STANDARD OPERATING PROCEDURE

FOR

UNIT DRON
JABATAN BOMBA DAN PENYELAMAT MALAYSIA
(FIRE AND RESCUE DEPARTMENT OF MALAYSIA)

ISSUE 01
REVISION 00 – 30 JULY 2021

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INTRODUCTION

This Standard Operating Procedure of Unmanned Aerial System Unit Jabatan Bomba dan Penyelamat Malaysia (UASJBPM) provides guidance for conducting small unmanned aircraft system (UAS or Drone) flight operation in order to support and improve the operations in relation to emergency or disaster in both Malaysia and international level.

UASJBPM is dedicated to provide highly professional UAS operation. Safety is always the top priority for the UASJBPM Personnel, followed by a high level of discipline. UASJBPM Personnel will be persistent in continuously demonstrating that UAS operations will add value to fire and rescue operations in Malaysia by conducting the operations in effective manners.

The UASJBPM program is established in accordance to federal law & regulations whereby the relevant authorities will continuously from time to time provide additional details and guidance as and when necessary, to ensure the highest level of safety is practiced for UAS operations. This UAS JBPM SOP is prepared by Air Division of JBPM, of which it will continuously ensure that this SOP is in compliance with the federal, state, local laws & regulation and statutory requirements and related international laws & regulations and standards and all applicable laws as may be amended from time to time.

All UASJBPM personnel are expected to follow this SOP and shall comply with its provisions. Any changes to this SOP will be promptly disseminated to all UASJBPM personnel.

(DATO' SRI TS. MOHAMAD HAMDAN BIN HAJI WAHID)
Director General
Jabatan Bomba dan Penyelamat Malaysia

STANDARD OPERATION PROCEDURE COMPONENTS

This Standard Operation Procedure (SOP) is made up of the following components and are defined as follows:

Standards: Usually preceded by words such as "shall" or "must", are any specification for physical characteristics, configuration, performance, personnel or procedure, where uniform application is necessary for the safety or regularity of air navigation and to which Operators must conform. In the event of impossibility of compliance, notification to the UAS JBPM Commander is compulsory.

Recommended Practices: Usually preceded by the words such as "should" or "may", are any specification for physical characteristics, configuration, performance, personnel or procedure, where the uniform application is desirable in the interest of safety, regularity or efficiency of air navigation, and to which Operators will endeavour to conform.

Appendices: Material grouped separately for convenience but forms part of the Standards Operation Procedure stipulated by the UASJBPM.

Definitions: Terms used in the Standards Operation Procedure which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standards Operation Procedure in which the term is used, since a change in the meaning of the term would affect the specification.

Tables and Figures: These add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

Notes: Included in the text, where appropriate, Notes give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

Attachments: Material supplementary to the Standards Operation Procedure or included as a guide to their application.

It is to be noted that some Standards in this Standards Operation Procedure incorporates, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in CAD 5. Where CAD 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

A common units of measurements used within this document are expressed in accordance with those used in normal aviation practise within Malaysia:
a) Vertical distances of aircraft (heights, altitudes) are expressed in feet (ft)
b) Heights of obstructions are expressed in metres (m)
c) Distances for navigation, airspace reservation plotting, and ATC separation are expressed in nautical miles (nm) Introduction Issue 01/Rev 00 CAD 6011 Part (I) 3
d) Shorter distances are expressed in metres (m) and kilometres (km) when at or over 5000 metres
e) Mass is expressed in kilogrammes (kg) and grammes (g) when less than 1 kg
f) Speed is expressed in knots (kt) Note: Speeds below 50 kts may also be expressed in metres per second (m/s)

Where appropriate, conversions will be provided with the text with the alternative value shows in brackets e.g. 400 feet (120 metres).

Other typical conversions that are used are:
a) Distance
   10 feet = 3 metres
   50 feet = 15 metres
   500 feet = 150 metres
b) Mass
   250 g = 0.55 lb (pounds)
   25 kg = 55 lb

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

CAD 6011 (I) is a subset the 'CAD 6011 series' of UAS Directives and Guidance documentation, which includes:

CAD 6011 : Unmanned Aircraft System (General)
CAGM 6011 : Unmanned Aircraft System (General)
CAD 6011 (I) : Remote Pilot Training Organisation
CAD 6011 (II) : Agricultural UAS Operations
CAD 6011 (III) : UAS Rotary Wing Swarm Operations
CAD 6011 (IV) : Standard Scenarios (STSs)
CAD 6011 (V) : Special UAS Project

Note: *Enquiries related to this Standard Operation Procedure can be made to the UAS JBPM.*

RECORD OF REVISION

Revision to this SOP shall be made by authorised personnel only. After inserting the revision, enter the required data in the revision sheet below.
The *'initials'* have been signed off by the person responsible for the change.

Rev. No.	Rev. Date	Revisions Detail	Initials

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1 General

1.1 Citation

1.1.1 This UASJBPM SOP is applicable by the date signed by DG JBPM

1.1.2 This UASJBPM SOP This SOP UASJBPM Issue 01/Rev 00 will remain current until withdrawn or superseded.

1.1.3 Depending on current applicable and related in clause 1.3

1.1 Applicability

1.1.4 SOP UASJBPM is applicable to all appointed JBPM Personnel or;

1.1.5 SOP UASJBPM is applicable to all JBPM drone Assets and accessories or;

1.1.6 SOP UASJBPM is applicable to authorized personnel.

1.2 Applicable Law & Regulation

1.2.1 Fire And Rescue Act (Act 341)

1.2.2 Malaysian Civil Aviation Regulation (MCAR 140 - 144)

    a) MCAR 2016 : PART XVI : Unmanned Aircraft System

1.2.3 Civil Aviation Directive (CAD 6011)

    a) CAD 6011 : Unmanned Aircraft System (General)
    b) CAGM 6011 : Unmanned Aircraft System (General)
    c) CAD 6011 (I) : Remote Pilot Training Organisation (RPTO)
    d) CAD 6011 (II) : Agriculture UAS Operation
    e) CAD 6011 (III) : UAS Rotary Wing Swarm Operation
    f) CAD 6011 (IV) : Standard Scenarios (STSs)
    g) CAD 6011 (V) : Special UAS Project

1.2.4 Malaysian Communication & Multimedia (Act 1998)

    a) Frequency list for UAV Malaysia

1.2.5 Jabatan Ukur dan Pemetaan Malaysia (JUPEM)

    a) Pekeliling Arahan Keselamatan Terhadap Dokumen Geospatial Terperingkat (Pekeliling A Bil. 1 Tahun 2007)

1.2.6 SIRIM

    a) 3.0 Equipment (Apparatus) type approval

1.2.7 Protected area and protected place Act 1959 (Act 298)

    a) Restricted area

1.2.8 Official Secret Act 1972 (Act 88)

    a) Confidential information

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2   Definitions & Abbreviations

1.2   Definitions

2.1.1   For the purposes of this Standard Operation Procedure, the definitions in Malaysia Civil Aviation Regulation 2016 apply.

2.1.2   The following definitions also apply:

1)   **'unmanned aircraft system' (UAS)** means an aircraft and its associated elements which are operated with no pilot on board;

2)   **'unmanned aircraft system operator'** ('UAS operator') means any legal or natural person operating or intending to operate one or more UAS;

3)   **'assemblies of people'** means gatherings where persons are unable to move away due to the density of the people present;

Note: Assemblies of people have been defined by an objective criterion related to the possibility for an individual to move around in order to limit the consequences of an out-of-control. It was indeed difficult to propose a number of people above which this group of people would turn into an assembly of people: numbers were indeed proposed, but they showed quite a large variation. Qualitative examples of assemblies of people are:

a)   sport, cultural, religious or political events;
b)   beaches or parks on a sunny day;
c)   commercial streets during the opening hours of the shops; and
d)   ski resorts/tracks/lanes

4)   **'UAS geographical zone'** means a portion of airspace established by the competent authorities that facilitates, restricts or excludes UAS operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment, arising from UAS operations;

5)   **'robustness'** means the property of mitigation measures resulting from combining the safety gain provided by the mitigation measures and the level of assurance and integrity that the safety gain has been achieved;

6) **'visual line of sight operation' ('VLOS')** means a type of UAS operation in which, the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions;

7) **'beyond visual line of sight operation' ('BVLOS')** means a type of UAS operation which is not conducted in VLOS;

8) **'dangerous goods'** means articles or substances, which are capable of posing a hazard to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified to those instructions.

