**STEM Studios**



**UAS OPERATING SAFETY CASE**

This document is a combined Safety and Operations Manual, compliant with *Volume 1 – Operations Manual* as set out in CAP722A, covering all of aspects of STEM Studios utilising small drone aircraft in accordance with the requirements of the UK Civil Aviation Authority’s Operational Authorisation UKPDRA-01.

**Document Reference**: Operations Manual v0.1

**Version:** 0.1 – 8 June 2021

**Document Author**: daniel@stemstudios.tv

**Accountable Manager:** Mr. Barney Clark

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## Amendment Record

|  |  |  |  |
| --- | --- | --- | --- |
| Version | Amendment Date | Amendments Incorporated | Signed Off By |
| 0.1 | 8 June 2021 | First Draft |  |
|  |  |  |  |
|  |  |  |  |

## Acronyms and Abbreviations

Below is a list of abbreviations used in this Operations Manual.

|  |  |
| --- | --- |
| Reference | Full Title |
| ATC | Air Traffic Controller |
| ATZ | Aerodrome Traffic Zone |
| CAA | UK Civil Aviation Authority |
| CTR | Controlled Traffic Zone |
| OP-AUTH | Operational Authorisation |
| PDRA | Pre-Determined risk assessment |
| STS | Standard Scenario |
| Remote Pilot | An individual responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time |
| UA | Unmanned Aircraft |
| UAS | Unmanned Aircraft Systems |
| Unmanned Aircraft Delegated Regulation | Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems |
| Unmanned Aircraft Implementing Regulation | Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft |
| VLOS | Visual Line of Sight |

## Safety Statement

This Operations Manual describes the organisation, aircraft systems, personnel, flight operations and procedures by which STEM Studios carries out its Small Unmanned Aircraft operations.

STEM Studios is committed to the safe conduct of all its Small Unmanned Aircraft operations and will ensure that the systems deployed are maintained and prepared in accordance with industry best practice, All Operations will be carried out in accordance with the issued Operational Authorisation PDRA01 and abide by the requirements of ANO2016 - 2020 Amendment and UAS Implementing Regulation 2019/947 (as retained in UK Law)

It is accepted that the contents of this document do not override the necessity of reviewing and complying appropriately with any new or amended regulation published from time to time by the CAA addressed by this document.

|  |  |  |  |
| --- | --- | --- | --- |
| Signed: |  |  | 8 June 2021 |
| Accountable Manager: | Mr. Barney Clark |  |  |
|  | STEM Studios |  |  |

For and on behalf of STEM Studios, a company registered in England & Wales at TODO No: 13442480.

Enquiries regarding the content of this document should be addressed to STEM Studios at the above address, or via email at contact@stemstudios.tv.

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# INTRODUCTION

## Purpose

The purpose of this document is to record the key data associated with the safe operation of Operations Manual Template by STEM Studios personnel.

## Scope

STEM Studios’ traditional business is Aerial Photography and Video Production. Its customer base is varied, ranging from corporate clients (such as estate agents or events companies) to individual artists.

## Overarching Strategy

STEM Studios is an established video production company, and is initially concerned with providing an expanded range services – including, but not limited to First Person View (FPV) video shoots - to an existing customer base with the view to growing the service offering over time.

Safety is paramount, and STEM Studios has put essential safeguards in place to maintain a safe environment for all involved or connected to STEM Studios UAS operations.

## Document Control and Amendment Process

All amendments to this Operations Manual are to be made by daniel@stemstudios.tv and must be recorded in the Amendment Record Page found at the front of this document. Each amendment is identified with a new Version Number, an Amendment Date, and a list of the major Amendments Incorporated. All amendments will be signed off by the Accountable Manager, Mr. Barney Clark.

The CAA will be informed of all major updates such as new aircraft or pilots.

All STEM Studios employees will be informed of any changes to this Operations Manual and they must ensure they have access to a current up-to-date version either in electronic or paper format.

## Referenced Documents

|  |  |  |
| --- | --- | --- |
| Reference | Full Title | Issue Number & Date of Issue |
| CAP 382 | Mandatory Occurrence Reporting Scheme | Tenth Edition – December 2016 |
| CAP 722 | Unmanned Aircraft System Operations – Guidance | Version 8 – 5 November 2020 |
| CAP 722A | Unmanned Aircraft System Operations in UK Airspace – Operating Safety Cases | Version 1 - 23rd July 2020 |
| CAP2013 | Air Navigation Order 2020 Amendment – Guidance for unmanned aircraft system users | Version 1 – 17 December 2020 |
| CAP1059 | Safety Management Systems: Guidance for small, non-complex organisations | Version 1 – June 2013 |
| CAP1789A | The UAS Implementing Regulation; UK consolidated text | Version 3 – 28 January 2021 |
| UAS IR | Commission Implementing Regulation (EU) 2019/947 | 24 May 2019 |
| ADMIN | COPTRZ TEMP V3.6 Remove after initial Review (This is so we know which template was used when creating) | V3.6 |

# SAFETY POLICY

## Policy

Safety is the priority in all STEM Studios activities. The business is committed to implementing, developing, and improving strategies, management systems and processes to ensure that all its aviation-related activities uphold the highest level of safety performance and meet national and where appropriate international standards.

