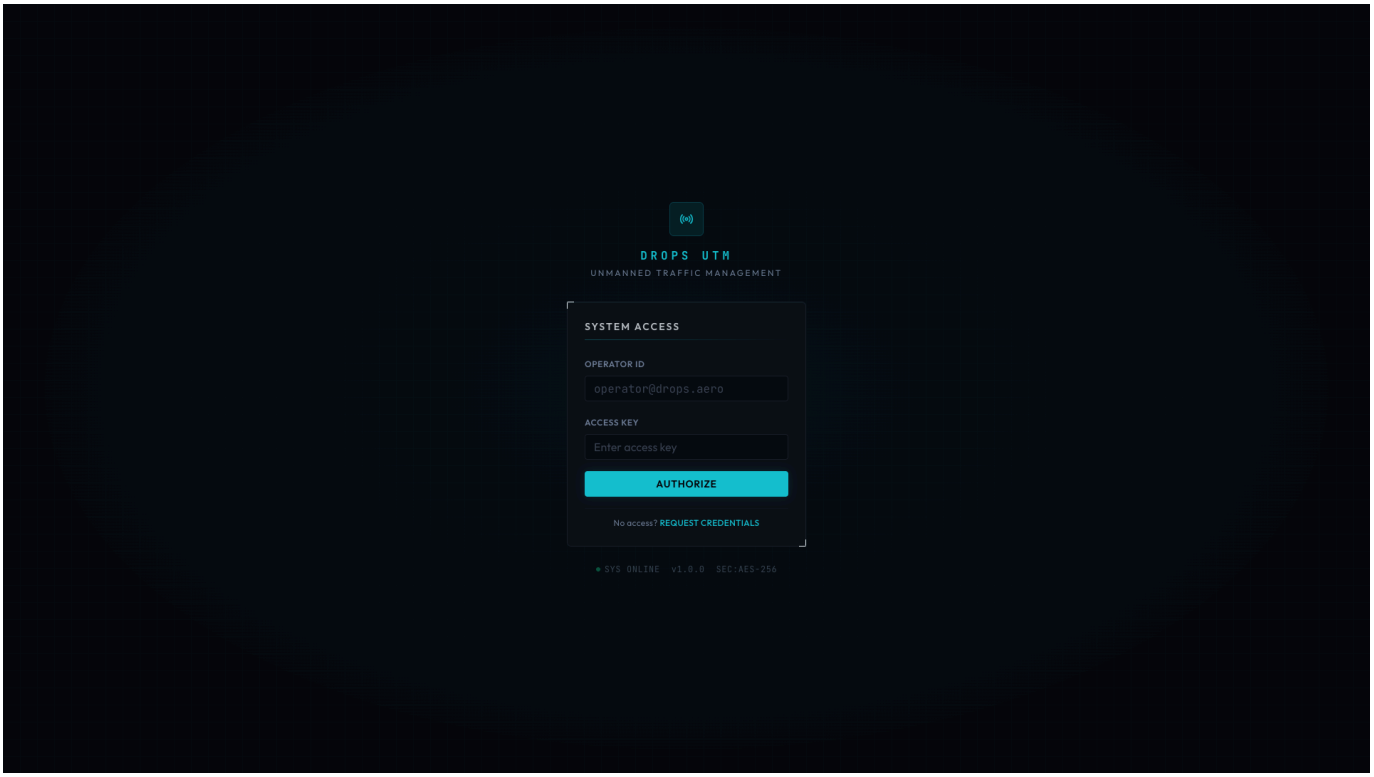

Figure 8.1: Drone Fleet Registry

8.1 Registering a New Drone

Required Role: Admin or Hub Operator

1. Navigate to **Drones** → Click **"Register Drone"**
2. Enter drone information:

Field	Description	Example
Registration Number	Unique identifier	GR-DRN-001
Manufacturer	Drone manufacturer	DJI
Model	Drone model	Matrice 300 RTK
Serial Number	Factory serial number	SN-ABC123456
Home Hub	Assigned base location	Athens Central Hub
Communication Protocol	Connection protocol	MAVLink

8.2 Drone Status Management

Status	Meaning	Can Fly?
Idle	Ready for operation	✓
Flying	Currently airborne	-
Charging	Battery charging	×
Maintenance	Under maintenance	×
Offline	No communication	×

8.3 Drone Health Monitoring

Monitor key health indicators:

- **Battery Health**: Capacity degradation over time
- **Flight Hours**: Total operational hours
- **Maintenance Due**: Scheduled maintenance date
- **Last Inspection**: Date of last inspection

8.4 Maintenance Scheduling

1. Select drone from list
2. Click **"Schedule Maintenance"**
3. Set maintenance type and date
4. Drone automatically set to maintenance status on date