Note: In the case of an incident or accident, that the unmanned aircraft is carrying as its payload, including in particular:
  i) Explosives (mass explosion hazard, blast projection hazard, minor blast hazard, major fire hazard, blasting agents, extremely insensitive explosives);
  ii) Gases (flammable gas, non-flammable gas, poisonous gas, oxygen, inhalation hazard);
  iii) Flammable liquids (flammable liquids, combustible, fuel oil, gasoline);
  iv) Flammable solids (flammable solids, spontaneously combustible solids, dangerous when wet);
  v) Oxidising agents and organic peroxides;
  vi) Toxic and infectious substances (poison, biohazard);
  vii) Radioactive substances;
  viii) Corrosive substances;

Note: Under the definition of dangerous goods, blood may be considered to be capable of posing a hazard to health when it is contaminated or unchecked (potentially contaminated). In consideration of Chapter 09 of CAD 6011 (V) -SUP.

a) medical samples such as uncontaminated blood can be transported in either 'Special UAS Project' or it must be 'certified' in accordance with CAD 6011 (V) - SUP;

b) unchecked or contaminated blood must be transported in the 'Special UAS Project' or the 'certified' category. If the transport may result in a high risk for third parties, the UAS operation belongs to the 'certified' category. If the blood is enclosed in a container such that in case of an accident, the blood will not be

spilled, the UAS operation may belong to the 'Special UAS Project' if there are no other causes of high risk for third parties.

9) **'payload'** **m**eans instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is installed in or attached to the aircraft and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller;

10) **'direct remote identification'** means a system that ensures the **local** broadcast of information about an unmanned aircraft in operation, including the marking of the unmanned aircraft, so that this information can be obtained without physical access to the unmanned aircraft;

11) **'follow-me mode'** means a mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius;

12) **'geo-awareness'** means a function that, based on the data provided by the competent authorities, detects a potential breach of airspace limitations and alerts the remote pilots so that they can take immediate and effective action to prevent that breach;

13) **'privately built UAS'** means a UAS assembled or manufactured for the builder's own use, not including UAS assembled from sets of parts placed on the market as a single ready-to-assemble kit;

14) **'autonomous operation'** means an operation during which an unmanned aircraft operates without the remote pilot being able to intervene;

   Note: Flight phases during which the remote pilot has no ability to intervene in the course of the aircraft, either following the implementation of emergency procedures, or due to a loss of the command-and-control connection, are not considered autonomous operations.

   An autonomous operation should not be confused with an automatic operation, which refers to an operation following pre-programmed instructions that the UAS executes while the remote pilot is able to intervene at any time.

15) **'uninvolved persons'** means persons who are not participating in the UAS operation or who are not aware of the instructions and safety precautions given by the UAS operator;

Note: Due to the huge variety of possible circumstances, the general guidelines below may be used.

An uninvolved person is a person that does not take part in the UAS operation, either directly or indirectly.

A person may be considered to be 'involved' when they have:

a) *given explicit consent to the UAS operator or to the remote pilot to be part of the UAS operation (even indirectly as a spectator or just accepting to be overflown by the UAS); and*

b) *received from the UAS operator or from the remote pilot clear instructions and safety precautions to follow in case the UAS exhibits any unplanned behaviour.*

In principle, in order to be considered a 'person involved', one:

a) *is able to decide whether or not to participate in the UAS operation;*

b) *broadly understands the risks involved;*

c) *has reasonable safeguards during the UAS operations, introduced by the site manager and the aircraft operator; and*

d) *is not restricted from taking part in the event or activity if they decide not to participate in the UAS operation.*

The person involved is expected to follow the directions and safety precautions provided, and the UAS operator or remote pilot should check by asking simple questions to make sure that the directions and safety precautions have been properly understood.

Spectators or any other people gathered for sport activities or other mass public events for which the UAS operation is not the primary focus are generally considered to be 'uninvolved persons'.

People sitting at a beach or in a park or walking on a street or on a road are also generally considered to be uninvolved persons.

An example: when filming with a UAS at a large music festival or public event, it is not sufficient to inform the audience or anyone present via a public address system, or via a statement on the ticket,

or in advance by email or text message. Those types of communication channels do not satisfy the points above. In order to be considered a person involved, each person should be asked for their permission and be made aware of the possible risk(s). This type of operation does not fall into the 'open' category and may be classified as 'specific' or 'certified', according to the risk.

16) **'making available on the market'** means any supply of a product for distribution, consumption or use on the Malaysian market in the course of a commercial activity, whether in exchange of payment or free of charge;

17) **'placing on the market'** means the first making available of a product on the Malaysian market;

18) **'controlled ground area'** means the ground area where the UAS is operated and within which the UAS operator can ensure that only involved persons are present;

19) **'maximum take-off mass'** ('MTOM') means the maximum Unmanned Aircraft mass, including payload and fuel, as defined by the manufacturer or the builder, at which the Unmanned Aircraft can be operated;

   Note: *This MTOM is the maximum mass defined by the manufacturer or the builder, in the case of privately built UAS, which ensures the controllability and mechanical resistance of the UA when flying within the operational limits.*

   The MTOM should include all the elements on board the UA:

   a)   all the structural elements of the UA;
   b)   the motors;
   c)   the propellers, if installed;
   d)   all the electronic equipment and antennas;
   e)   the batteries and the maximum capacity of fuel, oil and all fluids; and
   f)   the heaviest payload allowed by the manufacturer, including sensors and their ancillary equipment.

20) **'unmanned sailplane'** means an unmanned aircraft that is **supported** in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine. It may be equipped with an engine to be used in case of emergency.

21) **'unmanned aircraft observer'** means a person, positioned alongside the remote pilot, who, by unaided visual observation of the unmanned aircraft, assists the remote pilot in keeping the unmanned aircraft in VLOS and safely conducting the flight;

22) **'aircraft observer'** means a person who assist the remote pilot by performing unaided visual scanning of the airspace in which the unmanned aircraft is operating for any potential hazard in the air;

23) **'command unit' ("CU")** means the equipment to control unmanned aircraft remotely as defined in point 32 of Article 3 of Regulation (EU) 2018/1139 which supports the control or the monitoring of the unmanned aircraft during any phase of flight, with the exception of any infrastructure supporting the command and control (C2) link service;

24) **'C2 link service'** means a communication service supplied by a third party, providing command and control between the unmanned aircraft and the CU;

25) **'flight geography'** means the volume(s) of airspace defined spatially and temporarily in which the UAS operator plans to conduct the operation under normal procedures;

26) **'flight geography area'** means the projection of the flight geography on the surface of the earth;

27) **'contingency volume'** means the volume of airspace outside the flight geography where contingency procedures are applied;

28) **'contingency area'** means the projection of the contingency volume on the surface of the earth;

29) **'operational volume'** is the combination of the flight geography and the contingency volume;

30) **'ground risk buffer'** is an area over the surface of the earth, which surrounds the operational volume and that is specified in order to minimise the risk to third parties on the surface in the event of the unmanned aircraft leaving the operational volume

31) **'night'** means the time between 20 minutes after sunset and 20 minutes before sunrise, excluding both the times, determined at surface level;

