

# *OPERATIONAL SAFETY CASE OPERATIONS MANUAL VOLUME 1*

Version 1.1     26th May 2018



*DDM Drones*

## Safety Statement

An intuitive understanding of Air Safety and Risk Management including its importance in maintaining safe delivery of effective Unmanned Aircraft related services is embraced by David Moore owner of DDM Drones

The companies Air Safety and reporting culture is based upon honesty and openness, further supporting its aim in the reduction of risks by employment of ever evolving procedures. These procedures ensure the safety of employees, clients and third parties and help mitigate against risk whilst providing suitable and safe working environments.

All aviation related risks will be managed to achieve a level that is always tolerable and As Low As Reasonably Practicable (ALARP).

A commitment exists to operating within the bounds of this Unmanned Aircraft Systems Operations Manual and any CAA permission thereafter granted. Where specific risks have been identified within the safety matrix a commitment exists to further and specifically conduct further mitigation actions detailed within this UAS Operational Safety Case.

A pro-active approach to ensuring high standards of Air Safety will be foremost in all considerations and shall not be compromised. This document has been written in accordance with the dictates of the Air Navigation Order 2016 and CAP 722

This document contains proprietary information and is not to reproduced without the written permission of the Accountable Manager. The document has, in part, been futureproofed to enable more employees to be taken on in time.



David Moore  
29 Francis Close  
Horndon on the Hill  
Essex  
SS17 8NT

## Acronyms and Abbreviations


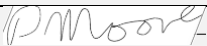
AAIB	-	Air Accident Investigation Branch
AGL	-	Above Ground Level
ANO	-	Air Navigation Order
ASMP	-	Air Safety Management Plan
ASMS	-	Air Safety Management Service
ATZ	-	Air Traffic Zone
ALARP	-	As Low As Reasonably Possible
BMFA	-	British Model Flying Association
CAA	-	Civil Aviation Authority
CRM	-	Crew Resource Management
DIO	-	Defence Infrastructure Organisation
EASA	-	European Aviation Safety Agency
ESARR	-	Eurocontrol Safety Regulatory Requirement
GAPAN	-	Guild of Air Pilots and Air Navigators
GASCo	-	General Aviation Safety Council
HSE	-	Health and Safety Executive
HF	-	Human Factors
ICAO	-	International Civil Aviation Authority
MAA	-	Military Aviation Authority
MATZ	-	Military Air Traffic Zone
NATS	-	National Air Traffic Service
OMHC	-	Orwell Model Helicopter Club
OSP	-	Operational Safety Case
PfCO	-	Permission for Commercial Operations
RPA	-	Remotely Piloted Aircraft
SARG	-	Safety and Airspace Regulation Group
SCT	-	Staff Continuation Training
SQEP	-	Specific Qualified and Experienced Person
SRG	-	Safety Regulations Group
SUA	-	Small Unmanned Aircraft
UAS	-	Unmanned Aircraft System
UKFSC	-	UK Flight Safety Committee

## Amendment Record

Document	Issue	Date of issue
CAP 393 Air Navigation Order 2016	Version 5.3	March 2018
CAP 722 Unmanned Aircraft System Operations in UK Airspace	6 <sup>th</sup> Edition	24 March 2015
CAP 382 Mandatory Occurrence Reporting Scheme	10	December 2016

### Review process

The Accountable Manager conducts a review of this document quarterly per annum. The review will be noted within the following amendment document.

Amendment Number	Date of incorporation	Amended By	Signature
V1.0	10 May 18	D Moore	
V1.1	26 <sup>th</sup> May 18	D Moore	

# Contents

<b>SAFETY STATEMENT</b>	<b>0</b>
<b>ACRONYMS AND ABBREVIATIONS</b>	<b>2</b>
<b>AMENDMENT RECORD</b>	<b>3</b>
<b>CONTENTS</b>	<b>3</b>
<b>INTRODUCTION</b>	<b>6</b>
1. DOCUMENT STRUCTURE	6
2. AIR SAFETY MANAGEMENT SYSTEM FOUNDATIONS.	6
3. JUST CULTURE.	7
4. AIR SAFETY MANAGEMENT SYSTEM.	8
5. SAFETY FORUMS.	8
<b>SECTION 1 – SAFETY POLICY</b>	<b>9</b>
1.1. AIR SAFETY OBJECTIVES	9
1.2. INFORMATION MANAGEMENT	10
1.3. AIR SAFETY DOCUMENTATION	10
1.4. ACCIDENT / INCIDENT MANAGEMENT	11
1.5. FATIGUE RISK MANAGEMENT	11
<b>SECTION 2 – RISK MANAGEMENT</b>	<b>12</b>
2.1. DELIVER SAFE OPERATIONS	12
2.2. HAZARD IDENTIFICATION AND ANALYSIS	13
2.3. RISK ASSESSMENT	13
2.4. RISK REDUCTION, MITIGATION AND REFERRAL	14
2.5. RISK MONITORING AND REVIEW	14
2.6. RISK AND HAZARD REPORTING, COMMUNICATION AND INVESTIGATION	15
<b>SECTION 3 - ASSURANCE AND ENSURANCE</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
3.1. CONTINUAL IMPROVEMENT	16
<b>SECTION 4 - PROMOTION</b>	<b>17</b>
4.1. TRAINING AND EDUCATION	17
4.2. COMMUNICATION	17
<b>SECTION 5 - ORGANISATION</b>	<b>18</b>
5.1. STRUCTURE OF ORGANISATION AND MANAGEMENT LINES	18
5.2. ACCOUNTABLE MANAGER.	19
5.3. UAS COMMANDER.	19
5.4. AERIAL PHOTOGRAPHY TEAM LEADER.	20
5.5. OPERATORS.	<b>ERROR! BOOKMARK NOT DEFINED.</b>
5.6. OBSERVERS.	20
5.7. SUPPORT PERSONNEL - RESPONSIBILITIES	21
5.8. AREAS OF OPERATION	21
5.9. TYPES OF OPERATION	21
5.10. SUPERVISION OF UAS OPERATIONS	23
5.11. ACCIDENT PREVENTION AND FLIGHT SAFETY PROGRAMME	24
5.12. ACCIDENT / INCIDENT AND INVESTIGATION POLICY.	24

5.13. FLIGHT TEAM COMPOSITION.	24
5.14. OPERATION OF MULTIPLE TYPES OF UAS.	25
5.15. QUALIFICATIONS REQUIREMENTS.	25
5.16. CREW HEALTH.	25
5.17. LOGS AND RECORDS.	26
5.18. OPERATOR TRAINING PROGRAMME.	26
5.19. COPY OF CAA APPROVAL.	26
5.20. INSURANCE DOCUMENTS.	26
<b>SECTION 6 - OPERATIONS</b>	<b>27</b>
6.1. ROLE TRAINING AND CURRENCY	27
6.2. AREA OF OPERATION.	27
6.3. OPERATING LIMITATIONS AND CONDITIONS.	27
6.4. METHODS TO DETERMINE THE INTENDED TASKS AND FEASIBILITY.	28
6.5. OPERATING SITE PLANNING AND ASSESSMENT.	29
6.6. COMMUNICATIONS.	29
6.7. PRE-NOTIFICATION.	29
6.8. SITE PERMISSIONS.	29
6.9. WEATHER.	29
6.10. ON SITE PROCEDURES.	30
6.11. SITE SURVEY.	30
6.12. SPECTRUM ANALYSER.	30
6.13. CREW BRIEFING.	30
6.14. SITE CORDON.	30
6.15. COMMUNICATIONS.	30
6.16. WEATHER CHECKS.	31
6.17. FIRE SERVICES.	31
6.18. CHARGING AND FITTING BATTERIES.	31
6.19. LOADING OF EQUIPMENT.	31
6.20. EMERGENCY PROCEDURES (AIRCRAFT).	31
6.21. EMERGENCY PROCEDURES (OTHER FACTORS).	33
6.22. DRONE – OPERATIONS.	33
6.23. ASSEMBLY AND FUNCTIONAL CHECKS.	33
6.24. PRE-FLIGHT CHECKS.	33
6.25. FLIGHT PROCEDURES - MODES.	34
6.26. TAKE-OFF.	35
6.27. POST FLIGHT AND BETWEEN FLIGHT CHECKS.	35
6.28. EMERGENCY PROCEDURES.	35
6.29. ADDITIONAL SAFETY TRAINING.	36
<b>APPENDIX A</b>	<b>37</b>
INSURANCE DOCUMENTS.	37
<b>APPENDIX B</b>	<b>38</b>
CAA PERMISSION FOR COMMERCIAL OPERATIONS CERTIFICATE.	38

## 1.1 Document Structure

This document has been written and published in accordance with the guidelines, dictates and structures of both the ANO 2016 and CAP722. It is regularly reviewed by the Accountable Manager and that review recorded in the table on the previous page.

It remains an ever evolving document ensuring that assurances for the safe operation of UAS are both present and tangible. This document is open to review and audit by the CAA on request. Any significant changes shall be communicated to the CAA via an SRG1320 application.

## 1.2 Air Safety Management System Foundations

The Accountable Manager has received CRM, HF and Air Safety training from a registered NQE. Employees (when employed in the future) shall receive regular formal safety briefings and access to the latest version of this document is always available. Those in the role of PiC (including contracted personnel) must have attended a formal training course delivered by a registered NQE. All other employees (observers and camera operators) shall receive formal in-house training on Air Safety – organised by the Accountable Manager. Training should be recorded and those records maintained by the Accountable Manager.

