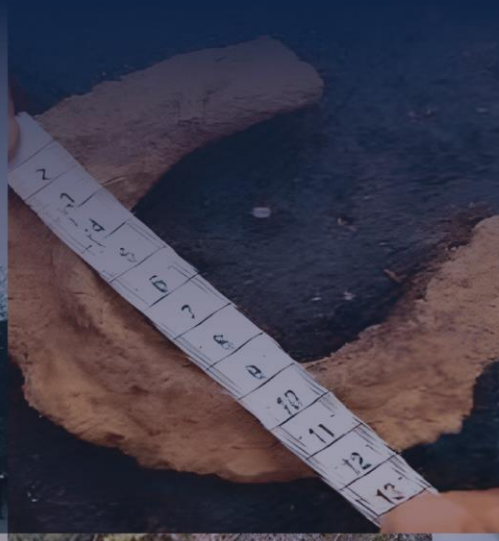
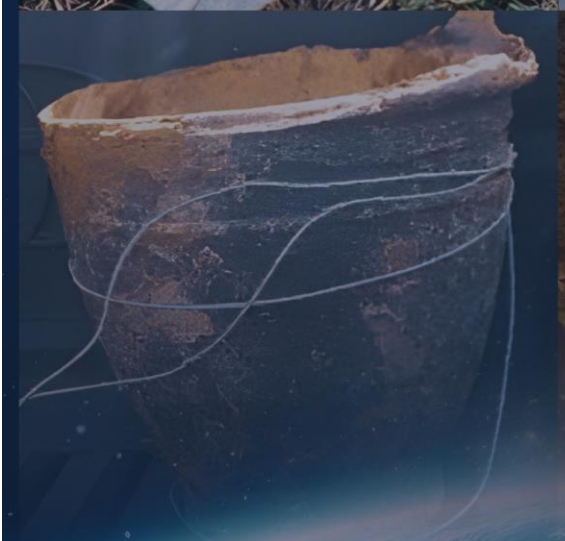
KEMENTERIAN SAINS,
TEKNOLOGI DAN INOVASI
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

GUIDELINES ON
NON-CATASTROPHIC SPACE ACCIDENT INVESTIGATION INVOLVING FALLEN SPACE OBJECTS IN MALAYSIA



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GUIDELINES ON NON-CATASTROPHIC SPACE ACCIDENT INVESTIGATION INVOLVING FALLEN SPACE OBJECTS IN MALAYSIA

SPACE REGULATORY DIVISION

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

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GUIDELINES ON NON-CATASTROPHIC SPACE ACCIDENT INVESTIGATION INVOLVING FALLEN SPACE OBJECTS IN MALAYSIA

INTRODUCTION

This guideline is designed to provide an overview of the process of investigating any non-catastrophic space accident involving fallen space objects in Malaysia.

This guideline should be read in conjunction with the latest *"Proses Kerja Siasatan Penemuan Objek Disyaki Objek Angkasa"*

The Space Regulatory Division (SRD) is responsible for conducting space accident investigations to prevent further accidents without apportioning blame or liability.

This guideline serves as supporting material for the SRD that conducts investigations under the Malaysian Space Board Act 2022 [*Act 834*]. Data collection was gathered from desktop studies, expert panel interview sessions and stakeholder engagement sessions through focus group discussions. This data collection contains examples of best practices to assist investigators in carrying out their duties.

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PART 1
PRELIMINARY

PART 1

PRELIMINARY

1.1 Interpretation

1.1.1 In this Guideline, unless the context requires otherwise—

"**the Act**" refers to the Malaysian Space Board Act 2022 [*Act 834*].

"**accident**" means any occurrence associated with a space object or launch facility which causes damage, including fall or collapse or collision or explosion, of a space object or launch facility;

"**authorised officer**" means any police officer not below the rank of inspector as provided in the Police Act 1967 [Act 344] and any public officer authorised under section 47 of the Malaysian Space Board Act 2022 [*Act 834*];

"**catastrophic**" means an event that disrupts societal activities and state affairs, involving loss of life, property damage, economic loss and destruction or impact on the surrounding nature and ecosystem. It exceeds the capacity of society to cope and requires extensive resource mobilisation measures;

"**damage**" means loss of life, any injury or impairment of health to any person, or loss of or damage to any property;

"**Duty Officer**" means a person assigned by the Space Regulatory Division to receive reports on a space accident;

"**investigation**" means a process conducted for the purpose of preventing an incident or accident in the future and not for the purpose of apportioning blame or liability;

"**investigator**" means an investigator appointed under section 44 of the Malaysian Space Board Act 2022 [*Act 834*];

"**space**" means a void extending from one hundred kilometres above mean sea level;

"**space object**" means spacecraft and launch vehicle, including the component parts of the spacecraft and launch vehicle;

"**On-scene commander**" means the official in charge of an accident/crash site;

"**SAR**" means search and rescue;

"**Space Regulator**" means the public officer appointed under section 14 of the Malaysian Space Board Act 2022 [*Act 834*];

"**territory**", for the purpose of this guideline, the territory of a State shall mean the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such State;

1.2 Application

1.2.1 This guideline shall apply to any non-catastrophic accident involving a space object that falls within Malaysia's territory.