2.2 Abbreviations

ADD	Air Division Director
AEC	airspace encounter category
AEH	airborne electronic hardware
ANSP	air navigation service provider
ARC	air risk class AGL above ground level
AM	Accountable Manager
AMC	acceptable means of compliance
ATC	air traffic control
ATO	Approved Training Organisation
ATP	Authorised Technical Personnel
AWC	Aerial Work Certificate
BVLOS	beyond visual line of sight
CAAM	Civil Aviation Authority of Malaysia
CEO	Chief Executive Officer (CAAM, unless stated otherwise)
CG	Centre of Gravity
CGSO	Chief Government Security Office
CO	Commanding Officer
COA	Certificate of Approval
CRP	Chief Remote Pilot
C2	command and control
C3	command, control and communication
ConOps	concept of operations
DAA	detect and avoid
DG	Director General
DDGO	Deputy Director General (Operation)
DOA	Department of Agriculture
ERP	emergency response plan
FHSS	frequency-hopping spread spectrum
FOM	Flight Operations Manager
GAO	Government Agencies to conduct adhoc UAS Operations (GAO)

GRC	ground risk class
GM	guidance material
GNSS	Global Navigation Satellite System
HMI	human machine interface
ISM	industrial, scientific and medical
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
JBPM	Jabatan Bomba Dan Penyelamat Malaysia / Fire & Rescue Department Of Malaysia
JUPEM	Jabatan Ukur dan Pemetaan Malaysia
IAW	in accordance with
METAR	aviation routine weather report (in (aeronautical) meteorological code)
MC	Maintenance Controller
MCC	multi-crew cooperation
MCAR	Civil Aviation Regulation 2016
MCMC	Malaysian Communications and Multimedia Commission
MTOM	maximum take-off mass
OM	operations manual
OEM	original equipment manufacture
OSO	operational safety objective
PDRA	predefined risk assessment
POPS	Prospective operator's pre-assessment statement
PtF	Permit to Fly
RBO	risk-based oversight
RCoC	remote pilot certificate of competency
RCP	required communication performance
RF	radio frequency
RFI	Remote Pilot Flight Instructor
RGI	Remote Pilot Ground Instructor
RLP	required C2 link performance
RP	remote pilot
RPS	remote pilot station
RPTO	Remote Pilot Training Organisation

SAIL	specific assurance and integrity level
SIRIM	Standard and Industrial Research Institute of Malaysia
SM	Safety Manager
SMSM	safety management system manual
SOE	Schedule of Events
SOP	Standard Operation Procedure
SORA	specific operations risk assessment
SPECI	aviation selected special weather code in (aeronautical) meteorological code)
STS	standard scenario
SW	software
TAF	terminal area forecast
TCAS	traffic collision avoidance system
TMPR	tactical mitigation performance requirement
TPM	Training and Procedure Manual
UA	unmanned aircraft
UAS	unmanned aircraft system
UAS Regulation	MCAR 2016 Part XVI and its legislations pertaining to UAS, including CAD 6011 and its subseries
UASJBPM	Unmanned Aircraft Syterm Jabatan Bomba dan Penyelamat Malaysia
VLL	very low level
VLOS	visual line of sight
VO	visual observer

3. Personnel

3.1 Role and Responsibility

This SOP UASJBPM is shall be followed with full of responsibility by the following position;

3.1.1 Director General (DG)

    a) Accountable to this SOP UASJBPM IAW updated Air Law and Regulation;

    b) Accountable to appoint UASJBPM Personnel including UAS operator and UAS crew;

    c) Accountable to drone task order and related clearance;

    d) Accountable to delegate power .

3.1.2 Deputy Director General (Operation) (DDGO)

    a) Accountable to this SOP UASJBPM IAW updated Air Law and Regulation;

    b) Accountable to appoint UASJBPM Personnel including UAS Operator and technical crew;

    c) Accountable to UASJBPM task order and related clearance;

    d) Accountable to delegate power .

3.1.3 Air Division Director (ADD)

    a) Accountable to this SOP UASJBPM IAW updated Air Law and Regulation;

    b) Accountable to appoint UASJBPM Personnel including UAS Operator and technical crew;

    c) Accountable to UASJBPM task order and related clearance;

    d) Accountable directly to UASJBPM personnel;

    e) Accountable to crew for following current SOP, law and regulation;

    f) Accountable to crew competency and training;

    g) Accountable to equipment competency;

    h) Accountable directly to UASJBPM personnel welfare;

    i) Accountable to delegated power .

3.1.4 Deputy Air Division Director (DADD)

    a) Responsible to this SOP UASJBPM IAW updated Air Law and Regulation;

    b) Responsible to appoint UASJBPM Personnel including UAS Operator and technical crew;

    c) Responsible to UASJBPM task order and related clearance;

    d) Responsible directly to UASJBPM personnel;

e) Responsible to crew for following current SOP, law and regulation;
f) Responsible to crew competency and training;
g) Responsible to equipment competency;
h) Responsible directly to UASJBPM personnel welfare;
i) Responsible for delegated power.

3.1.5 Base Commanding Officer (CO)

a) Responsible to this UASJBPM SOP's IAW updated Air Law and Regulation;
b) Responsible to appoint UASJBPM including UAS Operator and UAS crew;
c) Responsible to UASJBPM task order and related clearance;
d) Responsible directly to UASJBPM crew Personnel;
e) Responsible to crew for following current SOP, law and regulation;
f) Responsible to crew competency and training;
g) Responsible to equipment competency;
h) Responsible directly to UASJBPM personnel welfare;
i) Responsible for delegated power.

3.1.6 UASJBPM Commander

a) Responsible for updating SOP, current air law and regulation;
b) Responsible to appoint drone personnel for operations;
c) Responsible to execute Task Order and clearance;
d) Responsible for advising DG, DDG Ops, Air DD, DAir DD and CO for the technical issue, equipment, operation tactical, Air Law, rules and regulation.
e) Responsible directly to UAS personnel;
f) Responsible to crew for following current SOP, Air law and regulation;
g) Responsible to the crew competency and training;
h) Responsible to the equipment competency;
i) Responsible to delegated power UASJBPM personnel.

3.1.7 JBPM State Director & JBPM Deputy State Director

a) Accountable to state application;
b) Accountable to the UASJBPM operation team.

3.1.8 JBPM Assistance State Director

a) Responsible to state application;
b) Responsible to UASJBPM operation team;
c) Responsible to UASJBPM operation location;
d) Responsible to local authority, application and notification.

3.1.9   UAS Operator
   a)   Responsible and execute to the personnel para 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6 instruction and orders;
   b)   Responsible and execute on operation orders;
   c)   Report to ADD

3.1.10 UAS Technical / Maintenance Personnel
   a)   Responsible to UASJBPM operation technical system
   b)   Responsible and execute to the personnel para 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6 instruction and orders;
   c)   Responsible and execute on operation orders;
   d)   Report to ADD

3.2   UASJBPM Personnel Qualification Criteria

3.2.1   Qualification Criteria for Operators
   a)   Possess excellent body coordination
   b)   Possess good orientation skill
   c)   Possess high self-discipline
   d)   Possess good self-motivation
   e)   Possess good health and fitness level which will be fit to attend any kind of fire & rescue operation
   f)   Passionate in latest gadget technology
   g)   Proficient with computer skills
   h)   Able to work in stressful condition
   i)   Possess high sense of urgency
   j)   Has been confirmed in service by JPA
   k)   Able to work well in a team environment
   l)   Capable of understanding new information and/or knowledge in rapid pace

3.3   Organization Chart

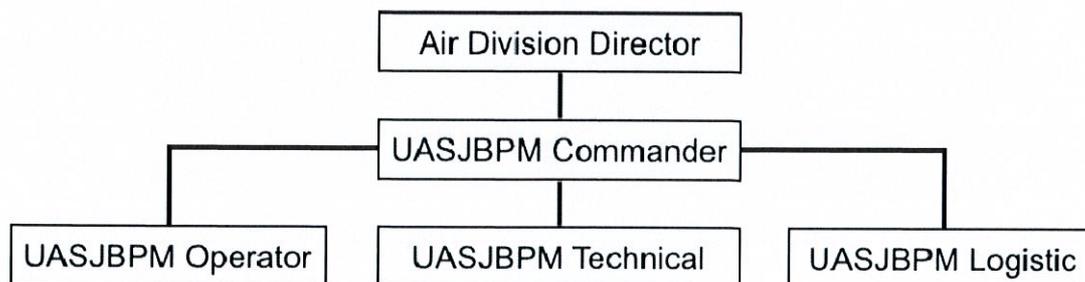3.3.1   UASJBPM organization chart as Figure 1