STEM Studios’ commitment is to:

1. Comply with and, wherever possible, exceed legislative and regulatory requirements and standards.
2. Develop and embed a safety culture in all aviation-related activities that recognises the importance and value of effective aviation safety management and acknowledges that safety is always paramount.
3. Minimize the risks associated with aircraft operations to a point that is as low as reasonably practicable and achievable.
4. Ensure that externally supplied systems and services that impact upon the safety of operations meet appropriate safety standards.
5. Ensure that sufficient skilled and trained resources are available to implement safety strategy and policy.
6. Establish and measure safety performance against realistic objectives and/or targets.
7. Continually improve its safety performance; and
8. Conduct safety and management reviews and ensure that relevant corrective action is taken.
9. Clearly define for all staff their accountabilities and responsibilities for the development and delivery of the company’s aviation safety strategy and performance.
10. Ensure that all staff are provided with adequate and appropriate aviation safety information and training, are competent in safety matters and are only allocated tasks commensurate with their skills.
11. Achieve the highest levels of safety standards and performance in all its aviation activities.
12. Ensure that enough skilled and trained resources are available to implement safety strategy and policy
13. Actively develop and improve safety processes to conform to world-class standards.

## Safety Management System

STEM Studios has implemented the rudiments of a full Safety Management System, using CAP1059 as appropriate guidance.

The ‘internal’ Safety Objectives are:

• Encouraging an environment whereby safety has top priority and is second nature, and

• Increasing the knowledge on safe operations and practices on the part of its customers.

## Safety Targets

It is the goal of STEM Studios to operate aircraft without harm, injury or damage to any persons or property. The STEM Studios Remote Pilot will comply with all the safety requirements and limitations granted by the UK CAA to STEM Studios.

The safety target is No Accidents.

# ORGANISATION

Organisation Name: STEM Studios

Organisation Type: Ltd

Organisation Registration Number: 13442480

Country of Registration: England

CAA Operator ID: TODO

STEM Studios has third Party Public Liability Insurance as outlined below:

Insurer: TODO

Insurance Policy Number: TODO

3rd Party Liability Insurance: [Value £] TODO

Insurance Expiry Date: TODO

A copy of the current Certificate of Insurance is enclosed as Appendix A to this Operations Manual.

STEM Studios operates the following UAS:

UAS: DJI Inspire 1

UAS Type: Multirotor

UAS MTOM: 3.03kg

UAS Serial No.: TODO

The technical specification for this UAS is attached as Appendix B.

TODO (Picture)

## Structure of STEM Studios

STEM Studios is owned by Mr. Barney Clark. He is also the Accountable Manager. Mr. Daniel Adelodun a remote pilot, and the primary author of this document.

## Nominated Personnel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Flyer ID | Role | NQE/RAE Issued Certificates | Acceptable Means of Compliance |
| Mr. Barney Clark | TODO | Accountable Manager |  |  |
| Mr. Daniel Adelodun | GBR-RP-Y678MLP5SRQC | Remote Pilot |  |  |
|  |  |  |  |  |

## Responsibilities

The Remote Pilot’s responsibilities are:

* Supervising each operation of the UAS.
* Completing the pre-flight risk assessment and mitigating any risks where possible.
* Having confidence that the flight can be conducted safely and the competence to perform that flight.
* Ensuring that the aircraft used is airworthy by completing the pre-flight checklist.
* Briefing all crew members prior to a flight to ensure they understand their responsibilities.
* Communicating with client as required to understand the required task.
* Planning each flight in advance and ensuring the right resources are available when required.
* Ensuring that the welfare of themselves or others is not compromised by any planned operations.
* Operating the aircraft within the stated limitations for that aircraft.
* Ensuring that he or she is of sound body and mind to operate the aircraft.
* Completing all required paperwork such as pilot & aircraft hours, battery log etc. after a flight.
* Maintaining constant look out for ground and air incursions.
* Ensuring the position of the UA is always known.
* Being prepared to activate the ‘failsafe’ function on the aircraft when required.

## Areas of Operation

The anticipated areas of operation are rural areas that would fall under the A3 Open Category - but occasionally, we may fly in Urban/Congested areas, such as in central London (but outside of any airspace that the Operational Authorisation associated to this document does not cover). All operations will be carried out in UK airspace, mainly within class G airspace.

## Types of Operation

The anticipated types of operation are:

* Aerial Photography
* Aerial Videography

Operations that are conducted during daylight will be within standard VLOS limitations of 400 ft above surface level and at a maximum distance from the Remote Pilot of 500 metres provided the Remote Pilot can see the UAS in good visual Meteorological Conditions.

Prior to all night time operations (where night time is defined as the time from half an hour after sunset until half an hour before sunrise, sunset and sunrise being determined at surface level), a daylight reconnaissance and site safety assessment including aircraft flight-paths within the surrounding area, shall be undertaken to identify, address and record any hazards, restrictions and obstacles. The launch site shall be provided with adequate illumination and the aircraft shall be equipped with adequate lighting. Flights shall only commence when the weather conditions and visibility of the UAS are suitable for continuous VLOS operations.

## Supervision of UAS Operations

The Remote Pilot present during each operation will be responsible for the supervision and safe conduct of that operation.

The Remote Pilot will seek clearance from the Accountable Manager in advance of a flight where a risk is identified as not being in the Low or Moderate categories and cannot be easily mitigated.