In-house training includes technical overview of the aircraft in use, limitations, organisational and emergency procedures. The company is in an excellent position regarding the awareness and the need for an Air Safety Culture; although complacency must be actively guarded against.

Open reporting is valued and encouraged as a 'Just Culture' is an important component in the overall armoury of Air Safety.



The company endeavours to maintain best industry practices, ensuring that all flight operations are carried out as safely as possible. Intelligent interpretation of the Air Safety Management System

(ASMS) and effective communication at all levels, including with and from clients, should result in a more efficient ASMS that is proactive, rather than reactive, in nature.

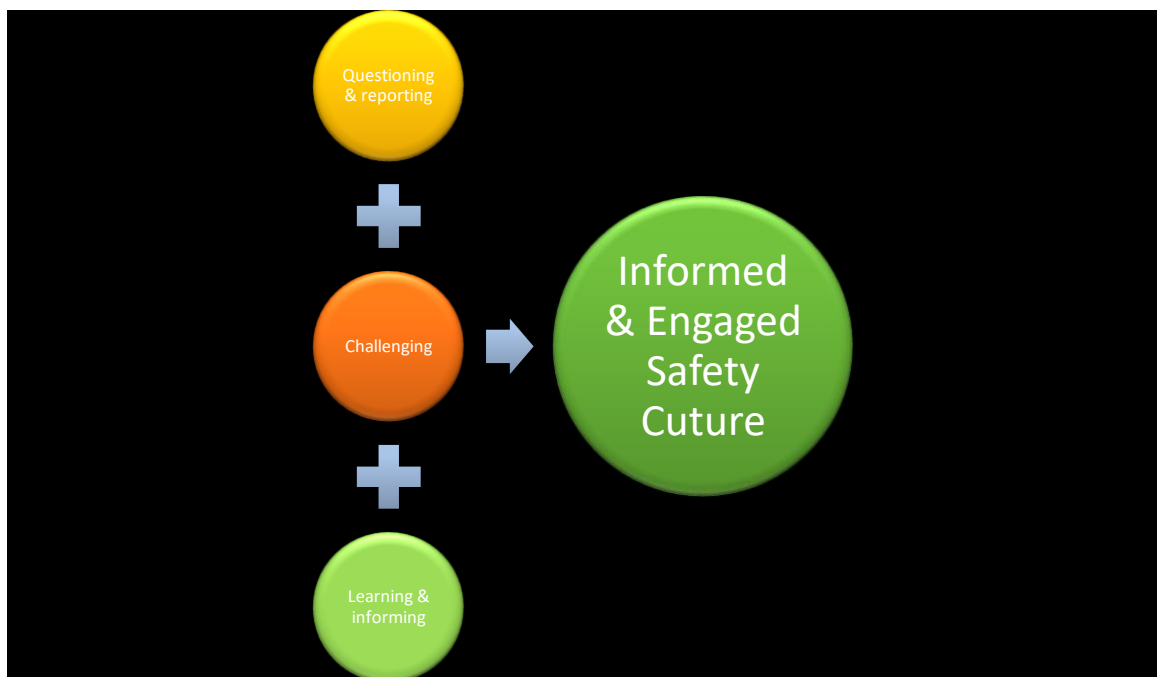
The previous model demonstrates daily practice.

### 3. Just Culture

A due regard to honesty and openness and acceptance that error is a component of human performance is embraced. However, as this is not a blameless culture any deliberate violations of rules and regulations could result in disciplinary action and or investigation and prosecution by the respective authorities.

The four elements of a Just Culture approach to Air Safety utilised are:

- a. **Questioning.** Safety related material is open to questioning in the aim of improvement.
- b. **Challenging.** Safety related procedures can be challenged by all.
- c. **Reporting.** All errors, incidents or accidents are to be reported immediately to all involved with our operations. A formal written report is to be produced and all incidents and accidents will be communicated to the CAA as detailed later within this document.
- d. **Learning and informing.** Lessons will be identified after every report and information subsequently communicated.





## 4. Air Safety Management System

The ASMS has been established on the framework founded upon and recommended by ICAO and is divided into three sections as detailed below:



## 5. Safety Forums

The company views communication as a key to success that is critical to safety. Formal safety meetings shall be convened once every three months and used as a facilitator to discuss Air Safety openly. All meetings will have a formal agenda and will require action points to be resolved within a calendar month of the meeting. All minutes will be distributed accordingly.

Attendance at CAA organised safety events when notified, will be attended where possible. Staff will also be encouraged to attend any seminars relating UAS/drones.

## Section 1 – Safety Policy

### References:

- A. CAP 371 – The Avoidance of Fatigue in Aircrews
- B. Health and Safety Executive Working Time regulations (1998) and amendment 2003
- C. Health and Safety Executive RIDDOR
- D. CAP 382 / ECCAIRS

### 1.1. Air Safety Objectives

Directive	1. <b>Measure</b> the success in achieving the Air Safety objectives laid out below
	2. These metrics shall be reviewed annually to ensure continued validity and should reflect the development of the ASMS and improvement to the companies Air Safety culture
Acceptable Means of Compliance	3. The performance indicators should provide the basis for assessment of the development and health of the ASMS and progress towards achieving performance targets
Guidance Material	4. Targets are designed to be SMART <sup>1</sup> and risk based. They should be either output or process related and be either absolute or relative in description

<b>Objective 1</b>	<b>Prevent and minimize</b> injury to people resulting from UAS activities.
<b>Performance Indicators</b>	Number of injuries per year
<b>Targets</b>	Zero

<b>Objective 2</b>	<b>Maintain an effective ASMS</b> that provides the CAA and the company with the confidence that Air Safety objectives are being met
<b>Performance Indicators</b>	Internal assurance - Accountable Manager External assurance - CAA (as required) Annual internal audit of the Safety Culture. Evidence of continual improvements to Air Safety Management
<b>Targets</b>	Achieve a minimum level of assurance, post any audits, of AMBER A progression to GREEN within a period determined by the CAA

<b>Objective 3</b>	<b>Maintain a robust reporting culture</b> through openness and a standardized system for reporting and investigating accidents, incidents, hazards / observations that could compromise or have compromised Air Safety
<b>Performance Indicators</b>	Time taken for raise a report is to be within an hour of occurrence Time taken for investigation into report is to be 24 hours
<b>Targets</b>	100% of occurrence reports registered within 1 hour 100% of internal investigations conducted within 24 hrs

<b>Objective 4</b>	<b>Establish and maintain a robust Risk Management process</b> that identifies and mitigates hazardous conditions. Specifically, to perform hazard and risk analysis for existing / proposed equipment, assignment locations and facilities
<b>Performance Indicators</b>	The use and maintenance of a standard Risk Register
<b>Targets</b>	Employment of a Risk Register

<sup>1</sup> SMART – Specific, Measurable, Achievable, Realistic, Time – related.

<b>Objective 5</b>	<b>Establish and maintain a robust ASMS assurance process</b> , through periodic safety audits that review all aspects of the ASMS. Evidence should also exist for the continuous enhancement of the effectiveness of the ASMS
<b>Performance Indicators</b>	Evidence of audits undertaken by the company Evidence of audits undertaken by the CAA
<b>Targets</b>	Completion of audits that display no major non-compliance issues (AMBER or better) A progression to GREEN in subsequent audits

<b>Objective 6</b>	<b>Ensure employees obtain appropriate ASMS education and training</b>
<b>Performance Indicators</b>	Percentage of staff who have received Human Factors (HF) & Error Management (EM) training
<b>Targets</b>	100% compliance

## 1.2. Information Management

To ensure that safety performance can be analysed, appropriate safety records must be maintained. This will also provide an audit trail and provide appropriate safety assurance to all associated with, and dependent upon, the ASMS as well as to external authorities for audit purposes. Records provide empirical data and traceability that may be used to identify and solve safety problems.

<b>Directive</b> <b>Acceptable</b> <b>Means of</b> <b>Compliance</b> <b>Guidance</b> <b>Material</b>	1. <b>Maintain</b> complete records of all Air Safety activity
	2. Captured from Air Safety Forums
	3. Maintain of all reports for a period of 6 years
	4. Information mechanisms must be available, accessible, compatible, and consistent to allow migration as necessary
	5. Record keeping is an essential component of Air Safety

## 1.3. Air Safety Documentation

<b>Directive</b>	1. <b>Detail</b> the organization and processes of the ASMS 2. Accountable Manager is responsible for the creation and control of documents that detail policy and procedures for the safe control of UAS activities 3. All personnel shall adhere to the policy, direction and guidance
<b>Acceptable Means of Compliance</b>	4. Accountable Manager will communicate the commitment to preserving Air Safety within the ASMP which should: a. Formalise governance processes for managing Air Safety b. Provide clear direction c. Be subject to continuous periodic review
<b>Guidance Material</b>	N/A

## 1.4. Accident / Incident Management

The ASMS is designed to ensure that procedures and processes are in place for dealing with an accident/incident involving employees or equipment, sub-contracted operators and/or third parties. Reporting will be in accordance with the dictates contained in reference C and D.