1.2.2 This guideline is principally based on the provisions of Act 834 and other acts that need to be read together. Where necessary, further clarification or explanation shall be sought by reference to written laws relating to space-related activities, including those pertaining to civil aviation, communications and multimedia, and strategic trade.

1.3 Abbreviation

1.3.1 The abbreviations used in this guideline are as follows:

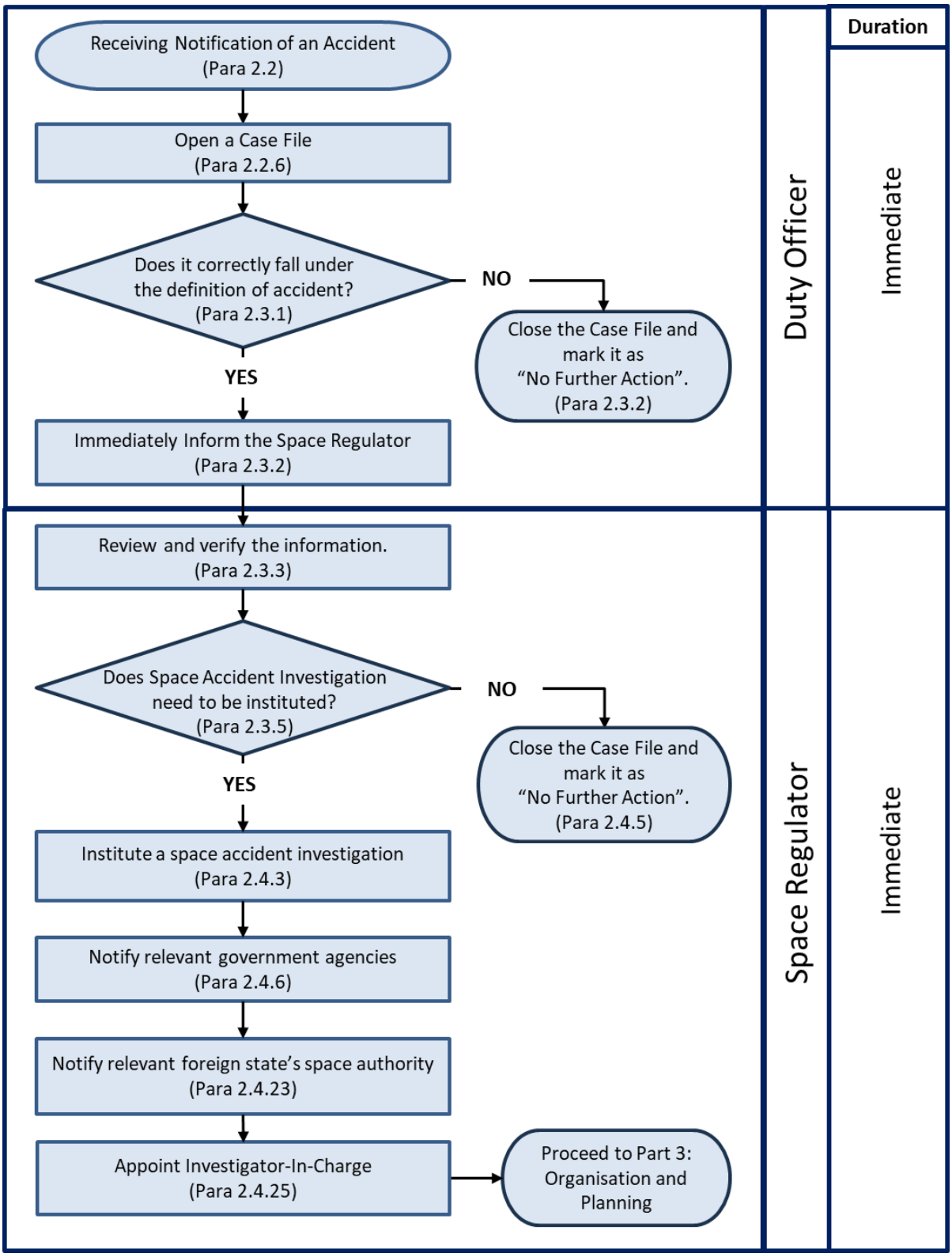
Abbreviation	Actual Term
APMM	: Malaysian Maritime Enforcement Agency
ATM	: Malaysian Armed Forces
ATOM Malaysia	: Department of Atomic Energy Malaysia
JAS	: Department of Environment
JBPM	: Fire and Rescue Department of Malaysia
JKKP	: Department of Occupational Safety and Health
JLM	: Malaysia Marine Department
KIMIA Malaysia	: Department of Chemistry Malaysia
KKM	: Malaysia Ministry of Health
MYSA	: Malaysian Space Agency
NADMA	: National Disaster Management Agency
PDRM	: Royal Malaysia Police
SRD	: Space Regulatory Division
UNOOSA	:United Nations Office for Outer Space Affairs