Figure 1

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4.   UAS Equipment

4.1   UAS Size Category
(this category is based on JBPM categorization)

4.1.1   MTOM less than 5 kg is categorize as small size drone

4.1.2   MTOM in between 5 kg up to 14 kg is categorize as medium size drone

4.1.3   MTOM in between 14 kg up to 20kg is categorize as large size drone

4.2   Operating Model
UAS Models that are currently in use by JBPM are as follows:

4.2.1   DJI Mavic Pro,

4.2.2   DJI Mavic 2 Ent. Dual,

4.2.3   DJI Inspire 1 Pro,

4.2.4   DJI Matrice 210 RTK,

4.2.5   DJI Matrice 600

4.2.6   Operating Camera Model

4.2.7   DJI Zenmuse X5 (Not in use - Unserviceable)

4.2.8   DJI Zenmuse XT2

4.2.9   DJI Zenmuse Z30

4.2.10   DJI Mavic 2 Ent. Dual Camera (Thermal and HD)

4.3   Storage Procedure

4.3.1   Storage during out of operation base - Short term storage

4.3.2   If drones need to be transported or moved out of the operation base, all sensitive equipment shall be kept in a hard case and protected.

4.3.3   Other supporting equipment shall be kept in a soft case and protected.

4.3.4   Storage of devices inside a vehicle (long term parking) that is exposed to direct sunlight or extreme temperature (more than 40°C) is strictly prohibited

4.3.5   Storage during in operation base - Long term storage

    a)   All drones and equipment shall be kept in open shelf and in a controlled temperature room;

    b)   All drones and equipment shall be cleaned from dirt and any debris prior to storage;

    c)   Drone Batteries shall be kept at maximum remaining power of 20% - 30% (Follow battery discharge procedure provided by OEM)

d)   Fully charged (100%) and fully discharged (0%) drone batteries are prohibited for storage;

e)   All drones and equipment shall be kept in a safe and secure room

4.4   Maintenance

4.4.1   Drone maintenance shall follow maintenance manual from OEM;

4.4.2   All electronic equipment shall keep clean before and after usage;

4.4.3   Proper chemical shall be apply upon advice from OEM;

4.4.4   Only original spare part from OEM is allowed to be used

4.4.5   Tools use shall be in a good condition, damage tool is prohibited to use on UAS

4.5   Data Storage

4.5.1   Operation data shall be stored in controlled storage condition

4.5.2   Forensics or investigation data shall be completely transfer to Investigation officer or person in charge (PIC) of the event in controlled condition

4.5.3   RAW data shall be provided to on scene commander as per request

4.5.4   RAW data shall be kept up to two (2) years before it deleted

4.5.5   RAW data shall be provided to *Unit Sumber* JBPM as per request

4.6   Cleaning

4.6.1   Pre Operation cleaning procedure

- refer pre operation procedure -

4.6.2   Post Operation cleaning procedure

- refer post operation procedure –

4.7   Battery care

4.7.1   Pre Operation shall kept battery at minimum of 80% on each battery or advise by OEM;

4.7.2   For continuous operation, battery shall be recharged up to 100% if necessary

4.7.3   For Post Operation or storage, drone batteries shall be drained up to 20%-30% or follow OEM advice.

4.7.4   For transportation, drone battery shall be kept for less than 30%, and shall avoid hard impact;

4.7.5   Drone Batteries shall be stored in controlled temperature which is less than 40°C or advice by OEM

4.7.6   Drone battery cycle is count maximum when the usage reach 200cycle or advise by OEM or depend on battery condition

4.7.7   Battery logbook, monitored & updated.

4.8   RTK Mobile Station

4.8.1   Pre Operation shall kept battery at minimum of 80% on each battery or advise by OEM;

4.8.2   For continuous operation, battery shall be recharged up to 100% if necessary

4.8.3   For Post Operation or storage, drone batteries shall be drained up to 20%-30% or follow OEM advice.

4.8.4   For transportation, drone battery shall be kept for less than 30%, and shall avoid hard impact;

4.8.5   Drone Batteries shall be stored in controlled temperature which is less than 40°C or advice by OEM

4.8.6   Drone battery cycle is count maximum when the usage reach 200cycle or advise by OEM or depend on battery condition

4.8.7   Battery logbook, monitored & updated.

4.9 Limitation

4.9.1   Shall be followed with latest instruction or order from local authorities;

4.9.2   Shall refer to latest OEM manual

4.9.3   If found damage or unusual condition, user shall raise report and submit for replacement and repair upon budget approval;

4.9.4   Lifespan of drones shall refer to OEM manual

5. UAS Operation

5.1 Legal force

5.1.1 Akta Perkhidmatan Bomba 1988 (Akta 341)

5.1.2 Arahan Majlis Keselamatan Negara Bil. 20

5.2 Type Of Operation

The UASJBPM shall be operated in compliance with the procedures specified in;