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9. Hub Management

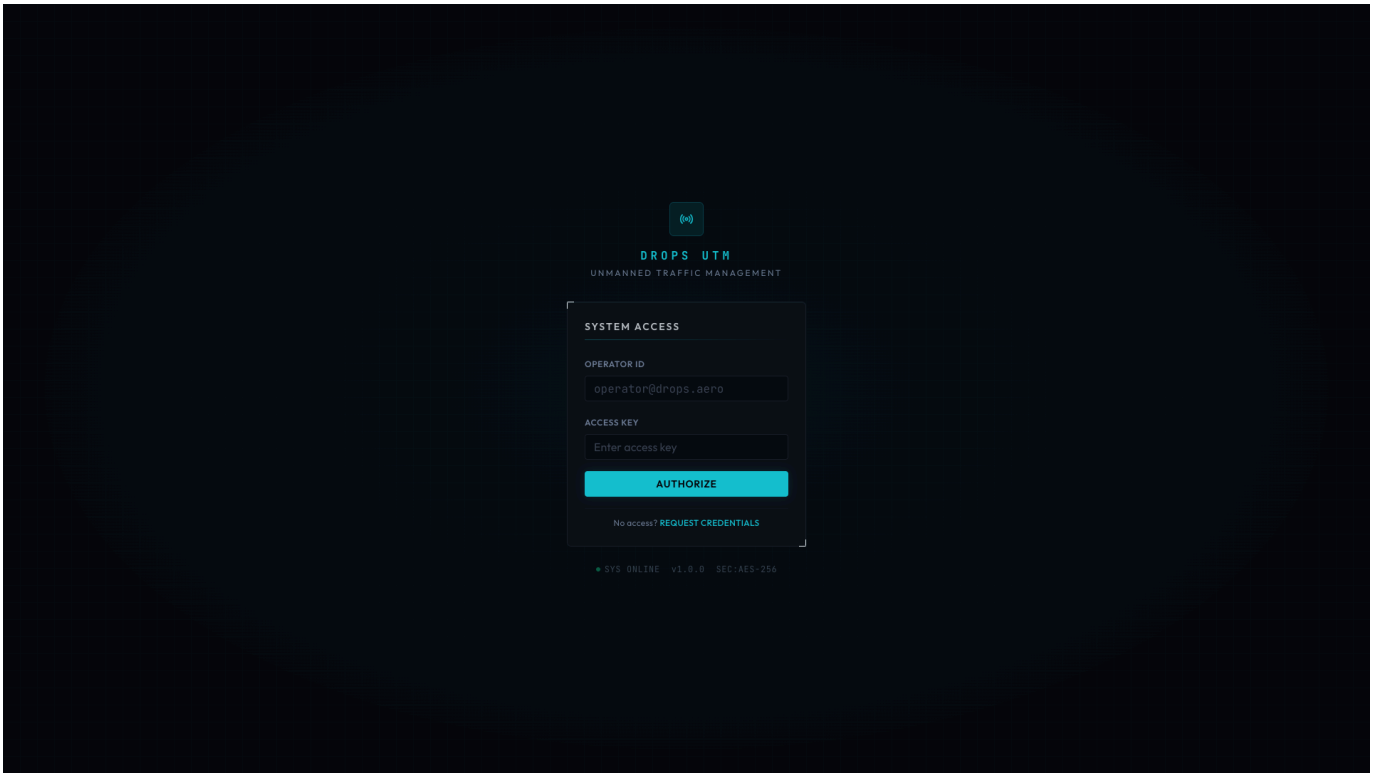

Figure 9.1: Hub Management with Map View

9.1 What is a Hub?

A Hub (or Vertiport) is a designated location for drone operations including:

- Takeoff and landing
- Battery charging/swapping
- Maintenance facilities
- Storage

9.2 Creating a Hub

Required Role: Admin only

1. Navigate to **Hubs** → Click **"Add Hub"**
2. Enter hub details:

Field	Description	Example
Code	Short identifier	ATH-01
Name	Descriptive name	Athens Central Hub
Latitude	GPS latitude	37.9838
Longitude	GPS longitude	23.7275
Airspace Radius	Controlled radius (meters)	5000
Airspace Ceiling	Maximum altitude (meters)	400
Timezone	Local timezone	Europe/Athens

9.3 Hub Status

Status	Description
Active	Fully operational
Maintenance	Limited operations
Offline	Not operational

9.4 Hub Capacity

Configure hub limitations:

- Maximum simultaneous drones
- Charging station count
- Landing pad availability