Directive	1. <b>Develop</b> an Accident / Incident Plan 2. <b>Conduct</b> table-top exercise (or similar model) annually
Acceptable Means of Compliance	3. Minutes of training exercise to be available for scrutiny by the CAA
Guidance Material	N/A

## 1.5. Fatigue Risk Management

A commitment to remain in compliance with reference A and B relating to working hours is expected.

Directive	1. The Accountable Manager shall: a. <b>Enhance</b> Air Safety by seeking to minimize the number of fatigue related accidents and or incidents b. <b>Encourage</b> a safe working environment by minimizing the hazards and risks associated with fatigue c. <b>Promote</b> and engender a safety culture that seeks to improve individual's health, retention and morale d. <b>Be responsible</b> for the implementation of measures to minimize fatigue-related risk
Acceptable Means of Compliance	2. Work programmes and schedules shall be designed to ensure the dictates within reference A and B are satisfied 3. The Accountable Manager is to ensure that adequate staff are available to cover tasking so that no employee works more than eight hours a day 4. Ensure that all employees are aware of and trained in the identification of fatigue in themselves and others
Guidance Material	Reference A and B

## Section 2 – Risk Management

### References:

- A. ICAO Doc 9859 AN/474 (Safety Management Manual) 3<sup>rd</sup> Edition 2013
- B. Health and Safety Executive – Reducing Risks Protecting People 2001
- C. ESARR 4 (Risk Assessment and Mitigation in ATM) 2001
- D. CAP 722 UAS OSC Vol 3 – Safety Assessment Template - Table 1

### 2.1. Delivery of safe operations

To ensure that the company continues to deliver safe operations, relevant management action must be taken to minimize risk. Aviation activities inherently expose hazards that create the possibility of incidents and accidents occurring. The intelligent management of these hazards reduce potential for incidents and accidents to occur.

Directive	<ol style="list-style-type: none"> <li>1. <b>Comply</b> with all related CAA Regulations</li> <li>2. <b>Challenge</b> any option that is proposed or implemented that may result in the activity not being Tolerable and ALARP</li> <li>3. <b>Establish</b> and maintain links with others on safety related matters</li> <li>4. <b>Manage</b> risks by establishing Air Safety management arrangements.</li> </ol>
Acceptable Means of Compliance	<ol style="list-style-type: none"> <li>5. Base risk management processes on objectives such as delivery of a 'safe' service and the maintenance of agreed standards</li> </ol>
Guidance Material	<ol style="list-style-type: none"> <li>6. The Air Safety RM Framework is structured as follows:               <ol style="list-style-type: none"> <li>a. Hazard Identification &amp; Analysis</li> <li>b. Risk Assessment</li> <li>c. Risk</li> <li>d. Risk Monitoring &amp; Review</li> <li>e. Risk Reporting &amp; Communication</li> </ol> </li> <li>7. Useful documents are contained in reference A - C</li> </ol>



## 2.2. Hazard Identification and Analysis

Directive	<p>1. <b>The company shall:</b></p> <ul style="list-style-type: none"> <li>a. <b>Make every effort</b> to identify hazards associated with operating UAS(s) owned, or operated by it. Also included are UAS operated by sub contracted personnel contracted for work</li> <li>b. <b>Ensure</b> that all identified hazards, with associated assessed risks, are recorded in a Risk Register</li> <li>c. <b>Ensure</b> that Hazard data/information is subjected to analysis and regular review</li> </ul>
Acceptable Means of Compliance	<p>2. The following tools are used to identify hazards associated with operating UAS(s)</p> <ul style="list-style-type: none"> <li>a. <b>Occurrence Reports.</b> This includes reporting from external organizations, including the CAA</li> <li>b. <b>Minutes &amp; Audit Reports.</b> The output from safety meetings at all levels and from audits are a valuable source of information on potential hazards</li> <li>c. <b>Employees.</b> Experienced people often have knowledge of current hazards of which the wider group may be unaware. Meetings and the confidence of being listened to are to be embraced by the company</li> </ul>
Guidance Material	<p>3. A hazard is a source of potential harm or a situation with a potential to cause loss. Effective hazard identification forms the foundation of the Risk Management process and may be conducted proactively or reactively. If a hazard is not identified, it cannot be controlled</p> <p>4. ICAO's Safety Management Manual states that analysis is the process of organising facts using specific methods, tools or techniques. Among other purposes, it may be used to:</p> <ul style="list-style-type: none"> <li>a. Ascertain factors underlying safety deficiencies</li> <li>b. Assist in deciding what additional facts are needed</li> <li>c. Assist in reaching valid conclusions</li> </ul>

## 2.3. Risk Assessment

Identified hazards must be assessed in terms of the severity of likely impact on objectives / outputs, which, in Air Safety contexts, means harm to persons, and the likelihood of that harm occurring. This is translated into an indication of the relative importance of the risk to enable consistent comparison and prioritization of effort to mitigate risk.

Directive	<p>1. Accountable Manager shall <b>determine</b> the safety risk that any hazard represents to safe operations concerning UAS.</p> <p>2. Risk Assessment shall be completed both prior to and following the application of risk reduction/mitigation measures.</p> <p>3. When determining risk, the Hazard Risk Matrix is to be used</p> <p>4. All risks are shall be suitably documented and regularly analysed</p> <p>5. The Risk Register shall be used to document all risks.</p> <p>6. Effective safeguards to ensure the Risk Register and associated evidence is protected from loss, corruption and/or unauthorized editing are to be employed</p>
Acceptable Means of Compliance	<p>7. Once a hazard has been identified, the Accountable Manager, will determine the risk that the hazard represents. The risk associated with a</p>

Guidance Material	<p>given hazard is considered in terms of likelihood / severity considered for the 'worst credible' situation and other more likely outcomes, given that potential outcomes are subject to uncertainty</p> <p>8. The Risk Register should be used to document: the hazard, the risk assessment and the mitigation that has been put in place to reduce the risk to ALARP. The register must identify who is accountable for the risk in order to formalize responsibility for Risk Management</p> <p>9. Any risk identified as un-acceptable is to be mitigated against to reduce the risk to an acceptable level. Unless this is done then the activity is not to be permitted</p>
	10. Reference D

## 2.4. Risk Reduction, Mitigation and Referral

For effective management of risk, the Accountable Manager shall determine the degree of mitigation to apply to ensure the tolerability of the risk. In respect to the activities of the company, all identified risk must be mitigated against to an acceptable level otherwise the activity will not be permitted.

Any mitigation should be monitored for effectiveness and managed to inform future decision making and, if appropriate, initiate changes and communicate lessons identified.

Directive	<p>1. <b>Take action</b> once a risk that is associated to an identifiable hazard has been registered</p> <p>2. <b>Terminate</b> an activity If the risk cannot be reduced to an acceptable level (ALARP)</p> <p>3. <b>Ensure</b> all Air Safety risks are demonstrably acceptable and ALARP</p>
Acceptable Means of Compliance	4. Due regard for human fallibility should be taken whichever type of risk reduction strategy is implemented and the effect on the system should be carefully considered and monitored
Guidance Material	5. Reference D

## 2.5. Risk Monitoring and Review

Risk Management is a continuous process. When risk reduction measures have been used they should be monitored for effectiveness. Such measures, even if effective, may have introduced new, unforeseen hazards. Through monitoring and review risk management validates its effectiveness and maintains a proactive stance to hazard identification.

Directive	<p>1. <b>Conduct</b> regular/periodic reviews of the overall Risk Management process. The review process shall:</p> <ul style="list-style-type: none"> <li>a. Ensure all aspects of the RM process are reviewed</li> <li>b. Make provision for alerting appropriate authorities (CAA) too new hazards or changes in current hazards/risks</li> </ul> <p>2. <b>Ensure</b> reviews of potential hazards associated with UAS activity is undertaken both regularly and in the following situations:</p> <ul style="list-style-type: none"> <li>a. Significant change occurs to the organization, equipment or procedures</li> <li>b. Regulation changes or a new regulation is being introduced</li> <li>c. Where no regulation currently exists to cover a particular activity</li> <li>d. Where it is considered a credible risk to that has not previously been assessed, might exist</li> </ul>
-----------	--

Acceptable Means of Compliance	e. Where an activity or event might raise societal concerns
	3. Regular monitoring and review should be established and this should assess risk reduction effectiveness and consider whether measures to effect risk reduction have become degraded, whether they should be modified, or whether they are still required. It should also form another method of hazard identification in case the reduction measures have created an unforeseen hazard
Guidance Material	4. As with all Risk Management activities, risk and ALARP assessment is an iterative process Regular review of the Risk Register may also be utilized as an assurance mechanism

## 2.6. Risk and Hazard Reporting, Communication and Investigation

Reporting of occurrences and/or observations is a valuable source of understanding existing or potential hazards. Communication allows increased awareness and maximizes efficiency of Risk Management. External communication across organisations (CAA, EASA, other UAS companies and former clients) increases knowledge and may aid hazard identification.

Directive	1. Champion an open reporting process and is to ensure appropriate training in risk and hazard reporting is provided to all 2. Information regarding identified risk and hazards are regularly communicated and that this information, where necessary is communicated to the CAA and former clients
Acceptable Means of Compliance	3. A successful reporting system is one that maintains simplicity whilst capturing the key elements that can assist in identifying and mitigating future hazards.
Guidance Material	4. Information will be provided via training sessions and regular information bulletins



## Section 3 – Assurance

### 3.1. Continual Improvement

It is essential that a proactive approach is adopted to manage change and put in place arrangements ahead of time in order to ensure safety performance is not detrimentally affected. Changes, or possible future changes, in personnel, organization, environment, regulation, equipment or policy must be assessed to ensure that they have no safety impact, and remain ALARP.