An Observer, if present, will be charged with pointing out to the Remote Pilot any unobserved threat or risk that manifests itself during a flight using Threat and Error Management techniques.

Any safety issue that arises will be brought to the attention of the Accountable Manager as soon as practicable after the incident has been recorded.

## Accident Prevention and Flight Safety Programme

STEM Studios will comply with the requirements of CAP382, Mandatory Occurrence Reporting.

Any occurrence, accident or serious incident will be dealt with by STEM Studios as follows: -

**Occurrence Handling**

In the event of any Occurrence, the severity must be assessed. The following lists should help to identify:

The definitions in this section are from Regulation (EU) 376/2014 and Regulation (EU) 996/2010.

**Occurrence**

Any safety-related event which endangers or which, if not corrected or addressed, could endanger an aircraft, its occupants or any other person and includes an accident or serious incident. Accidents and serious incidents are classifications of occurrence

**Accident**

An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

A) a person is fatally or seriously injured because of:

* being in the aircraft, or,
* direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or, — direct exposure to jet blast, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

B) the aircraft sustains damage or structural failure which adversely affects the structural strength, performance or flight characteristics of the aircraft, and would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, the aircraft skin (such as small dents or puncture holes) or minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike, (including holes in the radome); or

C) the aircraft is missing or is completely inaccessible.

**Serious Incident**

An incident involving circumstances indicating that there was a high probability of an accident and is associated with the operation of an aircraft, which in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down.

**Fatal Injury**

An injury which is sustained by a person in an accident and which results in his or her death within 30 days of the date of the accident.

**Serious Injury**

An injury which is sustained by a person in an accident and which involves one of the following:

a. hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received.

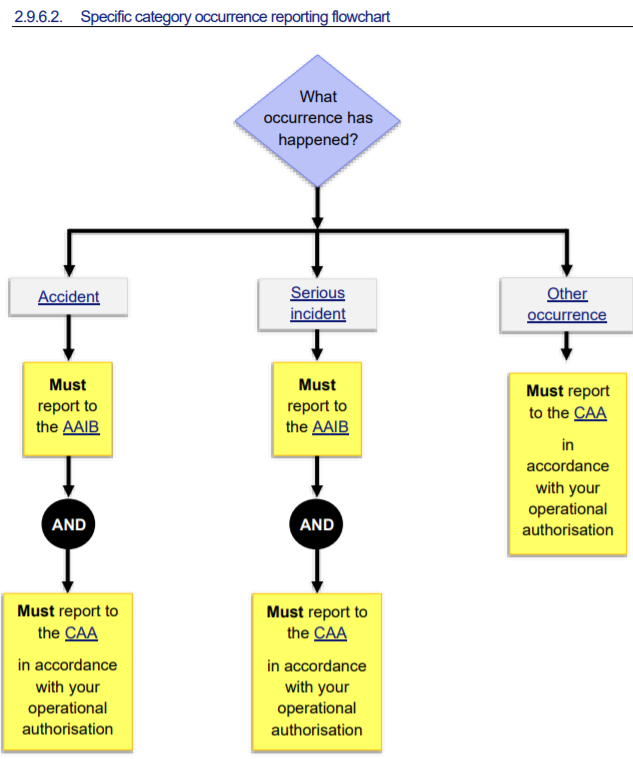
b. a fracture of any bone (except simple fractures of fingers, toes, or nose).

c. lacerations which cause severe haemorrhage, nerve, muscle, or tendon damage. Injury to any internal organ.

e. second- or third-degree burns, or any burns affecting more than 5 % of the body surface.

f. verified exposure to infectious substances or harmful radiation.

The following workflow should be used to determine reporting requirements in the Specific Category under PDRA - 01:



[ECCAIRS 2 Central Hub | Home (aviationreporting.eu)](https://linkprotect.cudasvc.com/url?a=https%3a%2f%2faviationreporting.eu%2fen%2fhomepage&c=E,1,_EGzdaclhLPGsMzp2o9TYu3q-aAWSKQtjiUSQSX9XGIPjkF3X5oqoFp-9TIBl2v3LEMyvcidz24Lzv5hWS91pr9lNoctciZpeQEBxXWTFKnk4kBlAk_k77gYrA,,&typo=1). Is to be used

**Incident Logging**

All incidents will be logged in the Aircraft Operating Hours Log as well as the STEM Studios Incident Log. Upon noting a minor incident, the logbook should be checked for similar occurrences. If a minor incident occurs three times, then an investigation should be initiated to identify the cause and consider implementing steps to reduce the likelihood of this incident occurring again.

All accidents and serious incidents require an investigation as outlined in the Investigation Procedure section. The Incident Log should also be updated.

**Investigation Procedure and Report**

Any investigations undertaken by STEM Studios will follow the procedure shown below to generate an Investigation Report with the following contents:

INTRODUCTION

The introduction contains the context for the Incident and confirms the major facts as to the companies and people involved, why they were present and the reason for the flights being carried out.

DESCRIPTION OF EVENTS

This is a factual account of the events leading up to and immediately after the incident as well as the incident itself. Its aim is to provide an agreed basis upon which the analysis is carried out.