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10. Airspace Management

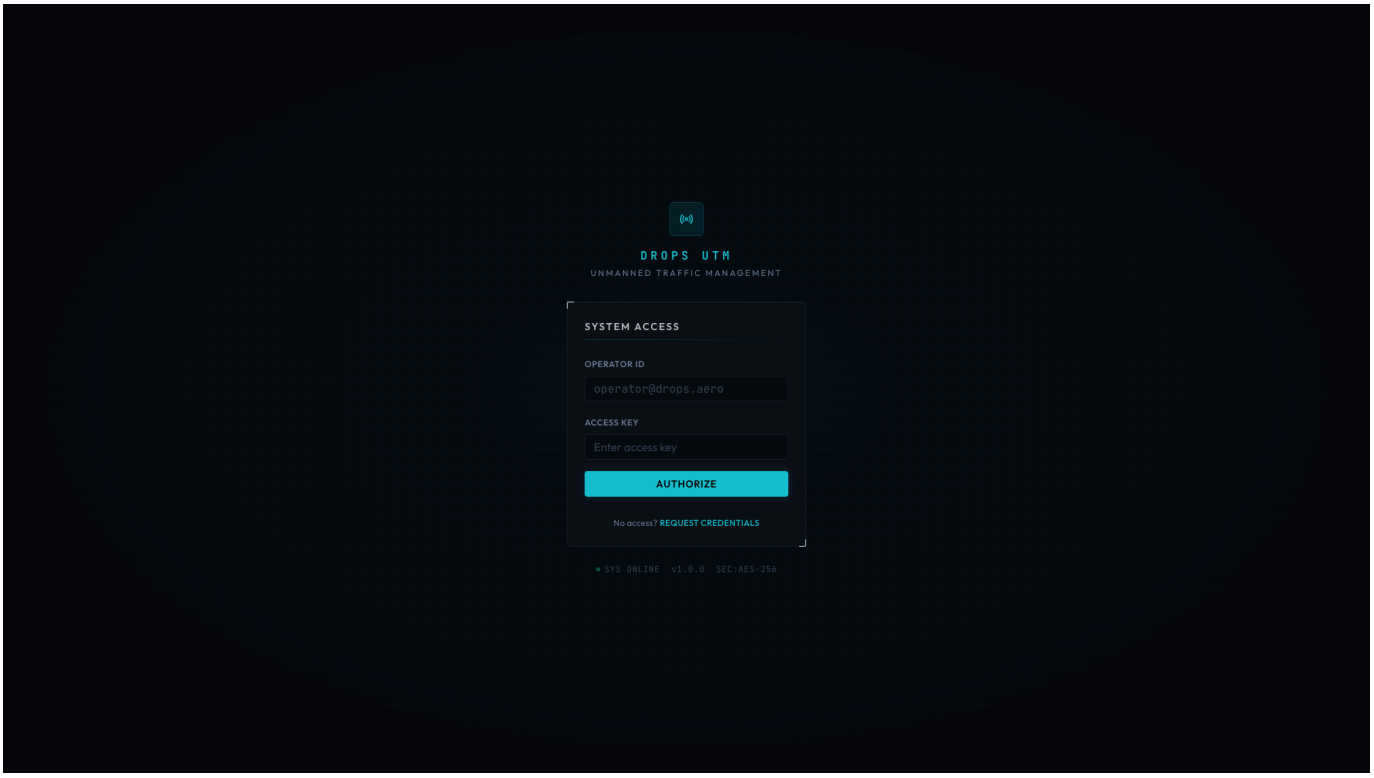

Figure 10.1: Airspace Zone Management

10.1 Zone Types

Zone Type	Description	Flight Rules
Controlled	Managed airspace around hubs	Authorization required
Restricted	Limited access areas	Special permission needed
Prohibited	No-fly zones	No flights allowed

Advisory	Caution areas	Extra vigilance required
Emergency	Temporary emergency zones	Emergency traffic only

10.2 Creating an Airspace Zone

Required Role: Admin or Hub Operator

1. Navigate to **Airspace** → Click **"Create Zone"**
2. Define zone parameters:
    - Name and type
    - Associated hub
    - Altitude floor and ceiling
    - Priority level

10.3 Geofencing

Geofences automatically:

- Warn drones approaching boundaries
- Prevent entry into prohibited zones
- Trigger alerts on breaches
- Initiate emergency protocols if configured