Directive	1. <b>Assess</b> regulatory and equipment changes to ensure compliance with authoritative documentation and their operational effectiveness
Acceptable Means of Compliance	2. The Accountable Manager and employees should be involved in the planning of any change, as they will aid hazard and consequence identification
Guidance Material	3. Auditing (and the audit report) is one method of assessing safety performance against stated policy objectives and/or targets. It can also be used to validate the effectiveness of risk reduction and allow regular analysis of all aspects of safety performance. Auditing is an important tool to maintain/improve safety performance through Continued Improvements 4. Analysis of all available data, whether from reporting, investigation, audit or any other source, allows the potential for proactive safety action. It provides early identification of necessary changes to policy or processes identify the cause and implications of sub-standard performance and assist with resource prioritization and allocation

## Section 4 - Promotion

### 4.1. Training and Education

Specific training of staff in the field of Air Safety is critical to the establishment and maintenance of a robust ASMS.

Directive	1. <b>Maintain</b> records of training to record all Air Safety, CRM and HF training activities
Acceptable Means of Compliance	3. Training must be delivered by a suitably qualified instructor
Guidance Material	N/A

### 4.2. Communication

People and effective communication are an essential element of Air Safety and key to a robust ASMS. Two-way communication between all personnel at all levels ensures that safety critical data is both routinely and freely exchanged.

Directive	1. The company <b>shall</b> : a. Use all means to communicate and promote all aspects of Air Safety to its fullest b. Disseminate all safety policy, procedures, occurrences, issues and lessons identified
Acceptable Means of Compliance	2. Regular Air Safety Awareness Days/Workshops to sharpen focus on Air Safety knowledge and vigilance will be organised
Guidance Material	3. Use the following mechanisms to communicate Air Safety a. Social media b. Direct email notification to past clients and other, similar UAS companies where possible 4. Engage and communicate with the CAA, EASA, NATS, UKFSC and GASCo on all aspects of Air Safety when and if the need arises.

## Section 5 - Organisation

### References:

- A. Air Navigation Order Articles 94 and 95
- B. CAP 722 Chapter 7.

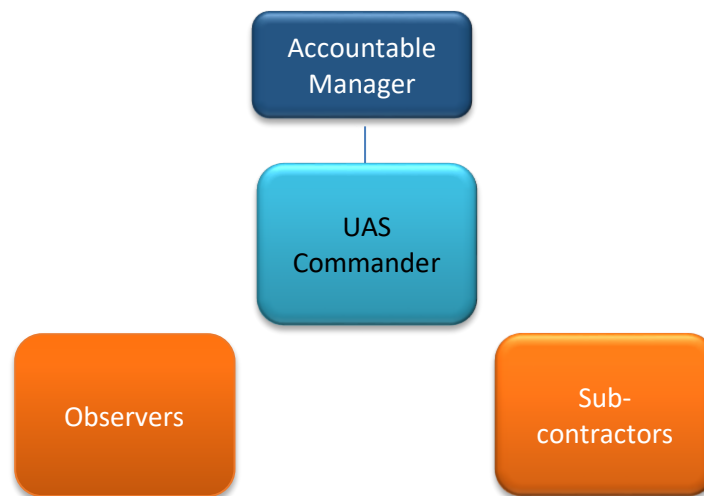
### 5.1. Structure of organisation and management lines

The Accountable Manager. Possesses the overall managerial responsibilities and is responsible for product delivery roles. At times he may, employ external pilot / operators.

Roles and responsibilities are detailed below:

Position	Responsibility	Qualifications	Previous experience
<b>Owner</b> <b>David Moore</b>	Accountable Manager Maintain direct contact with the UK CAA Maintaining records Maintaining maintenance records Maintaining flight log records Video editing and storage IAW Data Protection Act	Full NQE course UAV8 Ltd	
<b>UAS Commander / PiC</b> <b>David Moore</b>	Person in Command (PiC) Planning of task Reduction of risk via site assessment process Decision making on task Command of task and those directly involved Maintenance of equipment Flight Safety on site Safe operations Pre / post flight inspections of aircraft Physical loading and checking of aircraft loads and ancillary equipment Safe Battery charging	Full NQE course UAV8 Ltd	3 flight hours
<b>Camera Operator</b>  <b>Name if applicable</b>  <b>Spotter / Observers</b>  <b>To be confirmed</b>	Operation of UAS camera equipment Fitting of cameras and lenses to UAS Act as an observer   Responsible for providing safety lookout during flight operations Empowered to question PiC and to stop flying for safety related incidents.	In house training will be provided by the Accountable Manager      As above	

The following organogram details the hierarchy.



**Contract Personnel:** Depending upon the nature of the task, additional personnel may be required to ensure safe and efficient completion. These may include Camera Operators and support personnel. Where appropriate, any additional personnel required for the task are to receive a thorough briefing from the PIC and are to be informed of the Safety and Incident Reporting Procedures in place. They must also be informed of the appropriate communication procedures to be used, should they believe that the safe operation of the UAS or the safety of any person, property or livestock are or are about to be compromised.

## 5.2. Accountable Manager

The Accountable Manager shall be responsible for the safety of the whole business operation and the following:

- a. Risk mitigation and endorsement.
- b. Ensuring that all tasks are performed to the required standards.
- c. Ensuring that I am continuously compliant with the dictates of the UK CAA and procedures contained within CAP722 and the latest and current version of the Air Navigation Order.
- d. Is at all times accountable to the CAA.
- e. Ensuring data and privacy is handling in accordance with the Data Protection Act 1998.

## 5.3. UAS Commander (PiC)

The UAS Commander shall be responsible for:

- a. The safety of the UAS team and any third parties associated with UAS operations.

- b. Maintaining a level of competence and proficiency of flying.
- c. Ensuring standards are maintained by other company operators in terms of competency and proficiency. He is authorised, in consultation with the accountable manager, to remove an operator from duty if any of the above are in doubt or for any other reasonable reason such as medical or fatigue.
- d. Maintaining competency and proficiency on the companies UAS.
- e. Flight safety pertaining to the operation of the UAS on assignment.
- f. Physical pre-and post-flight inspections of the UAS and equipment.
- g. Flying with due regard to the rules and regulations stipulated by the UK CAA, the EASA where necessary and the Air Navigation Order. They are also to operate the UAS in compliance of the Data Protection Act 1998.

Additionally, as PiC they shall ensure the following:

- a. That the flight can safely be made, taking into account the latest information available as to the route and site to be used, the weather reports and forecasts available and any alternative course of action which can be adopted in case the flight cannot be completed as planned.
- b. Either the equipment (camera) carried in the circumstances of the intended flight is in a fit condition for use; or
- c. The UAS is in every way fit for the intended flight.
- d. The load carried by the aircraft is of such weight, and is so distributed and secured, that it may safely be carried on the intended flight.
- e. Sufficient power is available for the intended flight, and that a safe margin has been allowed for contingencies; and the instructions in the operations manual relating to power requirements have been complied with.
- f. Any pre-flight check system established by the operator and set out in the operations manual or elsewhere has been complied with by each member of the crew of the aircraft.
- g. Detailed site recce and risk assessments are conducted and recorded. This is to take into consideration the launch and recovery area and process if the control link is lost and noting of all obstructions at such places. A completed risk assessment form is to be completed prior to authorisation being granted.

## 5.4. Camera Operator

Currently and until employees are recruited the camera operation is conducted by the PiC. For standard aerial photography, cinematography/videography the PiC may use the camera and fly the aircraft. When conducting complex cinematography/videography or other complex tasks a camera operator should be employed for the purpose of filming; allowing the remote Pilot to concentrate on flying the aircraft. Camera operators are responsible for:

- a. Loading the camera and lenses onto the UAS.
- b. Ensuring the camera is operational and serviceable.
- c. Switching on the camera and operating it as directed by the PiC.
- d. Rotating and storing the camera prior to take off and landing.
- e. Acting as an observer.
- f. Communicating with the client to establish the task requirements.

## 5.5. Observers

This role can be conducted by any suitably identified person that has been notified to act as observer by the UAS Commander (PiC). The observer is to:

- a. Operate under the command of the UAS operator (PiC).
- b. Maintain a safety lookout at all times that the UAS is in a powered condition.
- c. Ensure the position of the UAS is known at all times.
- d. Is empowered to call for UAS to land in the event of any perceived conflict with another air vehicle or for any other matter concerning safety.

## 5.6. Support Personnel - Responsibilities

When larger and/or complex flight operations are being undertaken further support should be used to ensure the safe operations of the UAS(s). The main responsibilities of support personnel are to assist the person in charge in the preparation of the UAS and launch / recovery sites as detailed. They have an important role in the area of Air Safety and have the responsibility and authority to question and challenge where doubt exist in terms of overall safety.

## 5.7. Areas of Operation

The services of the company may be required nationwide across the UK and each area will be subject to a rigorous risk assessment on notification of a client's requirements. This will be complimented by a thorough on-site assessment prior to any flying activities taking place. The PiC must not be swayed by any perceived, or otherwise, commercial pressures and must conduct an honest site assessment. If the site is unsuitable the Accountable Manager is to be notified immediately and flying is not to take place until sufficient mitigation has been reached to ensure the risk is ALARP.