5.2.1 Structural Fire,

5.2.2 Forest Fire,

5.2.3 Land, Air and Water Search And Rescue (SAR),

5.2.4 Hazmat,

5.2.5 Natural Disaster,

5.2.6 Urban Disaster,

5.2.7 Industrial Disaster,

5.2.8 Aerial surveillance and monitoring,

5.2.9 Road Traffic Accident (RTA),

5.2.10 Official Event,

5.2.11 Supporting other departments and agencies.

5.3 Operation Coverage Area

5.3.1 Peninsular Malaysia , Sabah & Sarawak.

5.3.2 Depend on CAAM, Local Authorities Permission & Clearance

5.3.3 No Activation on NFZ area unless obtain clearance from CAAM / Local Authorities

5.3.4 Within VLOS, EVLOS and BVLOS

5.3.5 Within Active operation area (Permitted)

5.3.6 Limited to national border

5.3.7 Restricted & Prohibited area will carry out upon approval

5.3.8 International tasking will carry out upon special permission & clearance on specific state

5.4 Command Centre and Operation Centre

5.4.1 Command centre for UASJBPM will be conducted from Bahagian Udara JBPM, HQ Putrajaya

5.4.2 Operation centre for UASJBPM will be at:

a) Pangkalan Udara Subang JBPM, Selangor

b) Pangkalan Udara Bertam JBPM, Pulau Pinang

c) Pangkalan Operasi Udara Miri JBPM

5.5 UAS Operator & Crew

5.5.1 UASJBPM crew and pilot are selected among JBPM regular staff and will be trained for the authorisation.

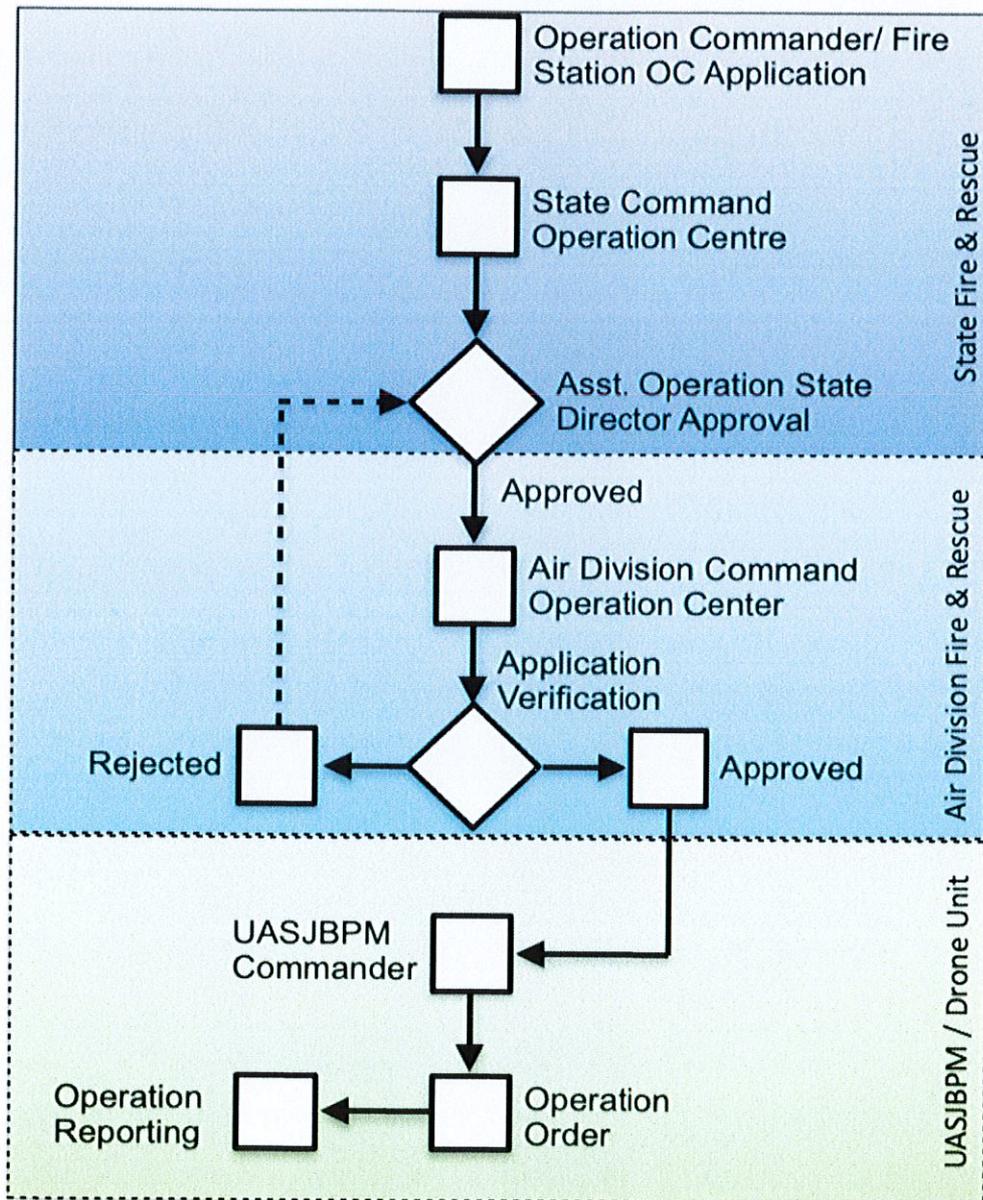5.5.2 Norm output for UASJBPM is included (varies on type of operation) ;

a) UAS Operation Commander / Pilot 1

b) Pilot 2

c) Technical Crew

d) Spotter / Logistic

5.6 Operation Management System (OMS)

Operation management system been created to ensure UAS Task will be carried out in proper manner and accordingly. This management system is a guidance to deploy UASJBPM Personnel to carry out the operation.

5.6.1 Flowchart for application UASJBP

Flow Chart
UASJBPM Operation Application

State Fire & Rescue

Operation Commander/ Fire Station OC Application

State Command Operation Centre

Asst. Operation State Director Approval

Approved

Air Division Fire & Rescue

Air Division Command Operation Center

Application Verification

Rejected

Approved

UASJBPM / Drone Unit

UASJBPM Commander

Operation Reporting
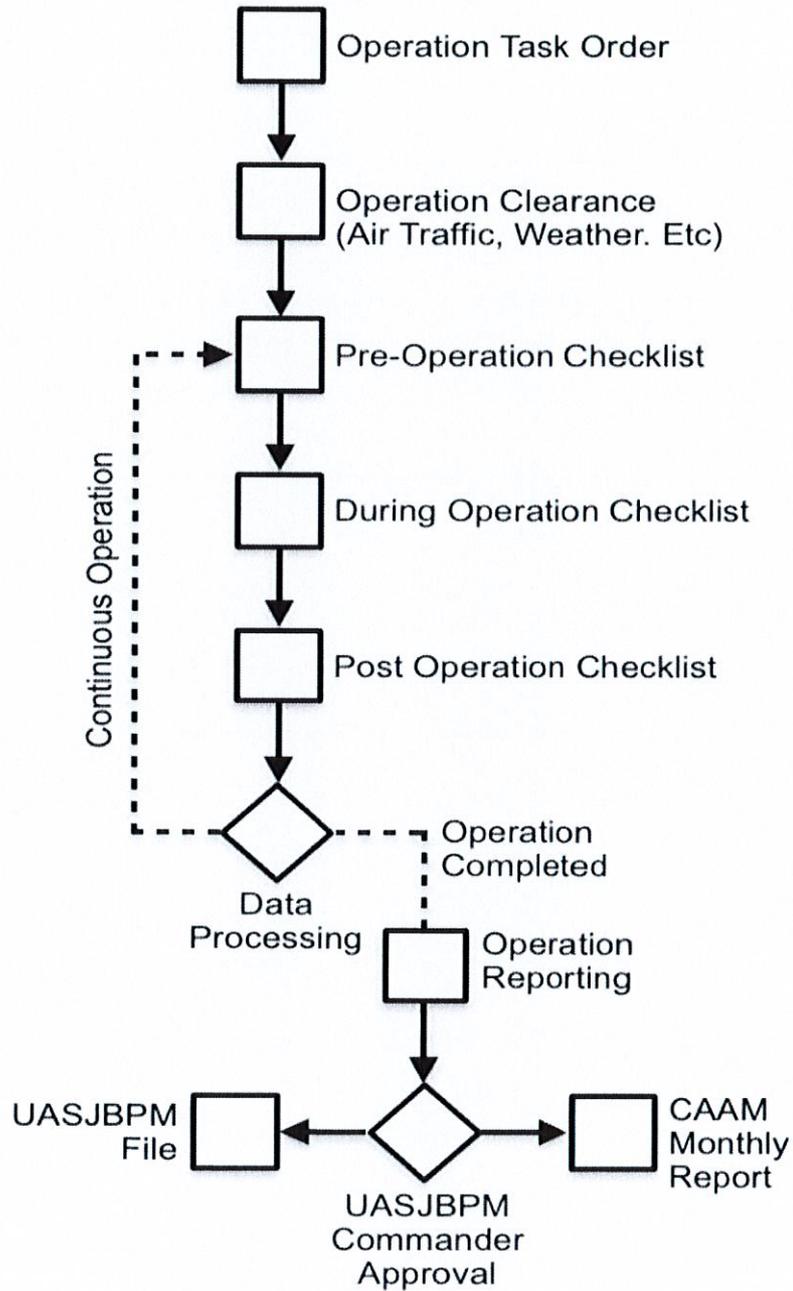
Operation Order

5.6.2   Deployment Application Form

Note: Refer Appendix A

5.6.3   Operation workflow procedure

5.6.4   Operational Checklist

a)   Operational Checklist is formulated to provide an efficient sequence of carrying out checks without dispensing any item.

b)   The checklist procedures are to be used whenever and in preparation until shutdown. The challenge and response procedure will be used whenever applicable.