Importantly any assumptions should be clearly stated, and all data provided should have its authenticity and derivation stated. If there are doubts, then these should also be clearly articulated so that future analysis can take this into account.

ANALYSIS

The analysis of events sets out to find explanations for what is described in the description of events. Wherever possible the analysis draws upon known concepts, models, and physical understanding to ensure that the events as described have a logical explanation.

The analysis should set the scene for any conclusions and provide traceability from the facts to the conclusions in a logical and auditable way.

CONCLUSIONS

The conclusions are derived from the analysis, which themselves are based upon the facts in the description of events or the facts as they pertain to concepts, models and physical understanding exposed within the analysis. A strong conclusion is one where this traceability is good and can stand up to scrutiny.

RECOMMENDATIONS

The aim of a recommendation is to provide the organisations or personnel identified for the report with those items and actions that can lead to a safer operation and which address the shortcomings highlighted through the investigation process.

## Flight Team Composition

Stem Studios will often be operating as part of a larger team, and as such the people involved - and their level of familiarity with the equipment - will often change. Nevertheless, Stem Studios will seek assistance where the risks may be greater and will brief all concerned parties on the dangers involved. We will ensure that the only people operating the UAS are those with the appropriate credentials (i.e. Mr. Barney Clark and the Remote Pilot).

## Operation of Multiple Types of UAS

The remote pilot will ensure they are fully competent with the operating limitations associated with the aircraft class, weight, and manufacturer they intend to operate with – especially when multiple aircraft are used.

## Qualification Requirements

STEM Studios will ensure that all STEM Studios pilots acting as the Remote Pilot of its UAS hold a UAS pilot competency assessment or qualification recognised by the CAA and compliant with the category they intend to operate within.

All remote pilots must hold a valid Flyer ID.

All remote pilots intending to operate within the open category must ensure they comply with the relevant qualification requirements.

All remote pilots intending to operate within the specific category must ensure they hold the relevant qualification requirements for the intended PDRA, in the case of UKPDRA-01, a GVC is required.

## Crew Health

All STEM Studios Remote Pilot and other crew members will be introduced to the ‘IMSAFE’ mnemonic and will be trained to use it as a proactive self-assessment tool.

It is the responsibility of the individual to determine if they are in a physically and mentally fit condition to participate in STEM Studios operations.

All crew members must be capable of clearly reading a vehicle registration number plate from twenty metres.

Crew members shall not attend a flight operation if they are under the influence of alcohol.

STEM Studios also has a strict no drugs policy. All Flight Crew members taking prescription drugs should seek professional guidance and advise the Remote Pilot.

Any crew member who begins to feel unwell and are unable to continue with their assigned responsibilities should advise the Remote Pilot immediately.

## Logs and Records

STEM Studios will maintain up-to-date information and operational logbooks for:

* Aircraft and Pilot Operating Hours
* Battery Charge
* Aircraft Maintenance
* Incidents / Accidents

See Appendix C for an example of the Aircraft and Pilot Operating Hours logbook, which includes a section on incident and accidents that occurred during flight.

## Operator Training Programmes

All STEM Studios pilots acting as Remote Pilot on flight operations will be subject to regular assessment by the STEM Studios Mr. Barney Clark on a regular basis for competency and currency, with emphasis on emergency procedures and non-GPS assisted flight manoeuvres.

To maintain currency, the remote pilot should have completed a minimum 2 hours flight time in the previous 90 days.

## Operational Authorisation

A copy of the Operational Authorisation issued to STEM Studios is included in this OM as Appendix D.

# OPERATIONS

## Role Training and Currency

All STEM Studios pilots will have to hold a pilot qualification recognised by the CAA for the relevant UAS operations and will be assessed by the STEM Studios Accountable Manager as being knowledgeable and competent to fly STEM Studios’ UAS’ in STEM Studios’ potential operating environments.

All STEM Studios pilots will be expected to maintain flying skills currency through hands-on flying with STEM Studios aircraft, aircraft they have access to or appropriately configured simulators.

## Area of Operation

The anticipated areas of operation are rural areas that would fall under the A3 Open Category - but occasionally, we may fly in Urban/Congested areas, such as in central London (but still outside of any airspace that this Authorisation does not cover). All operations will be carried out in UK airspace, mainly within class G airspace.

UAS operations will be assessed in advance using comprehensive site risk assessment forms and procedures. See Appendix E.

## Operating Limitations and Conditions

STEM Studios operations will be primarily conducted within the limitations stipulated within UKPDRA-01 or as stipulated in the Operational Authorisation issued by the CAA to STEM Studios.

Operations may take place within the Open Category. If so, the remote pilot will ensure that the compliant aircraft and competency requirements are held to operate in the specific subcategory.

All Operations will be carried out in accordance with the issued Operational Authorisation PDRA01 and abide by the requirements of ANO2016 - 2020 Amendment and UAS Implementing Regulation 2019/947 (as retained in UK Law)

**All Remote pilots are advised to sign up to CAA Skywise portal to ensure they remain up to date with Legislation, information notices and Temporary airspace restriction or changes.** [**http://skywise.caa.co.uk/**](http://skywise.caa.co.uk/)

## Methods to Determine the Intended Tasks and Feasibility

For all STEM Studios UAS operations, the designated remote pilot will assess the intended task using the Pre-Flight Site Research Form, see Appendix E. Details captured on the form from the customer will include: -

* Contact Details
* Work Required
* Date and Time Constraints
* Location of Work (Latitude and Longitude if possible)
* Landowner Details
* Other Nearby Air Users (if known)
* Any Other Relevant Information

A completed Pre-Flight Site Research Form will be retained for at least one year for future reference if required.