The operating distances from buildings, structures, vessels and people will be in accordance with the dictates of CAP722 and the Air Navigation Order 2016. Any changes to this will necessitate a formal request and completion of an additional Operational Safety Case; additional permissions.

## 5.8. Types of Operation

The UAS operations include the following:

- a. Two hours a month training flights, to maintain flight and equipment competency, regardless of any operational flights carried out within that month. (See 6.4 paragraph 3)
- b. Photographic assignments including, but not limited to, weddings, real-estate tasks and bespoke photographic tasks.
- c. Photographic and video surveying.
- d. Cinematography / Videography - Documentary and short film assignments.
- e. Aerial inspections including, but not limited to, wirelines, pipelines, solar farms, railway infrastructure, buildings and agriculture.
- f. Infra-red photography and videography.
- g. Building site inspections and surveys.
- h. Search and Rescue operations.
- i. Private Security commercial and corporate operations.
- j. Two hours a month training flights to maintain flight and equipment competency regardless of any operational flights carried out within that month

All flight is conducted in VLOS by day and night unless specific permissions have been granted by the CAA via an Operational Safety Case. Weather limitations will be observed in accordance with the specific UAS limitations. In general terms although part of the site risk assessment, UAS will not be flown in precipitation, including fog, poor visibility and when thunderstorm activity has been predicted. If new technologies evolve and become available that permit such activities the UAS shall on fly in these conditions after mitigation and improvements to visibility have been made; strobe lighting as an example. Aircraft however must remain within VLOS.

### **Night Flight Operations**

It is highly probable that night operations will be conducted by the company. The services may/will include the following:

- a. Construction site work such as surveying.
- b. Security surveillance of commercial and corporate property (Buildings).
- c. Media purposes.
- d. Site evaluation.
- e. Search and Rescue operations.

The locations of the above stated operations will be varied but all sites will be under the full control of the company via the site manager. The PiC will liaise with the site manager at all times to ensure that all operations are safe. In order to comply with the more stringent safety requirements necessary, the following will be observed:

- a. Flight at night shall only be conducted in accordance with the procedures contained within this document.
- b. The launch site shall be provided with adequate illumination.
- c. Flight will only commence when the weather conditions are suitable for continuous VLOS operations.
- d. The aircraft will be fitted with additional lightweight anti-collision lighting systems to aid visual ident.
- e. A thorough day time reconnaissance and assessment of the site must be conducted prior to night flying. This is to include the intended flight path. The purpose of this is to further ensure safe operations and to identify hazards including power line. Site Assessment in line with policy, to assess Airspace and Hazards such as Pylons, Domestic cables and HIRTA's.
- f. NOTAMs – will always be checked. They will also be submitted prior to commencement of night activities for the period and specific location of operations.
- g. Compliance of local authority bye laws, checks with Emergency Services and The Highways Agency.
- h. Knowledge and details of the nearest emergency services units will be recorded.
- i. Consideration of Extraordinary restrictions such as Prisons or nuclear facilities will be observed.
- j. Awareness of any Public Access that could or may create a hazard, such as footway paths, common ground, access and egress.
- k. Site Safety and Risk – In order to mitigate risk, the following actions will also be implemented.
  1. Segregated take-off and Landing site that will be illuminated. **Vertical Take-off only.**
  2. A consideration of using tethers.
  3. Extra lighting or markings attached to the UAV. In the case of extra lighting, this may drain extra power from the battery, consequently the battery low warning levels would be adjusted to compensate. Alternatively, chemical sticks may be use.
  4. All additional lighting mechanisms must be physically checked as being secure prior to take-off.
  5. 2 way air safe radios to be in operation during the task undertaken.
  6. Alternative take-off and landing area as “back-up”.

## 5.9. Supervision of UAS operations

On site and overall supervision will rest with the PiC unless otherwise stated. Supervision will be maintained in the following manner.

- a. Physically checking the risk assessments are fit for purpose prior to flying operations.
- b. The whole team including client if used as an observer shall receive a formal and



thorough pre-flight briefing from the PiC.

- c. Ensuring that on-going operations remain safe.

## 5.10. Accident Prevention and Flight Safety Programme

The Accountable Manager has requisite knowledge and ability in the operation of UAS. He has completed a full NQE course that included instruction in CRM and Flight Safety. Flight Safety is a vital component of every assignment and every pre-flight briefing begins and ends with a Flight Safety comment.

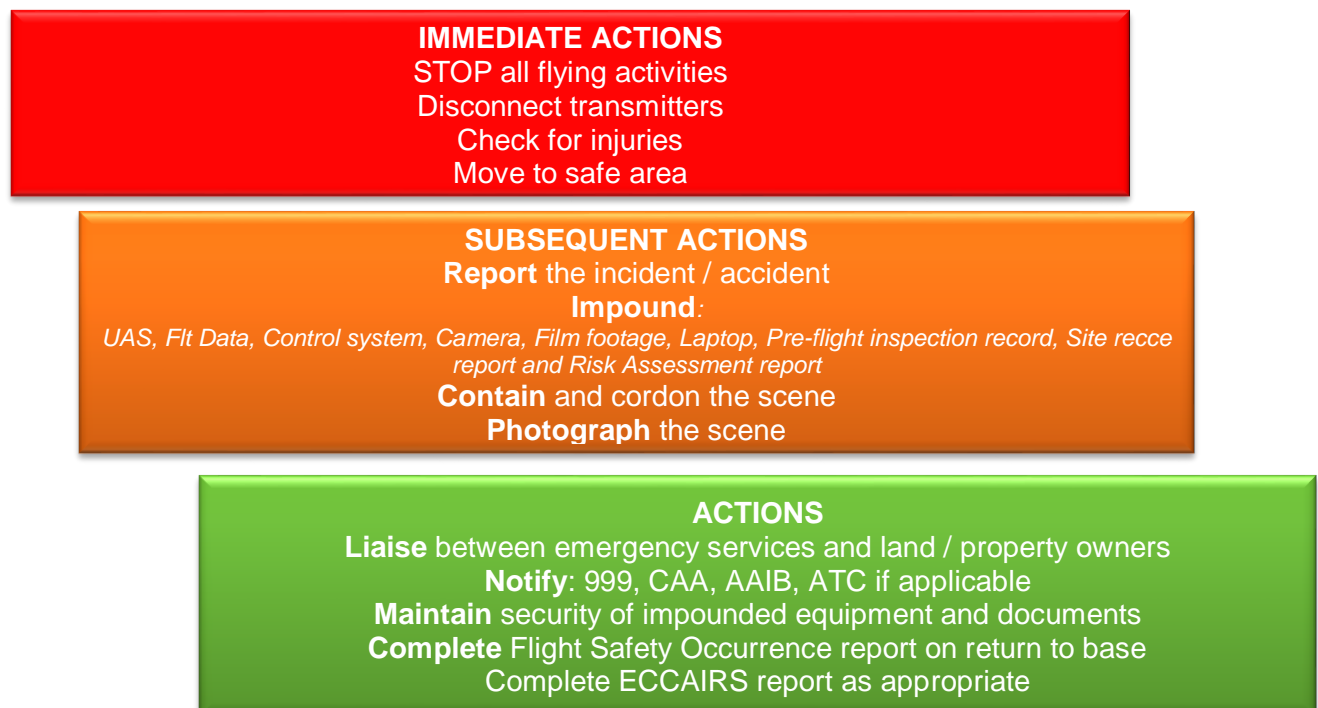
The company will remain compliant with the dictates contained within reference B and will utilise the CAA Mandatory Occurrence Reporting Scheme (MOR Scheme) and ECCAIRS.

## 5.11. Accident / Incident and Investigation Policy

Additionally, details of accidents and incidents occurring within the responsibility of the company will be communicated to the CAA, HSE or AAIB as appropriate; follow-up will be via ECCAIRS using the following link to the reporting portal <http://www.aviationreporting.eu/> . Accidents, incidents and near misses are to be fully investigated to a level commensurate with the level of risk. The result of investigations, where necessary, shared within the industry to help prevent other instances occurring to others.

The Accountable Manager will act as the point of contact until the investigation is closed.

In the event of an incident or accident the actions on the following flow chart shall be adhered to.



## 5.12. Flight Team Composition

All operations shall have a dedicated team assigned. This will comprise, as a minimum, a PiC (acting as the pilot / operator) and an observer. When required the team will consist of a PiC,

observer and payload operator. In large and/or complex flight operations the team will consist of a PiC, observer, payload operator (if required) and support personnel. One of the team will be a competent first aider, this does not include the PiC.

### 5.13. Operation of Multiple Types of UAS

Currently the company operates the DJI Mavic UAS, Yuneec Typhoon H520 UAS and Phantom 4 UAS. Operators are to be at a proficient standard on the equipment being operated.

In the rare circumstance that more than one UAS is employed for the same task, within the same time frame and airspace, the airspace shall need to be locally controlled. This will be achieved by use of a simple tactical reference point system, dividing the airspace by geographical positioning and if required height. A detailed briefing must be attended by all operators prior to flight.

Additionally, they must be qualified to operate the specific weight category of UAS by the UK CAA. The responsibility for ensuring crews are proficient lies with the Accountable Manager.