5.6.5   Ground / Air Checks drills

a)   Preparing the Aircraft

Note: -Refer Checklist on Appendix B-

1	Open case	------------	Check condition / item
2	Gimbal cover	------------	Remove and store
3	Arm	------------	Unfold / match and lock
4	Propeller	------------	Check condition
5	Motor	------------	Check condition / maker
6	Propeller / motor maker	------------	Match, secure and lock
7	Landing gear	------------	Match, secure and lock
8	Antena	------------	Check condition and secure
9	Remote	------------	Check condition and unstowed antena
10	Battery	------------	Check battery level, installed, and secure
11	Gimbal / camera	------------	Match, installed,secure and lock
12	Memori card	------------	Installed and secure
13	Monitor	------------	Check condition and power level
14	RTK	------------	Check condition, assemble and power level

b)   Preflight Check

Note: Refer Checklist on Appendix C

1	Aircraft	------------	Check condition
2	Arm lock	------------	Match, secure and lock
3	Propeller lock	------------	Match, secure and lock
4	Landing gear lock	------------	Match, secure and lock
5	Motor	------------	Free rotation
6	Gimbal / Camera	------------	Match, secure and lock
7	Battery	------------	Secure, lock and check power level
8	Remote	------------	Free control movement and power check
9	RTK (related model)	------------	Installed and secure
10	Monitor	------------	Check battery level, installed, and secure
11	Memori card	------------	Match, installed,secure and lock
12	Lanyard / remote harness	------------	Fitted and secure (if necessary)

c)   Start-up and Take off

Note: Refer Checklist on Appendix D

#	Item		Action
1	RTK (related model)	------------	Power on, GPS Signal, Mode binding,
2	Remote and monitor	------------	Power on, Check power, Mode setting, RTH setting, Distance/height setting, Memory storage setting.
3	Aircraft	------------	Power on (with call out "POWER ON")
4	Binding	------------	Check all binding good
5	GPS signal	------------	More than 9 GPS detection, GPS calibration (If required)
6	Remote	------------	Match with pilot configuration setting. Recommended mode 2 for remote setting
7	Area surrounding	------------	Keep clear area (With callout "CLEAR)
8	Remote to start-up	------------	Aircraft start-up (With callout "START UP")
9	Motor and propeller	------------	Normal and free movement
10	Aircraft Light	------------	Steady green
11	Gimbal / Camera	------------	Steady and stabilised
12	Remote power up	------------	Aircraft take-off (with callout "TAKE-OFF)
13	Aircraft in hover	------------	Normal movement with control, Normal light, Normal sound,

d)   During Flight

Note: Refer Appendix E

1	GPS, Frequency, Telemetry	------------	Power on, GPS Signal, Mode binding,
2	Remote and monitor	------------	Power on, Check power, Mode setting, RTH setting, Distance/height setting, Memory storage setting.
3	Aircraft	------------	Power on (with call out "POWER ON")
4	Binding	------------	Check all binding good
5	GPS signal	------------	More than 9 GPS detection, GPS calibration (If required)
6	Remote	------------	Match with pilot configuration setting. Recommended mode 2 for remote setting
7	Area surrounding	------------	Keep clear area (With callout "CLEAR)
8	Remote to start-up	------------	Aircraft start-up (With callout "START UP")
9	Motor and propeller	------------	Normal and free movement
10	Aircraft Light	------------	Steady green
11	Gimbal / Camera	------------	Steady and stabilised
12	Remote power up	------------	Aircraft take-off (with callout "TAKE-OFF)
13	Aircraft in hover	------------	Normal movement with control, Normal light, Normal sound,
14	Recording / still image	------------	Confirm start record (beeb sound), Check record timeline running, Confirm stop record (beeb sound),

| 15 | Power | | Aircraft / remote / monitor - check and confirm sufficient RTH |

e) Landing and Shut-down

Notes : Refer Appendix F

1	Recording / still image	------------	Confirm stop record and safe, Check record timeline stop running
2	Power	------------	Aircraft / remote / monitor - check and confirm sufficient safe landing
3	Area	------------	Clear area Clear danger Clear obstacle
4	Landing gear (Related model)	------------	Down and lock
5	Landing area (ground)	------------	Heli pad, Flat surface, Clear FOD Steady hover (With callout "LANDING")
6	Landing area (hand) *Only for critical situation and competence pilot	------------	Steady hover (With callout "LANDING") Blind spot sensor approach, Hold firmly aircraft until fully shut down
7	Remote power stick	------------	Full throttle dwon power until shut down and propeller stop
8	Power	------------	Off power switch Aircraft / remote / RTK (With callout "POWER OFF")

f)   Post flight

Notes : Refer Appendix G

	Action		Response
1	Aircraft	------------	Check condition
2	Motor	------------	Visual check temperature (no smoke or abnormal condition), Free and smooth rotation.
3	Propeller	------------	Check condition
4	Landing gear (Related model)	------------	Check condition
5	Battery	------------	Visual check temperature (no smoke or abnormal condition), Dismantle
6	Memory card / internal memory	------------	Data transfer, Processing data
7	Memory card	------------	Replace / insert memory card

5.6.6   Cruise / Maneuver /   Approach check

Handling pilot will also carry out a check while in remoting (**PRADA** Check). **PRADA** check is to be carried out as follows :

a)   Power – Check power status.

b)   Radio – Check signal and GPS strength.

c)   Altitude – Check current altitude.

d)   Distance - Check current distance.

e)   Area - Check current heading, position and surroundings.

5.6.7   Remote controllers configuration

a)   mode 1 (left: forward/backward; turn left/right | right: up/down; sideways left/right)

b)   mode 2 (left: up/down; turn left/right | right: forward/backward; sideways left/right)

c)   mode 3 (left: forward/backward; sideways left/right | right: up/down; turn left/right)
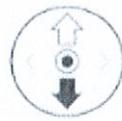
Mode 1

Left Stick

Forward
Backward
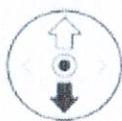Turn Left   Turn Right

Right Stick
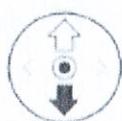
UP
Down
Left   Right

Mode 2

Left Stick

UP
Down
Turn Left   Turn Right

Right Stick

Forward
Backward
Left   Right

Mode 3

Left Stick

Forward
Backward
Left   Right

Right Stick

UP
Down
Turn Left   Turn Right

5.6.8   Cinematic and maneuver technique

The cinematic and maneuver control is the technique of operation used to achieve maximum effectiveness under the condition of tasking or operation requirement. Optimum result during flying is determined by a wise selection of following.

a)   Look up / Tilt reveal

This technique required aircraft on steady hover or level flight with camera setting focusing at bottom subject and background at same time tilt up gimbal / camera move up along the subject. The result of this technique will capture an image / video full of subject and background in order from bottom to top sequence.

b)   Tracking / dolly / Punch in

This technique required aircraft level flight forward or backward even on sideways flight with camera setting at subject and background at same, on steady camera gimbal focusing on the subject either moving or still. The result of this technique will capture an image / video that looks like we are looking at movement at the same time.

c)   Fly Through

This technique requires aircraft to fly between the subject and background, on steady camera gimbal focusing on the subject and just fly between gap or any clear space. This required pilot monitor the gap and any danger to the drone. The result of this technique will capture image / video came closer and we looked very clear.

d)   Pull pack / dronie / drone selfie

This technique requires camera setting focusing tight the subject at the same time maintaining the subject on the center screen. Start capture within steady hover then fly up and backward in line the subject. The result of this technique will capture an image / video full of subject and background in tight image to wide image without zooming lens. It depends on what scenario and we can even reverse this technique to get the effect.

e) Overhead / birds eyes / top-down

This technique is just a pointing camera straight down and it's useful for storytelling or getting creative with camera angles, patterns and lines or depending on requirement operations. Fly the aircraft in level flight forward or backward even on sideways flight. The result of this technique will capture image / video full of subject and background top image and it depends on what scenario and we can even reverse this technique to get the effect.

f) Jib / crane

This technique imitates the movement of a camera on jib or a crane. The jib or crane in cinematography is a boom or pole device for the camera on the end, allowing the camera to move up and down in smooth action. But this same action we use the movement and camera of the drone in slow and steady that give the perfect shot sequence the same here but up and down for showing the subject and background.

g) Orbit / Helix

This technique is the option to show all property, subject and surrounding on the operation. The technique required on control manually or it can be carried out by autonomous depending software to use. Maneuver of the drone circle pattern along the subject in sideway movement and at the same time maintain head/nose drone steady toward subject. Camera setting focusing on the subject and the result will capture 360∘ angle point.

h) Tripod

This technique imitates the movement of a camera on a tripod. The tripod in cinematography is a platform pole device for the camera to move in the smooth movement during capture. But in this same action we use the drone to hover, then to tilt or move a camera of the drone in slow movement that gives the perfect shot and it depends on the required shot.

5.6.9 Operation Reporting

Operation reporting shall be filled after completion of task given.