The designated remote pilot will be responsible for determining the method of operation for the intended task, identifying resources, and assessing the task’s feasibility. If he or she has any reservations he will discuss the reservations with the STEM Studios Accountable Manager before proceeding with the task.

## Operating Site Planning and Assessment

As part of the research into task feasibility, the STEM Studios remote pilot will use whatever tools and facilities deemed necessary and available to him or her. These may include:

* Client Information
* Current and Relevant Aeronautical Charts
* Integrated Aeronautical Information Package – United Kingdom
* SkyDemonLight, Altitude Angel and NoFlyDrones- Online Aeronautical Charts
* NOTAMinfo.com to confirm NOTAMs
* CAA SkyWise notifications
* Google Earth
* Google Maps

The task will only go ahead if the remote pilot is satisfied the necessary controls and safeguards can be put in place for a safe operation within the Operational Area of flight.

## Communications

Contact telephone numbers for the following will be recorded on the Pre-Flight Site Research Form, and the On-Site Survey Form, which can be found in Appendix E, when possible and before departure to the site:

* Landowner(s)
* Observer and Crew
* Client Contact
* Local Police Station
* Local Hospital
* Local Air Traffic Control (ATC)
* Local Air User Clubs

Where possible, contact will be made with the Landowner(s) and the ATC before any physical site survey in conducted.

**ATC Phone numbers can be found on**

Civil – <http://www.nats-uk.ead-it.com/public/index.php.html> > IAIP > Eaip > AD2 > Aerodrome Name

Military - <https://www.aidu.mod.uk/aip/> > IAP > AD > AD2 > Aerodrome Name > Textual Data

## Pre-Notification

Permission is required if a planned flight operation is to take place within the Flight Restriction zone or Runway Protection Zone of a protected aerodrome. The remote pilot will contact the ATC at least twenty-four hours before the planned flight. If Operating in controlled airspace the remote pilot will shall make the decision on whether to contact ATC and notify them of the planned flight in the interests of safety. Contact details for the tower will be recorded on the relevant On-Site Survey Form.

If there is a local air user club nearby the remote pilot will endeavour to contact the club and enquire about any likely activity on the day of the proposed flight operation.

If the planned flight operation is to take place in areas where there is likely to be members of the public, the remote pilot will inform the local police. The contact and telephone number will be recorded on the On-Site Survey Form.

If the flight operation is to take place in a highly populated area, such as a housing estate, a leaflet drop, and/or a door-to-door advisory campaign will be considered at least seven days in advance to advise members of the public of proposed flight operations.

All relevant STEM Studios crew members will be advised of a planned flight operation at least twenty-four hours in advance.

Some ATC’s will require an NSF approval via <https://nsf.nats.aero/>

**Applications for NSFs should be made with a minimum of 14 days notice. Applications submitted less than 7 days in advance of the flight may not be processed.**

## Site Permissions

The designated remote pilot will obtain permission from all relevant landowners or land occupiers where flight operations are to be conducted. Where possible, permission will be sought in writing. Where it is available in writing a copy of the permission will be carried on site. No flight operations will commence without permission, either written or verbal, from the relevant landowners or occupiers for the main take-off and landing site.

## Weather

In the week leading up to any flight operation the designated remote pilot will obtain long, medium, and short-range weather forecasts. Twenty-four hours before the proposed flight operations the remote pilot will determine whether the planned flight operations will go ahead.

Weather and other forecasts, such as solar activity, will be obtained using readily available resources, which may include: -

* UAV Forecast
* XC Weather
* Weather Channel
* BBC Weather

## On Site Procedures

Before setting up on-site in accordance with the On-Site Arrival Checklist, see Appendix F, the remote pilot or a designated crew member will carry out the following measurements:

* GPS/GLONASS satellite coverage, a minimum of seven satellites over a good spread will be required for all operations, using an App on a Smartphone, and
* Windspeed at surface level, using a handheld anemometer.

If the remote pilot feels confident that the proposed flight operations can be safely carried out, then the operation can progress, and the remote pilot can complete the On-Site Arrival Checklist.

The remote pilot will then carry out the On-Site Survey, see form in Appendix E, to familiarise him or herself with the local geography of the site. This will be completed by physically walking around the site to identify any hazards and any identified will be marked on the On-Site Survey Form. Where an Observer is present, the Observer will accompany the remote pilot.

The remote pilot must be satisfied that all risks identified are acceptable and will sign off the On-Site Survey before proceeding to the next stage.

## Assembly and Functional Checks

The UAS will be assembled and checked in accordance with the relevant UAS Assembly Checklist, see Appendix F.

The remote pilot will check the day prior to the flight operation that all necessary software and firmware updates have been completed on the UAS to be flown and if necessary, a test flight has been conducted.

## Pre-Flight Checks

The UAS will be prepared for flight by the remote pilot following the Pre-Flight Checklist, see Appendix F.