### 5.14. Qualifications Requirements

All personnel acting in the role of PiC or pilot/ operator of any UAS for the purpose of commercial work (on behalf of the company) must have the following qualifications and permissions:

- a. Successfully attended an UAS Training Course delivered by a UK CAA accredited Full NQE.
- b. Have been granted Permission for Commercial Operations (PfCO) by the UK CAA for the weight category concerned.
- c. Maintain a working knowledge of CAP722, CAP393, Articles 94 and 95.

### 5.15. Crew Health

At the time of publication UAS pilots are not required to have any formal medical category and therefore a common-sense approach is taken by me prior to any future legislation. All members of the UAS flight team must not be under the influence of alcohol or drugs when on site and must be appropriately fit, capable and able to conduct flight operations. If taking prescription medicines professional advice should be sought and a requirement to inform the PiC is mandated.

They must have adequate vision (can be assisted with corrective lenses) to see the equipment at a height of 400ft. The supervisor will prevent operations, if suspecting an individual's condition is not up to the required level. Remote Pilots / PiCs operating for me, including sub-contracted staff must be able to clearly read a vehicle registration number plate from a distance of 20m.

Supervisors may use the following mnemonic '**IM SAFE**' and guide to assist in decision making:

- **I**llness – Any illness that may affect performance and operation of an UAS.
- **M**edication – Drowsiness, side effects?
- **S**tress – Check for obvious signs.
- **A**lcohol – legal requirements differ but we take this seriously and recommend no alcohol consumption within 8 hours of flight operations.

- **Fatigue** – Sufficient undisturbed rest and sleep period?
- **Eating** – Sufficiently nourished and hydrated?

To fight against fatigue Remote Pilots are not permitted to fly for periods of more than 360 minutes in any twenty-four-hour period. They are to have a mandated rest period of 45 minutes after 60 minutes of flight time.

## **5.16. Logs and Records**

Records of the crew, type of UAS, type of operation, location and time of take-off and landing via soft and hard reporting mechanisms shall be kept. This information shall be maintained for a period of 12 months. All Remote Pilots are required to maintain an individual log book. The Accountable Manager is to conduct periodic reviews of logbooks to ascertain a perspective of competency and proficiency.

## **5.17. Operator Training Programme**

The Accountable Manager is to ensure that regular training events are organised for all operators to further improve competence. A training programme is mandatory for staff on change or major modification to primary equipment.

## **5.18. Copy of CAA approval**

A copy of the PfCO permission will be inserted at Appendix B to this document once granted by the CAA. The company shall comply at all times with its dictates.

## **5.19. Insurance Documents**

Insurance requirements are in accordance with regulation (EC) 785/2004 (Article 2). Even though the regulation states that insurance is not required for model aircraft with a mass less than 20kg, due to the commercial aspect of its work the company shall ensure it has appropriate levels of cover. Insurance details can be found at Appendix A to this document.

## Section 6 – Operations

### References:

- A. DJI Mavic Pro User Manual V1.2 2016.12
- B. DJI Phantom 4 User Manual V1.0 2016.03
- C. Yuneec Typhoon H520 Owners Manual V1.3.1(a)
- D. ANO Articles 94 and 95

All UAS operations are to be flown with reference to all mandated articles as detailed within CAP 393 Air Navigation Order (ANO) and specifically Articles 94 and 95.

Remote Pilots are to maintain a minimum currency of 2:00 hours flight time in a rolling 3 calendar month period. Staff Continuation Training (SCT) shall be organised by the Accountable Manager when deemed necessary; for example, mountain flying training, fixed wing conversion. If new equipment is procured the Accountable Manager may authorise externally sourced training.

### 6.2. Area of Operation.

As detailed in the previous section the company will be expected to operate nationally. UAS will all be limited to a maximum height of 400ft agl and a 500m radius of operation from the PiC.

### 6.3. Operating Limitations and Conditions

#### All company UAS

All UAS owned and operated by the company are under 7kg and this weight shall not be compromised. If the company expands to a stage where UAS in the 7-20kg weight category are purchased they shall not be operated commercially until:

- a. This document has been amended to record that fact.
- b. The CAA are informed of the significant change to operations and this manual via an SRG 1320 submission.
- c. That all operators (PiC) have completed an additional flight assessment with an authorized NQE.
- d. Until a revised PfCO has been issued.

#### General limitations

##### Yuneec H520



Operational Ceiling	400ft. Above Ground level (AGL)
Operational Endurance	23 Minutes
Maximum Permissible Airspeed	16m/s Airspeed (31 knots)
Maximum Wind speed	10m/s (20 knots)
Maximum Outside Air Temperature	40°C
Minimum Outside Air Temperature	0°C
Broadcast Frequency Signal Strength	2.4ghz at 100mW EIRP

## DJI Phantom 4



Operational Ceiling	19685ft. Above Mean Sea Level (AMSL)
Operational Endurance	30 Minutes
Maximum Permissible Airspeed	31mph Airspeed (50 knots)
Maximum Wind speed	10mph (20 knots)
Maximum Outside Air Temperature	40°C
Minimum Outside Air Temperature	0°C
Broadcast Frequency Signal Strength	2.4ghz at 100mW EIRP

## DJI Mavic Pro



Operational Ceiling	19685ft. Above Mean Sea Level (AMSL)
Operational Endurance	23 Minutes
Maximum Permissible Airspeed	16m/s Airspeed (31 knots)
Maximum Wind speed	10m/s (20 knots)
Maximum Outside Air Temperature	40°C
Minimum Outside Air Temperature	0°C
Broadcast Frequency Signal Strength	2.4ghz at 100mW EIRP

Additionally it will conform to any limitations regarding systems contained within Ref A-C.

## 6.4. Methods to Determine the Intended Tasks and Feasibility

The majority of tasks will be initiated in response to a customer request. In the case of a customer request, the feasibility of the task will be assessed by the Accountable Manager in order to ensure that the customer's expectations are satisfied, whilst maintaining safe operations within VLOS operating criteria. The PIC will conduct a pre-site (when-ever viable) and on-site survey. The use of various resources may be used from maps and charts to online software applications. There is a requirement for all media to be in date.

Where necessary, modifications to the task will be agreed with the customer in order to ensure successful capture of the highest quality data whilst reducing operating risk. If modified, the task will be re-assessed by the PIC to ensure that the mission aims can be achieved whilst maintaining safe operations.

Some tasks will be initiated internally for testing, training, competency, demonstration and marketing purposes. In all cases, tasks are assessed prior to conduct in order to ensure the highest standards of safety are met and maintained at all times. If it is deemed necessary for safe operation and Pre-Flight Risk Assessment Analysis, a formal site visit may be conducted in order to determine the feasibility of the task. Additional Risk Mitigation Procedures will be discussed with the client as part of the Pre-Flight Planning procedures, prior to deployment. The client will be held

responsible for covering all costs associated with a formal site visit if it is required in addition to the standard Pre-Flight Planning procedures. Before commencement of any task a clear and concise understanding of the customers' requirements, including any imposed restrictions must be established.

The PiC shall determine during the initial assessment if the task is legal, safe and achievable. If there are restrictions this will be communicated to the customer and solutions offered. The PiC will apply for any special permissions or airspace clearances, if required.

## **6.5. Operating Site Planning and Assessment**

A pre-site survey of the task site shall be carried out by the PiC using all available information. The site map (either digital or chart) will include a 1km diameter circle around the PiC location to illustrate the VLOS limit. Additionally, an area will be marked on the chart to illustrate the direction and maximum distance the UAS would travel if control of the equipment is lost. Airspace and other restrictions are to be noted along this path. On completion of each stage of assessment the findings will be recorded on the assessment sheets.

## **6.6. Communications**

Records of all communications relating to the intended task are to be maintained by the company for a reasonable period post completion of task. Any communications relating to safety are to be attached to the risk assessment conducted by the PiC. The PiC is also to attach any permissions obtained relating directly to the task such as landowners and ATCU permissions.

A mobile telephone shall be on site for use in an emergency. Hand held two-way radios will be issued to the team to ensure quick passage of information and provide increased safety on complex tasks.

## **6.7. Pre-notification**

If operating within areas of special interest to the public, the local police will be informed of the planned activities. If operating within an ATZ, MATZ or other controlled airspace the ATCU will be contacted to gain permission. If required a NOTAM may be raised.

When necessary the MOD Low Level Advisory Service will also be notified. And when operating close to military establishments the local units will also be notified.

Helicopter emergency service sites that are close to the task site will, due to their unpredictability, will also be notified directly or via the Critical Care Line.

## **6.8. Site Permissions**

All sites allocated for work task will require written land owner's permissions. For the purpose of transparency and evidence copies of these approvals will be attached to the site risk assessment forms.

## **6.9. Weather**

When operating on task the local weather reports from the UK Met Office will be utilised. Practical weather appreciation will be conducted prior to and during all flights. The weather conditions will be entered on the risk assessment form.

## **6.10. On site Procedures**

Much of the risk assessment process will have been completed during the planning phase and all bookings including ATCU notification, NOTAM and restricted Area permissions sought. On arrival at the site the PiC will update the initial site assessment and particularly check and confirm that there are no additional risks. If found they are to be mitigated against to a safe conclusion and the Accountable Manager notified formally of the changes. There is to be a final check that all third parties including residents have been informed of the flying activities prior to take-off.