Note: Refer Appendix G

6.   Safety Management System (SMS)

6.1   Personal Protective Equipment PPE

During operation, operators shall use PPE as:

a)   Helmet

b)   Goggles

c)   UAV Vest

Note: Refer Appendix H

6.2   Equipment safety

Operators shall ensure the equipment safety before commencement of flight

Note: Refer Appendix I

6.3   Hazard identification.

6.3.1   The service provider shall develop and maintain a process to identify hazards associated with its aviation products or services.

6.3.2   Hazard identification shall be based on a combination of reactive and proactive methods.

Note: Refer to Appendix J for guidance for hazard identification.

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7. Appendices

UNMANNED AIRCRAFT SYSTEM (UAS)
FIRE & RESCUE DEPARTMENT MALAYSIA (FRDM)
APPLICATION FORM

Form No.	FRDM/UAS/APPFORM/(XX)
Fire & Rescue Station	
State	
Rank & Name of Applicant	
Contact No.	

Date (DD/MM/YYYY)		Time	

INFORMATION

Type of Task	Operation		Event		Special Task	
Weather Information	Sunny		Windy		Heavy Rain	
	Foggy/Hazy		Cloudy		Thunderstorm	
Summary						

VERIFICATION

APPLICANT	STATE DIRECTOR / DEPUTY STATE DIRECTOR / OPERATION ASSISTANT DIRECTOR
.... Name : Post : Date : Contact No. :	.... Name : Post : Date :

APPROVAL

Application as mentioned above is (**APPROVE / REJECT**)

DRONE COMMANDER	AIR DIVISION DIRECTOR
.... Name : Post : Date :	.... Name : Post : Date :

APPENDIX B: CHECKLIST FOR AIRCRAFT PREPARATION

No.	Action		Response	Check
1	Open case	-------	Check condition / item	
2	Gimbal cover	-------	Remove and store	
3	Arm	-------	Unfold / match and lock	
4	Propeller	-------	Check condition	
5	Motor	-------	Check condition / maker	
6	Propeller / motor maker	-------	Match, secure and lock	
7	Landing gear	-------	Match, secure and lock	
8	Antena	-------	Check condition and secure	
9	Remote	-------	Check condition and unstowed antena	
10	Battery	-------	Check battery level, installed, and secure	
11	Gimbal / camera	-------	Match, installed, secure and lock	
12	Memori card	-------	Installed and secure	
13	Monitor	-------	Check condition and power level	
14	RTK	-------	Check condition, assemble and power level	

APPENDIX C: PRE-FLIGHT CHECKLIST

No.	Action		Response	Check
1	Aircraft	-------	Check condition	
2	Arm lock	-------	Match, secure and lock	
3	Propeller lock	-------	Match, secure and lock	
4	Landing gear lock	-------	Match, secure and lock	
5	Motor	-------	Free rotation	
6	Gimbal / Camera	-------	Match, secure and lock	
7	Battery	-------	Secure, lock and check power level	
8	Remote	-------	Free control movement and power check	
9	RTK (related model)	-------	Installed and secure	
10	Monitor	-------	Check battery level, installed, and secure	
11	Memori card	-------	Match, installed, secure and lock	
12	Lanyard / remote harness	-------	Fitted and secure (if necessary)	

APPENDIX D: STARTUP / TAKE OFF CHECKLIST

No.	Action		Response	Check
1	RTK (related model)	-------	Power on / GPS Signal / Mode binding	
2	Remote and monitor	-------	Power on / Check power, Mode setting / RTH setting, Distance/height setting, Memory storage setting.	
3	Aircraft	-------	Power on (with call out "POWER ON")	
4	Binding	-------	Check all binding good	
5	GPS signal	-------	More than 9 GPS detection, GPS calibration (If required)	
6	Remote	-------	Match with pilot configuration setting. Recommended mode 2 for remote setting	
7	Area surrounding	-------	Keep clear area (With callout "CLEAR")	
8	Remote to start-up	-------	Aircraft start-up (With callout "START UP")	
9	Motor and propeller	-------	Normal and free movement	
10	Aircraft Light	-------	Steady green	
11	Gimbal / Camera	-------	Steady and stabilised	
12	Remote power up	-------	Aircraft take-off (with callout "TAKE-OFF)	
13	Aircraft in hover	-------	Normal movement with control, Normal light, Normal sound,	

APPENDIX E: DURING FLIGHT CHECKLIST

No.	Action		Response	Check
1	Recording / still image	--------	Confirm stop record and safe, Check record timeline stop running	
2	Power	--------	Aircraft / remote / monitor – check and confirm sufficient safe landing	
3	Area	--------	Clear area Clear danger Clear obstacle	
4	Landing gear (Related model)	--------	Down and lock	
5	Landing area (ground)	--------	Heli pad, Flat surface, Clear FOD Steady hover (With callout "LANDING")	
6	Landing area (hand) *Only for critical situation and competence pilot	--------	Steady hover (With callout "LANDING") Blind spot sensor approach, Hold firmly aircraft until fully shut down	
7	Remote power stick	--------	Full throttle dwon power until shut down and propeller stop	
8	Power	--------	Off power switch Aircraft / remote / RTK (With callout "POWER OFF")	

APPENDIX F: LANDING & SHUTDOWN CHECKLIST

No.	Action		Response	Check
1	Recording / still image	---------	Confirm stop record and safe, Check record timeline stop running	
2	Power	---------	Aircraft / remote / monitor - check and confirm sufficient safe landing	
3	Area	---------	Clear area Clear danger Clear obstacle	
4	Landing gear (Related model)	---------	Down and lock	
5	Landing area (ground)	---------	Heli pad, Flat surface, Clear FOD Steady hover (With callout "LANDING")	
6	Landing area (hand) *Only for critical situation and competence pilot	---------	Steady hover (With callout "LANDING") Blind spot sensor approach, Hold firmly aircraft until fully shut down	
7	Remote power stick	---------	Full throttle dwon power until shut down and propeller stop	
8	Power	---------	Off power switch Aircraft / remote / RTK (With callout "POWER OFF")	

APPENDIX G: POST FLIGHT CHECKLIST

No.	Action		Response	Check
1	Aircraft	--------	Check condition	
2	Motor	--------	Visual check temperature (no smoke or abnormal condition), Free and smooth rotation.	
3	Propeller	--------	Check condition	
4	Landing gear (Related model)	--------	Check condition	
5	Battery	--------	Visual check temperature (no smoke or abnormal condition), Dismantle	
6	Memory card / internal memory	--------	Data transfer, Processing data	
7	Memory card	--------	Replace / insert memory card	

UNMANNED AIRCRAFT SYSTEM (UAS)
FIRE & RESCUE DEPARTMENT MALAYSIA (FRDM)
OPERATION REPORT

Report No.	FRDM/UAS/OPS/000
Date	
Location	
Operation	
Fire Station Response	
Area Covered (m²)	

Crew Response

Drone Operation Commander	
Drone Pilot 1	
Drone Pilot 2	
Technical Crew	
Technical Crew	

Drone & Accesories

DJI Mavic Pro	DJI Inspire	
DJI Mavic Ent. Dual (M2E-01)	DJI Mavic Ent. Dual (M2E-01)	
DJI Matrice 210 RTK	DJI Matrice 600	
DJI Zenmuse X5	DJI Zenmuse XT2	
DJI Zenmuse Z30	DJI RTK	
Generator Set	Television + Tripod	
Laptop	Wifi Modem.	
Others equipment ;- Please specify		

Case Information

Task Order Date & Time	
UASJBPM Unit Arrival Time	
Operation Commander	
Operation Type	
Area Size	

Summary
- 45 -

Conclusion & Improvement Suggestion

Data & Information Sharing
This report will be sharing to following details ;

Verification	
Prepare by :	Verify by :
....	....
Name :	Name :
Post :	Post :
Date :	Date :

APPENDIX I: PPE & EQUIPMENT CHECKLIST

No.	Item	Item	Check	Explanation
1.	Safety Gear	Protection Helmet		To protect the head from injuries.
		Goggles		To protect eyes from injuries.
		UAV Vest		People with acknowledge drones are operated within area.
		Cone for landing area		To secure the landing perimeter.
		Landing Pad		To protect from excessive dust and flying sands.
		Briefing to crew		Everyone will get the same information.
		Pilot and spotter		To make sure the drone is in correct path and attitude.