## Flight Procedures

When the remote pilot is satisfied the UAS is ready for launch, he or she will follow the Launch Checklist, see Appendix F.

During flight, the remote pilot will conduct situational awareness updates. Situational awareness updates will include:

* UAS position and responsiveness
* UAS battery status (including Aircraft, Controls, Ground Station etc.)
* Horizon scans and airspace assessments
* Landing site incursions
* Alternate landing site incursions
* Air incursions (air users / birds)
* Potential weather changes
* Ground incursions, dangers to the Remote Pilot

Prior to landing, the Remote Pilot will go through the Landing Checklist.

## Post Flight and Between Flight Checks

The UAS will shut down, made safe and checked in accordance with the Post Flight Checklist, see Appendix F.

## Emergency Procedures

The Emergency Procedures for STEM Studios’ UAS are set out in Appendix G.

# APPENDICES

## Appendix A – Insurance Certificate – TODO

## Appendix B – UAS Technical Specification

**Manufacturer** DJI

**Model** Inspire 1

**Type-Configuration:** Multirotor

**Overall Dimensions (H x L x W):** 301 Mm x 736 Mm x 747 Mm

**Weight:** 3.03 Kg (maximum takeoff weight), 2.37 Kg(empty)

**Propulsion:** Battery Powered Electric, 4 motors

**Energy Store:** LiPo, Required voltage: 22.8V

**Flight Control Computer:** DJI -DJI Inspire 1 Integral

**Lost link response:** If GPS is available, return-To-home-point, automatic landing

**C2 Link:** Line-of-Sight, spread spectrum R/C 5.8 GHz

**Maximum range:** 2 Km or 1.2 Miles

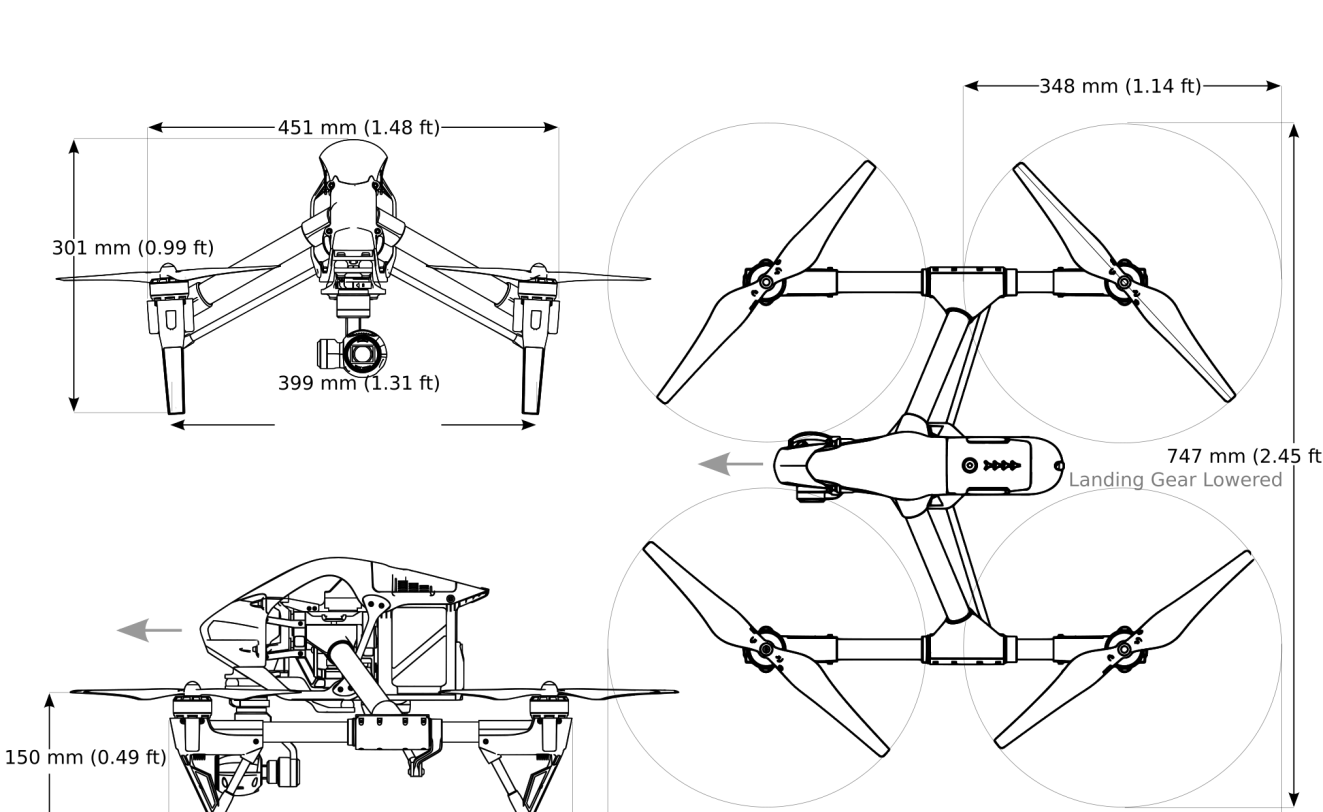
**Flight Control Station:** DJI C1.

