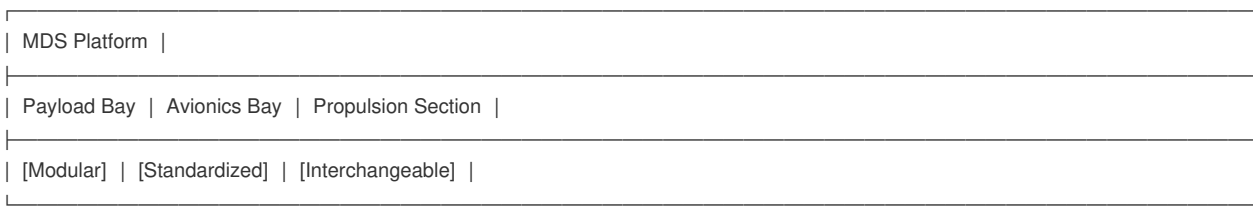
MOSA Documentation - Military Drone System (MDS)

Overview

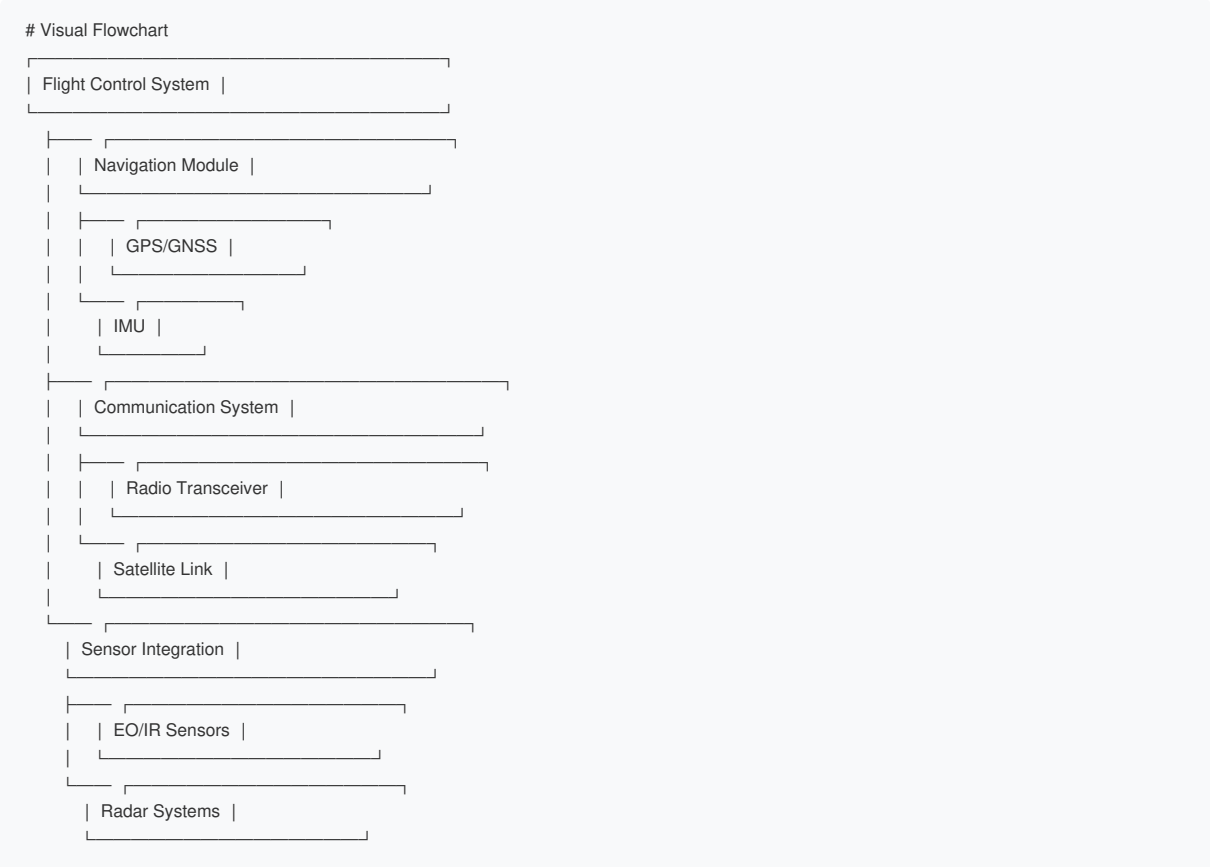
Military Drone System (MDS) is a modular, open architecture unmanned aerial vehicle platform designed for reconnaissance, surveillance, and tactical operations. This document outlines the Modular Open Systems Approach (MOSA) implementation for the MDS.