A thorough briefing is to be delivered by the PiC to all those involved prior to operations. The site is to be cordoned appropriately.

Physical checks of the aircraft prior to and post flight must be conducted.

## **6.11. Site Survey**

A thorough site survey is to be conducted on arrival and prior to flying taking place. This will ensure that all hazards are identified, logged and mitigated against. This formal document will be kept for a period of not less than 12 months.

## **6.12. Spectrum Analyser**

Although spread spectrum is now in common use in modern UAS there is still a risk from interference especially within the 2.4GHz range. The use of a spectrum analyser especially within urban areas of operation is recommended.

## **6.13. Crew Briefing**

Briefing will be conducted in a quite benign area to ensure little disturbance during this critical time. The simple 'MATE' format will be utilised to ensure consistency of briefing.

**M** – Meteorological report and operational effects.

**A** – ATC, Airspace.

**T** – Technical – Aircraft and equipment.

**E** – Exercise / mission details.

All members of the team must attend the briefing, without exception prior to tasking.

During the briefing emergency procedures are to be discussed in detail.

## **6.14. Site Cordon**

On some sites, cordons may be required to ensure safety to third parties. Cordons may be established with signage, reflective tape or physical form, if manpower permits. The take-off and landing area must be clearly marked by use of cones and/or tape; includes alternate site.

## **6.15. Communications**

Communications will be conducted as previously detailed in this document.



## 6.16. Weather Checks

Conducted visually and as discussed above. Local wind effects and turbulence areas are to be identified. The PiC will terminate flying activities once precipitation is evident and also when wind speeds are deemed to be too high (+19kts). Wind speed will be checked by an anemometer.

## 6.17. Fire / Emergency Services

During the pre-task assessment, the details of the local fire services are to be noted. If possible an RV point is also to be established on site.

## 6.18. Charging and Fitting Batteries

All charges of individual batteries pre / post flight shall be recorded in the battery log. Each battery has its own unique identification number and they are used in sequence to maintain uniformity. Batteries are only charged using the manufacturers designed and supplied battery chargers – all batteries are of the intelligent type. Battery charging must be supervised, in a well ventilated, free from moisture environment. If batteries are found to be damaged in any way, it is to be disposed of safely and under no circumstances used. Batteries are to be visually and physically checked as being correctly fitted to an UAS prior to flight.

## 6.19. Loading of Equipment

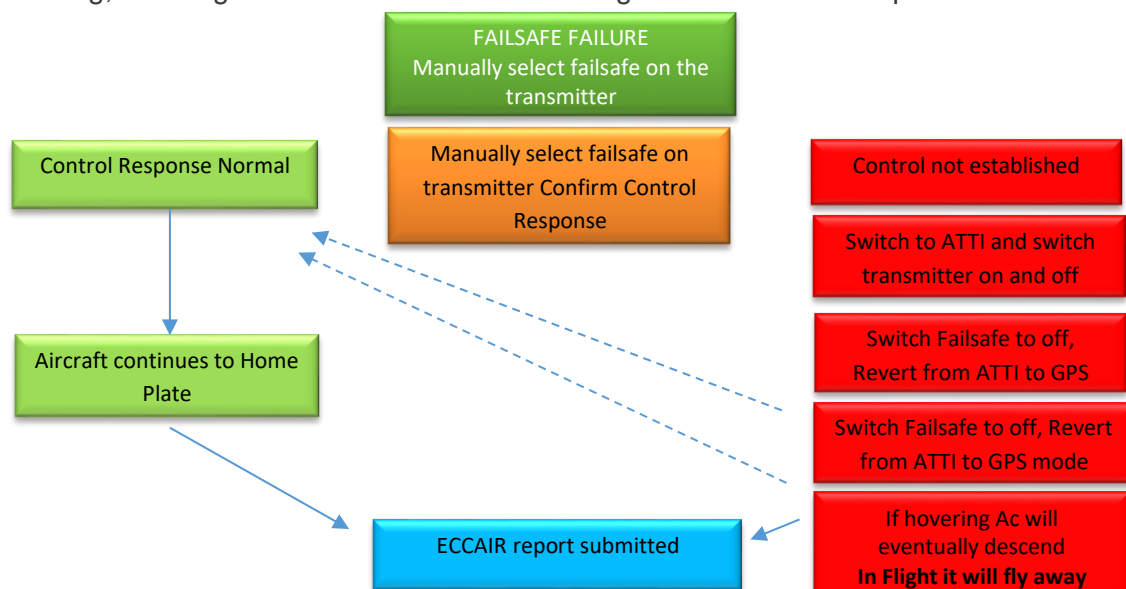
Loading of equipment including cameras shall be under the supervision of the PiC. A physical check of security must be completed prior to flight.

## 6.20. Emergency Procedures (aircraft)

Full emergency actions are contained in Ref A-C.

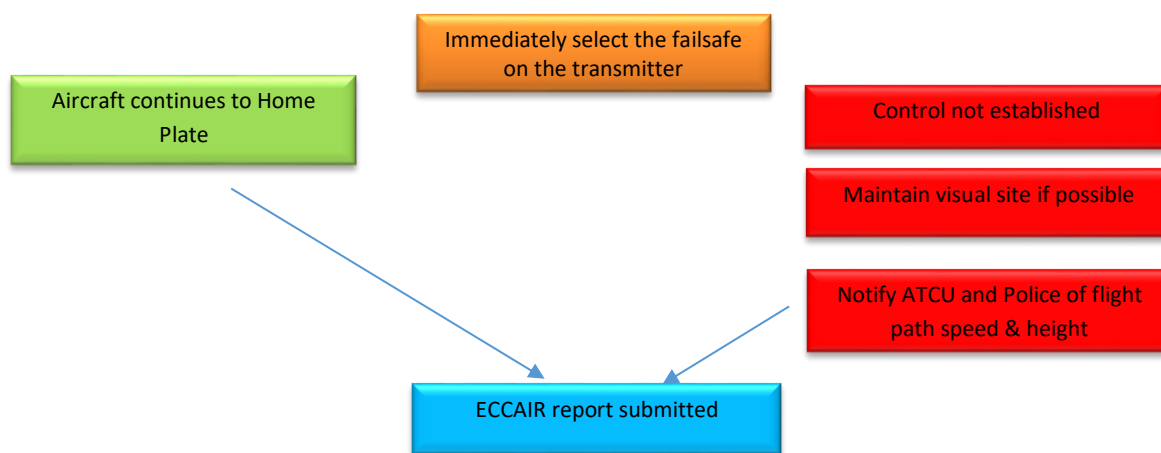
### Loss of primary Control Frequency (generic all UAS).

In this circumstance, the UAS automatically enters the failsafe mode resulting in the aircraft hovering, climbing to a safe altitude and returning to the stored home point.





- e. **Fly Away Actions.** Should the aircraft fly beyond the range of the transmitter the GCS / MC will automatically apply the Failsafe mode. In this mode, the aircraft will operate as previously discussed. If the aircraft continues to fly away the PiC is to carry out the following actions:



In terms of actions for the following the drills are the same for all UAS with minor name / system differences only

- c. **Loss of power to the rotors.** In the event of loss of power to the rotors the PiC is to immediately initiate the start stick sequence detailed in the user manual in an attempt to re-start. If power is not restored the immediate vicinity should be vacated – shout from the PiC.
- d. **Aircraft Battery Failure.** If possible the PiC should attempt to land the aircraft in the designated areas, unless deemed safe enough to land in current location. In the unlikely event that the battery voltage should suddenly drop or the battery connectors disconnect the aircraft will descend rapidly. In this situation, the PiC is to attempt to clear the area of people.
- e. **Transmitter or Transmitter Battery Failure.** If the transmitter or transmitter battery fails the DJI UAS will initiate the failsafe feature. The aircraft will slow down and hover if manoeuvring, wait 3 seconds in case connection is restored and then under failsafe will return to home.
- f. **Fire On-Board Aircraft.** The call to alert that there is a fire on the aircraft shall be 'Fire on Aircraft'. On hearing this call, the PiC is to land the aircraft immediately in a safe area. The camera operator or spotter will only fight the fire, if safe to do so; consider calling 999 if required.

**Subsequent actions:** Cordon the site and report the incident via the means and levels previously detailed within this document.

- g. **Fire on the ground (Aircraft or Equipment).** The call to alert the team of a fire is simply 'FIRE'. If the fire is caused by LiPo batteries do not attempt to fight the fire with an extinguisher simply evacuate the immediate area, up wind and allow the fire to burn out. If the fire spreads fight the subsequent fire if safe to do so and consider calling 999.

Subsequent actions: Cordon the site and report the incident via the means and levels previously detailed within this document.