**Operating temperature range:** -10 C to + 40 C

**Maximum operating wind speed:** 10 m/s or 22 mph

**Maximum endurance:** 18 Minutes

**Maximum speed:** 22 m/s or 49 mph



## Appendix C - Logbooks

[Examples from the FRCs Forms and Checklists spreadsheet have been inserted here. Amend and format them in Excel and copy them in as Pictures (Paste Special) rather than as Excel Objects (see word doc for ease of use). For the Combined Pilot and Aircraft Log you may have to use a Photo Software tool to rotate the image before inserting it. Remember the CAA only expects to see the format of the logs, not actual content, however if you are using DJI pilot or similar you can place a screen print of that here too.

Insert a copy of your Pilot and Aircraft Log template here

Insert a copy of your Maintenance Log template here – Not mandatory

Insert a copy of your Battery Log template, if you intend to use one, here - Not mandatory

## Appendix D – Operational Authorisation

Intentionally Left Blank: Awaiting arrival of Operational Authorisation

Intentionally Left Blank: Awaiting arrival of Operational Authorisation

## Appendix E – Flight Planning and Risk Assessment Forms

Insert a copy of your Pre-Flight Research Form here

Insert a copy of your On Site Survey Form here

## Appendix F –Flight Reference Cards and Checklists

**F.1 Equipment Loading List**

Insert a copy of your Equipment Loading List here, if you propose to use one

**F.2 On Site Set Up Checklist**

Insert a copy of your On-Site Set Up Checklist here

**F.3 UAS Assembly and Functional Checklist**

Insert a copy of your Assembly and Functional Checklist here

**F.4 Pre-Flight Checklist**

Insert a copy of your Pre-Flight Checklist here. Checklists are optional.

**F.5 Pre-Landing Checklist**

Insert a copy of your Pre-Landing Checklist here

**F.7 Post Flight Checklist**

Insert a copy of your Post Flight Checklist here

## Appendix G – UAS Emergency Procedures

**G.1 Pilot Incapacitation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Pilot incapacitation |  | Activate RTH (Return to Home) or BL (Back Landing) if possible. | Pick up controller.  Confirm launch area clear.  Monitor video display (if still functioning).  Initiate Return to Home procedure OR land the UAS if trained to do so.  Administer First Aid to pilot as appropriate  Call Emergency Services if required | Administer first aid to pilot.  When Return to Home is initiated: If below 20m the UAS will climb to 20m (if already above 20m the UAS will stay at the same height)  The UAS will return directly to the launch position, hover for 15 seconds then gradually descend until it lands, and the motors will automatically disarm.  Report to appropriate bodies as identified in section 3.8 |

**G.2 Airspace Incursion**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Airspace Incursion | Visible or audible signs of another air user in the location. | Climb or descend as appropriate.  Alert crew to issue.  When location of other air user has been identified move directly away, land if safe to do so. | Crew to prioritise the identification of the location of the other air user.  Crew to keep pilot aware of what they can see.  Ensure landing location is clear. | Record any relevant information relating to the airspace incursion for UK AirProx Board.  Report to appropriate bodies as identified in section 3.8 |

**G.3 Loss of Control Data Link**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Loss of Control Data Link | UAS unresponsive.  Poor signal strength.  UAS shows fast flashing amber lights | Alert crew to issue.  Attempt to regain control of the UAS by changing flight mode from its current mode to an alternate and back. | Ensure landing location is clear.  Monitor video display (if still functioning).  Provide pilot with appropriate updates on status. | UAS will enter a ‘failsafe’ mode in this situation after 3 seconds.  When failsafe is initiated: If below 20m the UAS will climb to 20m (if already above 20m the UAS will stay at the same height)  The UAS will return directly to the launch position, hover for 15 seconds then gradually descend until it lands, and the motors will automatically disarm.  If UAS re-acquires link at any time the pilot can change the flight mode to regain control of the RPA by cycling the flight mode switch.  Pilot must land the RPA as soon as it is safe to do so to investigate the issues.  Report to appropriate bodies as identified in section 3.8 |

**G.4 Rogue UAS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| UAS flying without response from Remote Pilot and uncontrollable | UAS unresponsive. | Alert crew to issue.  Attempt to regain control of the UAS by changing flight mode switch.  Attempt to initiate Return to Home using switch.  Turn off Pilot Controller to attempt to force a failsafe. If this does not work turn controller back on again and try to regain control.  If control regained, bring UAS home and land.  If control not regained, prepare for crash landing.  *Call “CLEAR”*  Proceed to crash site if possible  Inform local ATC if required  Inform emergency services if required | Identify a landmark on the horizon to assist with identifying direction of flight, from launch area or mark location.  Monitor video display (if still functioning). Provide pilot with appropriate updates on status.  Take a bearing of the direction of flight.  Inform local ATC if required  Inform emergency services if required | Dependent on outcome possibly inform the relevant agencies and personnel.  Report to appropriate bodies as identified in section 3.8 |

**G.5 Loss of Power (UAS)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Loss of power (UAS) | Un-commanded descent | Alert crew to impending crash.  Attempt to regain control by changing flight mode switch.  If control regained, bring UAS home and land.  If control not regained, prepare for crash landing.  *Call “CLEAR”*  Proceed to crash site if possible  Inform local ATC if required  Inform emergency services if required | Identify a landmark on the horizon to assist with location of UAS.  Monitor video display (if still functioning).  Provide pilot with appropriate updates on status.  Proceed to crash site if possible  Inform local ATC if required  Inform emergency services if required | Carry out post-crash management procedure.  Report to appropriate bodies as identified in section 3.8 |