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11. Emergency Response

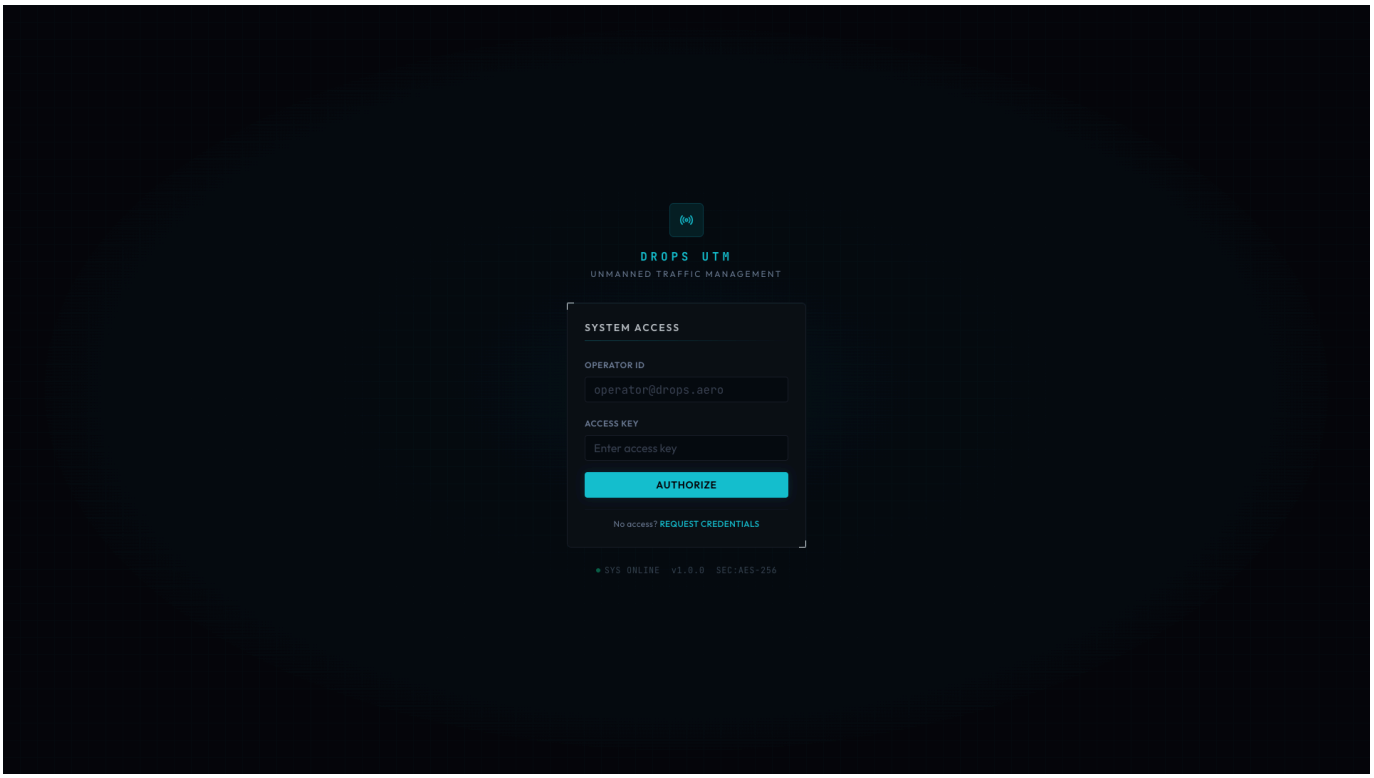

Figure 11.1: Emergency Response Dashboard

11.1 Emergency Types

Type	Severity	Description
Battery Low	Warning	Battery below 30%
Battery Critical	Critical	Battery below 20%
Signal Weak	Warning	Communication degraded
Signal Lost	Emergency	No communication
Geofence Warning	Warning	Approaching boundary
Geofence Breach	Critical	Boundary violated
Motor Anomaly	Critical	Motor malfunction detected
GPS Degraded	Warning	Poor GPS signal

11.2 Response Modes

Automatic Mode

- System automatically executes response protocols
- Immediate action without operator confirmation
- Best for: High-risk operations, remote areas

Supervised Mode

- System proposes action
- Operator must confirm within timeout
- Auto-executes if no response
- Best for: Standard operations with oversight

11.3 Response Actions

Action	Description
RTH	Return to home hub
LAND	Immediate landing
HOVER	Hold current position
DIVERT	Fly to alternate location
DESCEND	Reduce altitude
CLIMB	Increase altitude
ESTOP	Emergency stop (hover + alert)

11.4 Responding to Emergencies

1. Alert appears in Emergency dashboard
2. Review incident details
3. For Supervised mode:
    - Click **"Approve"** to execute recommended action
    - Click **"Override"** to reject and handle manually
4. Monitor execution
5. Document resolution

11.5 Incident History

All incidents are logged with:

- Timestamp
- Drone and flight information
- Severity and type
- Response action taken
- Resolution time
- Operator notes