## 6.21. Emergency Procedures (other factors)

There may be other factors not directly concerned with the UAS or even outside of the direct control of the PiC. These include the following:

- a. **Aircraft Incursion / conflict.** In the event of another aircraft approaching the area of operation the PiC is to immediately descend vertically to a height less than 50ft or land. If perceived that the incident was a near miss an AirProx report is to be raised and filed.
- b. **Public Encroachment.** The 'spotter' or any other member of the operating team will indicate that a person(s) are encroaching the operating area by shouting the word 'public' with an indication of the locations – by clock-code or feature. If safe to do so a member of the team will approach the person(s) to explain that UAS flight is taking place and explain the potential dangers. Whilst this is taking place the PiC will maintain a high hover until safe to continue. If the situation cannot be resolved the UAS is to be landed in a safe area.
- c. **Malicious or Accidental Interference with Control Frequency.** In the unlikely event of the frequency being compromised the PiC is to land the aircraft, as safely and expeditiously as possible given that the controls may be difficult to operate. Further investigations are to be made when the aircraft is safe and follow up report under MOR must be conducted.
- d. **Pilot Incapacitation.** In the event of a PiC becoming incapacitated for any reason the Camera Operator or other team member is to activate the return to home function on the transmitter.

It is important that all members of the team are briefed on the return to home function and respective switches prior to the task commencing to cater for such circumstances.

## 6.22. UAS – Operations

The following paragraphs have been written in consultation with Ref A. Flight operations will be conducted in accordance with Ref A and this document. The equipment used to control company UAS are factory supplied standard controllers operating on 2.4Ghz – multi channels.

Firmware and software updates are to be recorded in the maintenance logs. Post updates the UAS is to be 'test flown' in an open area to ensure it is safe to operate.

## 6.23. Assembly and Functional Checks

Assembly of the UAS must only be conducted in accordance with Ref A. Post assembly the aircraft is to be physically checked by PiC. Functionality checks are to be conducted by the PiC. Checks are to be conducted in accordance with the user manual and particular emphasis is to be placed on the security of the rotor blades.

## 6.24. Pre-Flight Checks

These checks shall be carried out by the PiC. Checks are to be conducted in accordance with the References A-C. The Yuneec should be treated the same although it uses the ST16 GCS rather than the 'Pilot App'.

- a. Visual inspection of UAS for damage
- b. Remote Controller Power Status checks. System battery status must be indicating normal (fully charged) prior to any flight operations.
- c. If using a mobile device and 'Pilot App': Confirm power level of mobile device and connect to controller clamp; finally connect via UAS lead.
- d. Calibrate the compass if required as per user instructions.
- e. Remote Controller stick neutral and released check for centring.
- f. Full and free movement of controls and correct action on UAS.
- g. Camera secured and functioning – check functionality as per reference A.
- h. Orientation LED signal lights must be serviceable for flight.

## 6.25. Flight Procedures – Modes

The Mavic pro and Phantom 4 is fitted with three flight modes, P Mode, A Mode and F Mode and it is planned that all three modes will be used during tasking and training.

- a. **P Mode (positioning).** This mode has three different states and works best with a strong GPS signal.
  1. P-GPS: GPS and Vision Positioning both are available. The aircraft is using GPS for positioning.
  2. P-OPTI: Vision Positioning is available but the GPS signal strength is not sufficient. The aircraft is using only the Vision Positioning System for positioning.
  3. P-ATTI: Neither GPS nor Vision Positioning is available. The aircraft is using only its barometer for positioning, so only altitude can be stabilized.
- b. **A Mode (Attitude).** The UAS uses its own barometer for stabilisation purposes. The UAS can still automatically return to the home point if the control signal is lost and the Home Point was recorded successfully.
- c. **F-mode (Function).** Intelligent Orientation Control (IOS). This allows the pilot to lock the control orientation of aircraft in different modes. There are three working modes for IOC that can be selected in the DJI Pilot app.
  1. Course Lock. This will not be used during training operations but will be briefed.
  2. Home lock. Enables the UAS to return to the home point within +/- 10m.
  3. Point of Interest (POI). A distance of between 5 and 500m from the POI.

The Yuneec H520 is fitted with seven flight modes, it is planned that all seven modes will be used during tasking and training.

- a. **Not Connected Flight Mode.** Not Connected Flight mode is set when there is no aircraft bound to Data Pilot. A valid RC connection is required for a flight mode to be present.
- b. **Auto Position Flight Mode.** Automatically set when the aircraft is flying autonomously but has no commands to execute. In this case, the H520 will hold its current position and hover in place.
- c. **Manual Flight Mode.** Manual Flight mode disables all GPS on the H520, however altitude is maintained using barometric sensors.
- d. **Angle Flight Mode.** Angle Flight mode incorporates GPS, barometric and other sensors to maintain stable position in-flight.
- e. **Mission Flight Mode.** Is the mission execution mode. After uploading and starting a mission, the H520 will automatically be set to Mission flight mode.
- f. **Return to Launch flight mode.** An automatic execution of the H520 to return to the launch point. During RTL, the Pilot has limited control over the H520.
- g. **Low Battery Flight Mode.** The H520 will attempt to RTL. In some cases, the H520 might be too far from the launch site to return. During low battery flight mode, the Pilot has limited lateral control and no vertical control of the H520.

## 6.26. Take-Off

Care is to be exercised especially at the first launch of the day and therefore the area for launch shall be marked off to a 10m radius where access is restricted (within an outer cordon of 50m). The PiC and authorised supporting staff are the only people authorised to be within the launch and recovery area.

Take-off checks shall be conducted immediately after take-off for all flight sorties and shall include:

- a. Conduct stable hover at 6 feet.
- b. Aircraft responds normally and responds to control inputs.

Flights shall only be completed in VLOS and within the written authorisation.

## 6.27. Post Flight and Between Flight Checks

Post flight inspections are to be conducted with the emphasis on noting and reporting any faults of damage to the equipment. Between flight checks are to include as a minimum a physical check of power, only normal (fully charged) status is acceptable for a further launch. The person in charge is to conduct the power check.

## 6.28. Emergency Procedures continued

- a. **Lost Signal.** Prior to take off the home point will be recorded to allow the UAS to fly home autonomously. If the signal is lost for more than 3 seconds, the system will use the Failsafe

Return to Home (RTH). In the event of a lost link the supervisor is to be made immediately aware and the landing site vacated outside of the 10m marked area.

- b. **Low battery level Warning.** The DJI UAS are fitted with a RTH function in the event of low battery conditions. This failsafe operates when the battery has been depleted to a point that may affect the safe return of the aircraft, this condition will be notified to the pilot if using the DJI Pilot App. If after ten seconds, there has been no action from the pilot the UAS will automatically return to the home point. The pilot may however cancel the RTH by pressing the TRH button on the controller. The person in charge is to allow the automatic RTH to occur or take control land the immediately. The person in charge must always be aware that this may occur and therefore should always consider safe landing areas whilst operating. A verbal warning should be communicated loudly that landing is imminent.

## 6.29. Additional Safety Training

Everyone shall receive fire training on the use fire extinguishers. Additionally, no-notice emergency practices are to be initiated randomly. All such practices are to be recorded and lessons identified communicated with records maintained for a period of 6 years for audit and scrutiny purposes.

---

## Appendix A

To  
Ops Manual Vol 1

### Insurance Documents



## Cover Note

This is to certify that the entity named in this note is registered on the Flock Cover app and is eligible to purchase Flock's UAS pay-as-you-fly insurance underwritten by Allianz Global Corporate & Specialty SE subject to the conditions specified below.

### Policy Holder

Operator	David Moore trading as DDM Drones		
Flock registration ID	D-PF-T-234793	Email address	davebeansmoore@aol.com

### Coverage

Flock's UAS pay-as-you-fly policies offer cover for legal liability to third parties including bodily injury, accidental damage of property, noise and invasion of privacy, accidental damage to UAS, acts of war, terrorism, hijacking, acts of sabotage, unlawful seizure of aircraft and civil commotion as required by EC785/2004. Full details of the coverage can be found on the policy wording document attached (Wording) to this Cover Note. Policy limits for certain coverage types can be selected by the user at the time of purchase. As detailed in the Wording, Allianz Global Corporate & Specialty SE, certifies that the policies distributed by the Flock Cover app comply with all the requirements defined by the regulation EC785/2004.

Policy	UAS pay-as-you-fly for commercial operations [2017 - rev1]		
Minimum limit of Liability Indemnity	The greater of: i) £1000000, or ii) the highest equivalent in GBP, during the Policy Period, of SDR750,000		
Eligible UAS range	Any UAS under 20kg MTOM of a type designed, manufactured, assembled and made available on the market by the manufacturer, which has not been modified since delivery by the manufacturer. The precise type is to be selected at the start of the Policy Period.		
Policy underwritten by	Allianz Global Corporate & Specialty SE		
Cover note valid from:	09/05/2018	Cover note valid until:	09/05/2019

### Conditions

Operator understands that insurance is a legal requirement for UAS commercial operations. During the coverage period, Operator is required to hold every permission, license and certificate legally required to perform commercial operations.

Operator understands that Flock's UAS pay-as-you-fly policies cover flight activities inside the selected flight time only, and that it is the Operator's sole responsibility that each and every flight is covered.

Flock's pay-as-you-fly cover will be automatically activated at the time of successful payment through the Flock Cover app and will only be valid for the selected flight time, geographical flight area and UAS.

Flock's UAS pay-as-you-fly policies are underwritten by Allianz Global Corporate & Specialty SE (FCA Registration FRN214374). You can check this by visiting the Financial Services Register or by contacting the FCA on 0800 111 6768.

Signed by: Brian Kirwan  
Chief Executive Officer UK  
Allianz Global Corporate & Specialty SE

On: 09/05/2018

**Appendix B**  
To  
Ops Manual Vol 1

**CAA Permission of Commercial Operations**

To be added on award of PfCO