System Architecture

1. Physical Architecture



2. Logical Architecture



```
graph TD
  A[Flight Control System] --> B[Navigation Module]
  A --> C[Communication System]
  A --> D[Sensor Integration]
  B --> E[GPS/GNSS]
  B --> F[IMU]
  C --> G[Radio Transceiver]
  C --> H[Satellite Link]
  D --> I[EO/IR Sensors]
  D --> J[Radar Systems]
```

MOSA Compliance Matrix

Requirement	Status	Implementation	Reference
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Modular Design	Compliant	Plug-and-play modules	DoD-STD-2525
Open Interfaces	Compliant	REST APIs, DDS	IEEE 1451
Standard Protocols	Compliant	STANAG 4607, Link-16	NATO STANAGs
Backward Compatibility	Compliant	Version control system	MIL-STD-499

Key Modules

1. Flight Control Module (FCM)

- **Module ID**: FCM-001
- **Version**: 2.3.1
- **Interface**: MIL-STD-1553B
- **Specifications**:
- Operating Range: -40°C to +70°C
- MTBF: 5,000 hours
- Weight: 2.3 kg

2. Communication Module (COMM-002)

- **Module ID**: COMM-002
- **Version**: 1.5.0
- **Interface**: Ethernet, RF
- **Specifications**:
- Frequency Range: 2-6 GHz
- Encryption: AES-256
- Range: 150 km LOS

3. Sensor Payload Module (SPM-003)

- **Module ID**: SPM-003
- **Version**: 3.1.2
- **Interface**: Camera Link, USB 3.0
- **Specifications**:
- Resolution: 4K at 60fps
- Zoom: 30x Optical
- Thermal Range: -20°C to +150°C

Interface Standards

1. Hardware Interfaces

Power Interface

Pin 1: +28VDC (5A max) Pin 2: Ground Pin 3: +5VDC (2A max) Pin 4: Ground Pin 5: Signal Ground

Data Interface

- **Physical**: MIL-DTL-38999 Series III
- **Protocol**: Ethernet/IP
- **Bandwidth**: 10 Gbps
- **Latency**: < 1ms

2. Software Interfaces

API Endpoints

FlightControl: - /api/v1/flight/status - /api/v1/flight/control - /api/v1/flight/navigation

Sensors: - /api/v1/sensors/camera - /api/v1/sensors/radar - /api/v1/sensors/thermal

Communications: - /api/v1/comms/transmit - /api/v1/comms/receive - /api/v1/comms/status

Security Architecture

1. Security Domains

- **Domain 1**: Flight Safety (Level 3)
- **Domain 2**: Mission Data (Level 4)
- **Domain 3**: Command & Control (Level 5)

2. Encryption Standards

- **Data at Rest**: AES-256
- **Data in Transit**: TLS 1.3
- **Key Management**: PKI X.509

3. Authentication

- **Multi-factor**: Smart Card + PIN + Biometric
- **Certificates**: DoD PKI
- **Session Management**: OAuth 2.0

Integration Guidelines

1. Module Integration Process

1. **Compatibility Check**
2. Verify interface compliance
3. Validate power requirements

4. Confirm environmental specifications

5. **Installation**

Load module configuration mosaload --module FCM-001 --config flight_control.cfg

Verify integration mosaverify --module FCM-001 --test integration

1. **Testing**
2. Unit testing

3. Integration testing
4. System testing

2. Configuration Management

Module Registration

{ "module_id": "FCM-001", "version": "2.3.1", "checksum": "SHA256:abc123...", "dependencies": ["NAV-001", "COMM-002"], "certifications": ["DO-178C Level A"] }

Maintenance and Support

1. Update Procedures

Firmware Update

```
# Check current version mosacli --module FCM-001 --command version

# Download update mosacli --command update --module FCM-001 --version 2.4.0

# Apply update mosacli --command apply --module FCM-001
```

2. Diagnostic Capabilities

Health Monitoring

- Real-time performance metrics
- Predictive maintenance alerts
- Fault isolation and reporting

3. Lifecycle Management

- **Development**: Continuous Integration
- **Deployment**: Automated provisioning
- **Operations**: Remote monitoring
- **Decommission**: Secure data wipe

Compliance and Certification

1. DoD Standards Compliance

- DoD Instruction 5000.02
- DoD-STD-2167A
- DI-MISC-85316

2. Safety Certifications

- DO-178C Level A (Flight Critical)
- DO-254 Level B (Hardware)
- MIL-STD-810G (Environmental)

3. Security Certifications

- NIST SP 800-171
- DFARS 252.204-7012
- CNSS Instruction 1253

Performance Specifications

1. Operational Envelope

- **Altitude**: 0-15,000 ft
- **Speed**: 50-200 kts
- **Endurance**: 24 hours
- **Payload**: 50 kg maximum

2. Environmental Specifications

- **Temperature**: -40°C to +70°C
- **Humidity**: 5% to 95% RH
- **Vibration**: MIL-STD-810G
- **EMI/EMC**: DO-160G

Documentation References

1. Primary Documents

- [MDS-TR-001] Technical Requirements Document
- [MDS-UM-002] User Manual
- [MDS-MM-003] Maintenance Manual

2. Standards References

- MIL-STD-1553B: Digital Time Division Command/Response Multiplexing
- STANAG 4607: NATO Secondary Imagery Format
- DO-178C: Software Considerations in Airborne Systems

Contact Information

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