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12. Fleet Orchestration

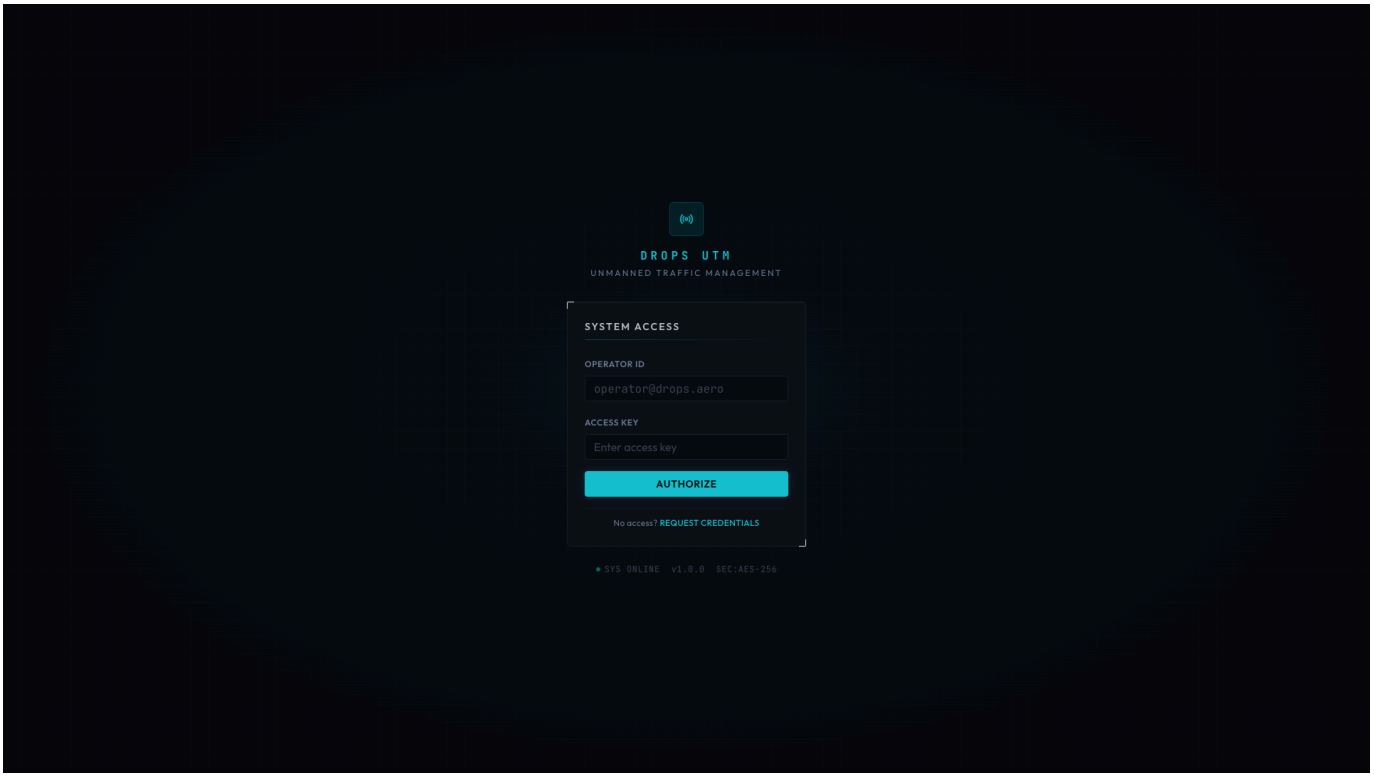

Figure 12.1: Fleet Orchestration Settings

12.1 Overview

Fleet Orchestration optimizes drone deployment across hubs based on demand, battery levels, and operational requirements.

12.2 Configuration Modes

Mode	Description
Balanced	Even distribution across hubs
Demand-Driven	Concentrate where needed
Energy-Optimized	Minimize battery consumption

12.3 Rebalancing

The system can automatically:

- Detect imbalanced fleet distribution
- Propose rebalancing flights
- Execute transfers between hubs

12.4 Fleet Analytics

Monitor fleet-wide metrics:

- Utilization rates by hub
- Average flight times
- Battery efficiency
- Maintenance patterns

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13. Connectivity & Device Management