2.	Compass calibration	Calibrate compass (New area)		Always calibrate compass in new area
		No metal		Compass will have problem if there is magnetic interference.
		Take off from hand		Make sure not to handle bottom of the sensors.
3.	Calibration	Turn on and leave UAV for few minutes		To make sure drone is calibrated with surrounding
		To let the drone on a hot road will cause abnormalities to the drone sensor.		Don't take too long for the drone in the sun.
4.	Checklist	Always go through checklist and improvise.		It will get better time to time.
5.	Battery	Battery is stored in cool and dry casing		Hot and dry will cause the battery to bloat faster.
6.	Go or No Go	On Pilot decision		Wind speed and surrounding.
7.	Fly Higher for better GPS reception	GPS needs better reception		Buildings and aluminum blockage.

APPENDIX J: RISK ASSESSMENT

No.	Item	Action	Explanation
1	Small particles (dust, sand) might get into the brushless motor if we land in an unclean surface.	Observe and take out any of these particles using vacuum.	These particles might get into the brushless motor and create unwanted frictions which will reduce motor performance. And which will destroy brushless motor. Don't use air gun or blower which will translate the particles to other locations.
2	Wipe and clean out water particles especially sea water	Use heater or tissue to clean these particles.	Water particles is a good conductivity that will might short circuit your electronics. Sea water particles are also a high corrosion element. After work with sea conditions, do proper action to your UAV. Water is not drone best friends.
3	Never use WD40 to your UAV	WD40 is a water based solution.	This will promote corrosion to your drone. Use Acetone instead of WD40 to clean or wipe out dirt, marking, old adhesive glue that might be stick on your drone.
4	Checking motor performance	Use tachometer to check each of motor rotation speed.	Motor rotation is very important so that it will create similar speed rotation and create uniform lift.
5	Drone submerge into water.	Quickly turn off battery and take out excessive water. Wipe clean and keep dry. Put your drone in a basket of rice.	Rice will absorb moisture around the drone especially inside the flight controller.
6	Send your drone that beyond your repair capabilities to service center.	Always make sure to replace with original parts and not third party parts.	Original parts will have its warranty especially if replaced by service center. Some parts can be replaced by our own. But some firmware need to be replace by experience technician.parts that involve
7	Always make sure your UAV is label and stick with detail information.	Name, Contact number, email, drone number and etc.	Easier if found by someone else.

#			
8	Carbon arm will wear out time to time.	Vibration that exist during flying will create failure to any parts including carbon.	Make sure that you observe the carbon time to time. Once crack exist in any carbon, this will induce wider crack and tends to fail. Make own observation and notes to predict.
9	Use high quality tool to maintain your UAV.	Bolts, nuts, screws of these kind of UAV are hard to find if its broken.	Proper use of tools will reduce this parts failure.
10	Compile pictures of your UAV on every angle and every parts	Might be you are the only one own this type of machine.	To compare if the drone is in still original condition if any actions that need to be made to the drone.
11	Regularly check for software updates	Software updates will take sometimes that might take your important time. Some updates will prevent you to fly before updates.	Software updates needs internet connection and might take some times. Create a timetable that can plan your software updates.
12	Any additional payload must be well secured and tested.	Payloads that are not properly secured might tangle the propeller, unwanted payload drop and hanging to the drone unexpectedly.	Drone might suffer from stability lost and crash. Always do a test flight before conforming any action. Different load will have change the drone reactions.
13	Always check for wear and tear in every parts of the drones.	Especially when a drone face a fail take off, hard landing, drop from a low altitude and crash.	To reduce risk and break mid-flight.
14	Improvise maintenance and flight checklist.	Always improvise your checklist. This checklist will be complete from time to time.	Your UAV is your soul. Only you know how to handle it.
15	Dismantling a drone requires effort and discipline.	Always make sure you don't lose any of the small parts such as bolts, nuts and etc.	Every tiny parts are important to make sure drone can fly safely.
16	Never lose a tool in a drone	Make sure you have every maintenance tools in your storage.	An Ellen Key is a tiny and black tool that might be tangled in a carbon frame.
17	Always observe indicator lights on your drone.	To keep any reference documents in your hand to refer if the led blinks different color.	Led indicator will show different color. Such as green, yellow, red, or blinks. This is to make sure your drone is in 18good condition especially before any flight.

18	Never over torque nuts	Never over torque bolts and tighten it firmly.	Over torque nuts will produce failure to the bolts. This will break the bolt's head and leave the rest inside the hole. This will make your life hard.
19	Apply blue Loctite to bolts.	Apply Loctite to the bolt thread and leave it to dry to make sure that it is applied correctly.	Every bolts that are operated in vibrations will turn by itself and untighten the parts that it should.
20	Bolts marking	Use light marking that marks your bolt head and to the original surface that is tighten. This is to make sure your tightened bolts are not untighten by itself.	This marking will show to you as the bolt should be in its positioned.
21	Parachute system	Test the parachute system regularly.	Parachute system is important during UAV failure. This system might save your drone and people below them.
22	Memory card or internal storage will get full someday	Prepare for large storage such as hard drive, laptops. Prepare additional memory cards for backups.	Most of nowadays system capable of capturing high definition that will have big files (GB). Make sure the storage is clear before any operation.
23	Always replace dull and unclear label on the remote controller.	Print and stick newly label signs on the remote controller.	Excessive use of the remote controller will make labels and sign dull and unclear.
24	Flowchart	Prepare flowchart for any incident that might happen.	Bird strike is some incidents that might happen. What will you do if the motor broke off during flight?
25	Additional GPS Tracker.	Additional GPS tracker that use GSM is the best solution for now.	Sudden power failure of drone will make the drone lost contact with its remote controller and turn off its system. No position in maps that can be used to trace the drone.

Standard Operation Procedure (SOP)
Unmanned Aerial System (UAS)
Jabatan Bomba dan Penyelamat Malaysia (JBPM)

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UNIT DRON

JABATAN BOMBA DAN PENYELAMAT MALAYSIA

DATO' SRI MOHAMMAD HAMDAN BIN HJ WAHID
Ketua Pengarah
Jabatan Bomba Dan Penyelamat Malaysia

UNIT DRON

JABATAN BOMBA DAN PENYELAMAT MALAYSIA

IKON DRON MENYATAKAN PERALATAN UTAMA YANG DIGUNAKAN OLEH UNIT INI

IKON SHUTTER KAMERA BERWARNA MERAH DAN BIRU MEMBAWA MAKSUD PENUGASAN MENGGUNAKAN KAMERA BERESOLUSI TINGGI DARI UDARA

KAPAK ADALAH ALAT YANG SINONIM DENGAN BIDANG KEBOMBAAN

LAMBANG JBPM BERADA DI TENGAH-TENGAH MEMBAWA MAKSUD UNIT INI ADALAH KOMITMENT MEMBANTU DALAM MENGFOKUSKAN KEPADA OBJEKTIF PENGOPERASIAN JABATAN

LAMBANG SAYAP MEMBAWA MAKSUD UNIT INI ADALAH SALAH SATU CABANG PENERBANGAN DAN IA JUGA DI TUNJANGI OLEH BAHAGIAN UDARA JABATAN BOMBA DAN PENYELAMAT MALAYSIA

IMEJ API PADA LOGO MEMBAWA MAKSUD SEMANGAT BERPASUKAN UNIT INI DALAM MENJALANKAN PENGOPERASIAN SERTA SALAH SATU ELEMENT OPERASI YANG AKAN DI HADIRI OLEH UNIT INI

UNMANNED AIRCRAFT SYSTEM

MOTO

"VIEW FROM EAGLE EYES"

PANDAGAN DARI MATA HELANG BERMAKSUD SETIAP OPERASI YANG DIHADIRI AKAN DILAKUKAN DENGAN TELITI, KEMAS, CEKAP DAN BERKESAN