**G.6 Loss of Power (Ground Control Equipment)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Loss of power (ground control equipment) | Tablet screen extinguished.  Green connection light and / or white power lights on RC extinguish.  UAS shows fast flashing amber lights. | Alert crew to the loss of control.  Ensure landing site is cleared.  Watch behavior of machine to ensure failsafe is operating correctly. If not initiate Rogue UAS procedure. | Monitor video display (if still functioning).  Provide pilot with appropriate updates on status. | If UAS experiences control data loss for more than 3 sec it will enter the failsafe mode.    If UAS experiences control data loss for more than 3 seconds it will enter a failsafe mode.  When failsafe is initiated: If below 20m the UAS will climb to 20m (if already above 20m the UAS will stay at the same height)  The UAS will return directly to the launch position, hover for 15 seconds then gradually descend until it lands, and the motors will automatically disarm.  If UAS re-acquires link at any time the pilot can change the flight mode to regain control of the UAS.  Pilot must land the UAS as soon as it is safe to do so to investigate the issues.  Report to appropriate bodies as identified in section 3.8 |

**G.7 Unexpected Behaviour in Flight**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Unexpected behavior in flight |  | Alert crew to the loss of control.  Ensure landing site is cleared.  Pilot must land the UAS as soon as it is safe to do so to investigate the issues. | Monitor video display (if still functioning).  Provide pilot with appropriate updates on status. | Report to appropriate bodies as identified in section 3.8 |

**G.8 Lithium Polymer Battery Fault**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Swelling of battery or overheating  From impact damage following aircraft crash, dropping of battery, or charging malfunction |  | Alert crew to the fault.  *Call “CLEAR”*  If RPA is in flight and still under control land immediately in a safe area away from public.  Inform emergency services as required.  Cordon off area 30m radius from battery/UAS.  *If necessary* and safe to do so use extinguisher. | Crew to keep location of fire clear.  Inform emergency services as required.  Cordon off area 30m radius from battery/RPA.  *If necessary* and safe to do so use extinguisher. | LiPo batteries are highly dangerous and can explode  Keep distance until safe to approach  First on scene of UAS:  approach battery with extreme caution, wearing PPE (goggles, fire resistant gloves), LiPo bag and with fire extinguisher to hand.  Dispose of battery in accordance to safety guidelines OR safely discharge battery.  Report to appropriate bodies |

**G.9 UAS Fire**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Symptom/Issue | Warning | Pilot Action | Crew Action | Remarks |
| Smoke / fire |  | Alert crew to the fire.  *Call “CLEAR”*  If RPA is in flight and still under control land immediately in a safe area away from public.  Inform emergency services as required.  Cordon off area 30m radius from battery/RPA/crash site.  If safe to do so use extinguisher. | Crew to keep location of fire / crash site clear.  Inform emergency services as required.  Cordon off area 30m radius from battery/RPA/crash site.  If safe to do so use extinguisher. | LiPo batteries are highly dangerous and can explode  Keep distance until safe to approach  First on scene of RPA:  approach battery with extreme caution, wearing PPE (goggles, fire resistant gloves), LiPo bag and with fire extinguisher to hand.  Dispose of battery in accordance to safety guidelines.  Report to appropriate bodies as identified in section 3.8 |

**G.10 Loss of GNSS signal**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Symptom/Issue** | **Warning** | **Pilot Action** | **Crew Action** | **Remarks** |
| Loss of GPS modes in-flight.  Aircraft fails to hold position lock | Visual warning on iOSD  Aircraft may switch to a non-GPS mode (i.e. ATTI / OPTI)  Aircraft status light may change. | Immediately switch to non-GPS assisted mode.  Land at the nearest suitable TOLZ.  If Pilot is unable to regain control, refer to **G.4 Rogue UAS** | Clear operational area of all personnel  Identify clear TOLZ  Provide pilot with appropriate updates on status. | Operation should be aborted until GPS can be established.  UNLESS it is safe to continue the flight without the use of GPS and the functionality it provides (e.g. GPS RTH)    Report to appropriate bodies as identified in section 3.8 |
|  |  |  |  |  |

**G.11 Compass Error**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Symptom/Issue** | **Warning** | **Pilot Action** | **Crew Action** | **Remarks** |
| Loss of GPS mode in-flight  Aircraft fails to hold heading | Visual warning on iOSD  Aircraft may switch to a non-GPS assisted mode (i.e. ATTI / OPTI)  Aircraft status light may change  Aircraft may fail to keep commanded heading | Land at the nearest suitable TOLZ  Consider Switching to ATTI Mode if available  If aircraft begins to yaw uncontrollably, consider landing underneath flight path provided safe to do so  If pilot is unable to regain control, refer to **G.4 Rogue UAS** | Clear operational area of all personnel  Identify clear TOLZ and/or clear area below flight path  Provide pilot with updates on status | Operation should be aborted until Compass error is rectified.  Refer to pre-flight documents to reassess any electromagnetic interference or distortion risks.  Report to appropriate bodies as identified in section 3.8  Consider servicing aircraft for further investigation |