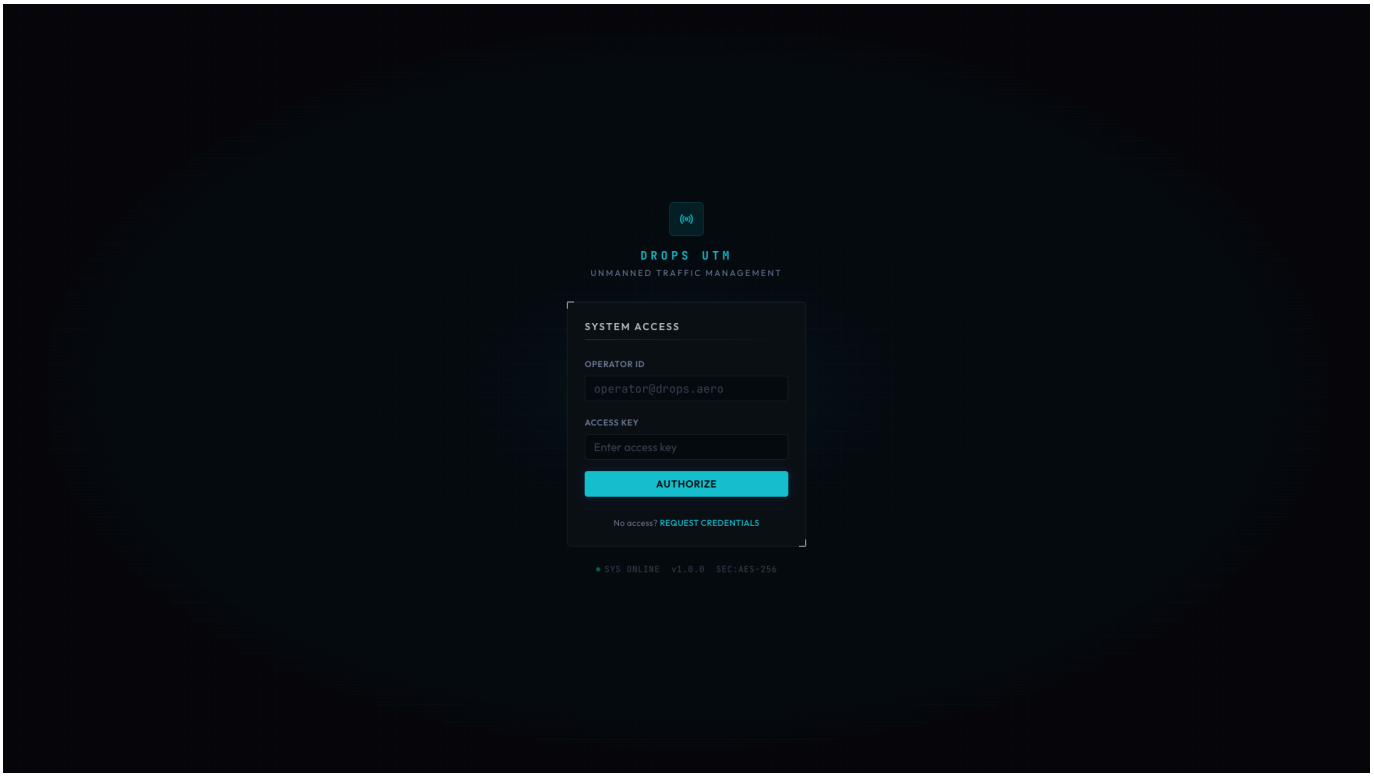

Figure 13.1: Device Connectivity Management

13.1 Device Registration

Drones connect to DROPS UTM through secure protocols:

1. Generate device credentials
2. Configure drone communication module
3. Establish connection
4. Verify telemetry flow

13.2 Communication Protocols

Protocol	Use Case

MAVLink	Standard drone protocol
DJI SDK	DJI enterprise drones
Custom API	Proprietary systems

13.3 Connection Monitoring

View connection status:

- Signal strength
- Latency
- Packet loss
- Last communication time

13.4 Command Routing

Send commands through:

- Direct connection
- Relay through hub
- Satellite backup (if available)

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14. Weather Monitoring

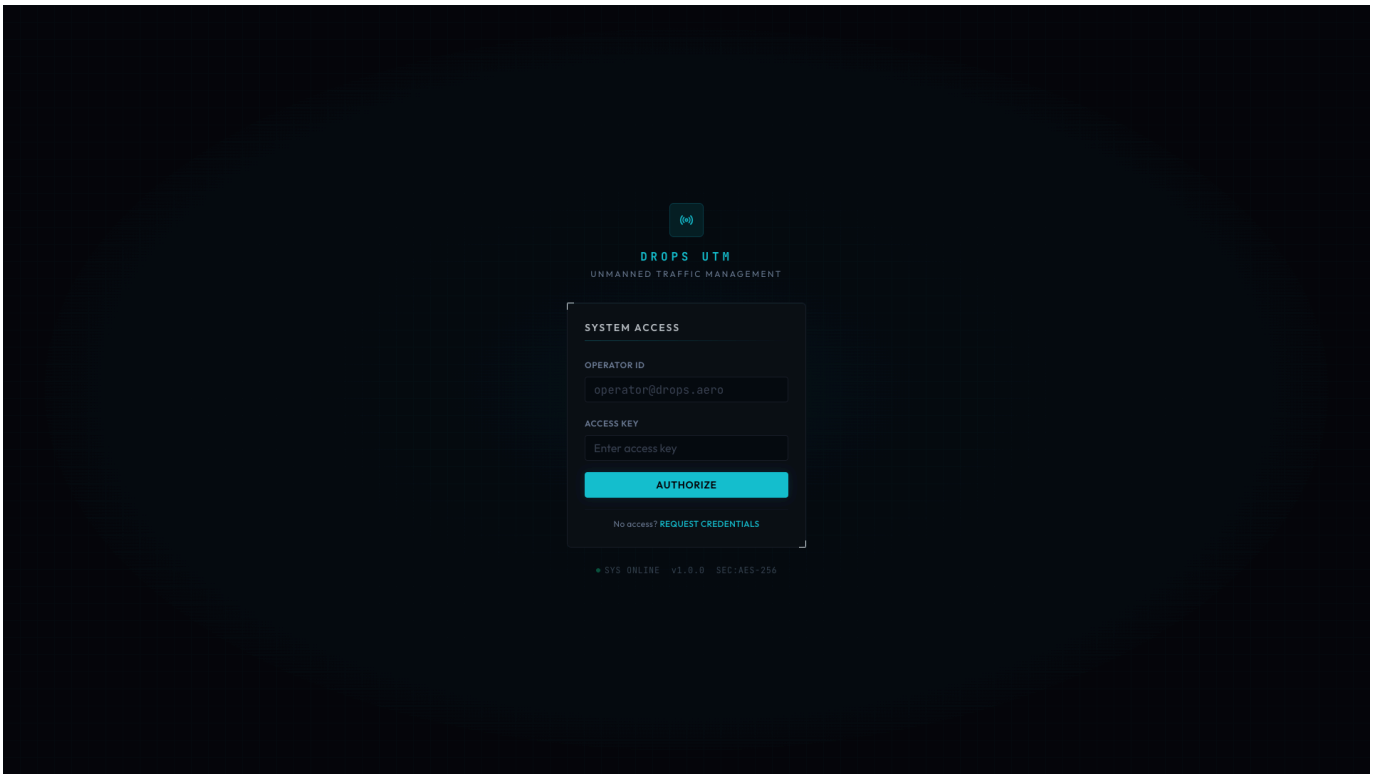

Figure 14.1: Weather Monitoring Dashboard

14.1 Weather Dashboard

View current conditions:

- Temperature

- Wind speed and direction
- Visibility
- Precipitation
- Cloud cover

14.2 Flight Weather Assessment

Before each flight:

- Check departure hub weather
- Check destination weather
- Review en-route conditions
- Verify within operational limits

14.3 Weather Alerts

Automatic alerts for:

- High winds exceeding limits
- Low visibility
- Incoming storms
- Rapid condition changes

14.4 Weather-Based Restrictions

Configure automatic restrictions:

- Maximum wind speed for operations
- Minimum visibility
- Precipitation limits

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15. Conflict Detection

15.1 Conflict Types

Type	Description	Severity
Airspace	Drones in same airspace	Medium
Collision Risk	Potential collision course	High
Schedule	Overlapping flight times	Low
Resource	Competing for same resource	Low

15.2 Conflict Resolution

1. System detects potential conflict
2. Alert generated with details
3. Resolution options presented:
    - Reroute one or both flights
    - Delay one flight
    - Altitude separation
    - Cancel one flight
4. Operator selects resolution
5. System implements changes

15.3 Conflict Prevention

Proactive measures:

- Flight plan deconfliction
- Automatic separation enforcement
- Time-based slot allocation

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16. Settings & Configuration

Required Role: Admin only

16.1 System Settings

- Organization information
- Default operational parameters
- Alert thresholds
- Notification preferences

16.2 User Management

- Create/edit user accounts
- Assign roles
- Reset passwords
- Deactivate accounts

16.3 Integration Settings

- Weather service API
- External system connections
- Webhook configurations

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17. Practical Examples

Example 1: Daily Operations Startup

Scenario: Hub operator starting morning operations

1. **Login** to DROPS UTM as hub operator
2. **Check Dashboard** for overnight alerts
3. **Review Weather** for all hubs
4. **Verify Drone Status**:
    - Navigate to Drones
    - Check battery levels
    - Confirm maintenance status
5. **Review Scheduled Flights**:
    - Navigate to Flights
    - Authorize pending flights
6. **Open Control Center** for monitoring

Example 2: Creating and Executing a Cargo Mission

Scenario: Delivering package from Hub A to Hub B

1. **Create Mission**:
    - Navigate to Missions → New Mission
    - Name: "Cargo Delivery ATH-001"
    - Departure: Athens Central Hub
    - Arrival: Piraeus Port Hub
    - Assign available drone
2. **Plan Route**:
    - Add waypoints along approved corridor
    - Set altitude to 80m (above obstacles)
    - Review altitude profile
3. **Configure Parameters**:
    - Speed: 15 m/s
    - No hover points needed
4. **Save and Review**:
    - Verify total distance and time
    - Check weather along route
5. **Execute**:
    - Click "Start Mission"
    - Monitor in Control Center
    - Await completion notification

Example 3: Handling an Emergency

Scenario: Drone reports critical battery during flight

1. **Alert Received**:
    - Emergency banner appears
    - Audio notification sounds
2. **Review Situation**:
    - Drone: GR-DRN-003
    - Battery: 18%
    - Location: 5km from destination
    - Recommended action: LAND
3. **Assess Options**:
    - LAND: Safe but package not delivered
    - RTH: May not have enough battery
    - Continue: Risk of forced landing
4. **Decision**:
    - Click "Approve" for LAND
    - Drone descends to safe landing
5. **Follow-up**:
    - Dispatch recovery team
    - Document incident
    - Schedule battery inspection

Example 4: Setting Up a New Hub

Scenario: Admin adding new vertiport location

1. **Gather Information**:
    - Exact GPS coordinates
    - Airspace clearances
    - Operational parameters
2. **Create Hub**:
    - Navigate to Hubs → Add Hub
    - Code: SKG-01
    - Name: Thessaloniki Airport Hub
    - Coordinates: 40.5200, 22.9700
    - Radius: 3000m
    - Ceiling: 120m (airport proximity)
3. **Configure Airspace**:
    - Navigate to Airspace → Create Zone
    - Define controlled zone around hub
    - Set as Controlled type
    - Priority: High
4. **Assign Drones**:
    - Edit drones to set new home hub
    - Or register new drones
5. **Verify**:
    - Check hub appears on map
    - Confirm airspace zone visible
    - Test drone assignment

Example 5: Pilot Creating a Survey Mission

Scenario: Pilot planning infrastructure inspection

1. **Login** as pilot
2. **Create Mission**:
    - Navigate to Missions → New Mission
    - Name: "Pipeline Inspection Segment 7"
    - Description: "Monthly inspection of gas pipeline"
3. **Draw Survey Path**:
    - Select "Draw Path" mode
    - Click along pipeline route
    - Maintain consistent altitude (50m)
4. **Configure Waypoints**:
    - Add camera actions at key points
    - Set hover time for detailed inspection
    - Configure photo intervals
5. **Schedule**:

- Set for next available weather window
- Save as scheduled mission

6. **Await Authorization**:
   - Hub operator reviews and authorizes
   - Receive notification when approved

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18. Troubleshooting

18.1 Common Issues

Cannot Login

- Verify email and password
- Check caps lock
- Clear browser cache
- Contact admin for password reset

Drone Not Appearing on Map

- Verify drone is online
- Check communication status
- Refresh browser
- Verify hub assignment

Mission Won't Start

- Ensure drone is assigned
- Verify at least one waypoint exists
- Check drone battery level
- Confirm weather conditions

Commands Not Executing

- Verify drone connection
- Check signal strength
- Try alternative command route
- Contact support if persistent

18.2 Error Messages

Error	Cause	Solution
"Forbidden"	Insufficient permissions	Contact admin for role upgrade
"Drone not available"	Drone busy or offline	Wait or select different drone
"Airspace conflict"	Route crosses restricted zone	Modify flight path
"Weather limits exceeded"	Conditions unsafe	Wait for improvement

18.3 Support Contacts

- Technical Support: support@drops.eu
- Emergency Hotline: +30 210 XXX XXXX
- Documentation: docs.drops.eu

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19. Glossary

Term	Definition
AGL	Above Ground Level - altitude measured from terrain
BVLOS	Beyond Visual Line of Sight - operations where pilot cannot see drone
Geofence	Virtual boundary that triggers actions when crossed
Hub	Ground station for drone operations (also: Vertiport)
MAVLink	Micro Air Vehicle Link - common drone communication protocol
MSL	Mean Sea Level - altitude measured from sea level
RTH	Return to Home - command to fly back to launch point
Telemetry	Real-time data transmitted from drone
UTM	Unmanned Traffic Management - system for managing drone airspace
VLOS	Visual Line of Sight - operations where pilot can see drone
Waypoint	Geographic point along a planned route

Document Information

Document Version: 1.0 **Last Updated**: February 10, 2026 **Author**: DROPS UTM Team

Change Log:

Version	Date	Changes
1.0	Feb 10, 2026	Initial release