PART 2

INITIAL NOTIFICATION AND RESPONSE

PART 2

INITIAL NOTIFICATION AND RESPONSE



2.1 General

2.1.1 This part provides guidelines for the Space Regulatory Division (SRD) to manage the notification of an accident, including reviewing and verifying the information received and conducting an initial response, which should be carried out without delay.

2.2 Receiving Notification of an Accident

2.2.1 Any accident involving a space object shall immediately be reported to the SRD dedicated reporting line, available 24 hours a day, seven (7) days a week (24/7).

2.2.2 A Duty Officer from the SRD will be available 24/7 to receive and respond to any reported accident.

2.2.3 The Duty Officer shall record all reported accidents and shall inform the reporting person that his/her telephone conversation is being recorded.

2.2.4 The Duty Officer shall request the necessary information to fill out the Accident Notification Form for Fallen Space Object in Malaysia (refer to Appendix I).

2.2.5 Before the call is terminated, the Duty Officer shall request the reporting person to also file a report to the Royal Malaysia Police (PDRM) and the Fire and Rescue Department of Malaysia (JBPM) if it has not already been done.

2.2.6 Once the call ended, the Duty Officer shall open a Case File for the reported accident.

Note: The SRD must respond immediately to any accident notification and shall maintain a 24/7 response plan, readiness posture, and operational capability.

2.3 Reviewing and Verifying Information

2.3.1 The Duty Officer shall review the description of the accident to determine whether it falls within the definition of accident as stated in the Malaysian Space Board Act 2022 [*Act 834*].

2.3.2 If the reported accident falls within the definition of an accident, the Duty Officer shall immediately inform the Space Regulator for further action. If it does not, close the case file and mark it as “No Further Action”. The Duty Officer shall notify the Space Regulator at the earliest opportunity during working hours.

2.3.3 Upon being informed by the Duty Officer about the accident, the Space Regulator shall immediately review and verify the information in coordination with the Duty Officer.

2.3.4 As far as practicable, the following information shall be reviewed and verified:

A. Types of Space Objects.
B. Description of the accident.
C. Vehicles or structures damaged by space objects.
D. Location of the space object or space debris.
E. Physical characteristics of the accident area.
F. Number of casualties related to the accident, if any.
G. Presence and description of dangerous goods/substances (radioactive, flammable, explosive, biological or chemical).

2.3.5 The above information shall be used to determine whether a space accident investigation should be instituted, which government agencies need to be notified, and whether any foreign state’s space authority needs to be informed.

2.3.6 If certain information is unavailable, the Space Regulator shall employ any methods to obtain the missing details. Methods of verification may include confirmation with relevant government agencies, such as the PDRM, the JBPM or the Malaysian Space Agency (MYSA).

2.4 Responding to the Accident Notification

2.4.1 After all relevant information has been reviewed and verified, the Space Regulator shall immediately respond to the accident notification as appropriate.

2.4.2 Responding to the accident notification can be divided into four (4) main sections:

A. Institution of Space Accident Investigation.
B. Notification to the relevant government agencies.
C. Notification to the relevant foreign state's space authority.
D. Appointment of the Investigator-in-Charge.

Institution of Space Accident Investigation.

2.4.3 Based on the information reviewed, the Space Regulator shall determine whether a space accident investigation shall be instituted.

2.4.4 If a decision is made to institute a space accident investigation, the Space Regulator shall proceed with the remaining procedures outlined in this guideline.

2.4.5 If the Space Regulator decides not to institute a space accident investigation, the case file shall be closed with the status of "No Further Action".

Notification to the Relevant Government Agencies.

2.4.6 Relevant government agencies shall be notified of the accident, and also the decision whether to institute or not to institute a space accident investigation.

2.4.7 There are five (5) main objectives that need to be achieved through this notification process:

1. To ensure the security of the accident site.
2. To ensure the safety of the accident site.
3. To ensure the preservation of the evidence.
4. To coordinate with judicial and other investigations.

5. To facilitate support arrangements for the conduct of the investigation.

Objective No.1: To ensure the security of the accident site.

2.4.8 The first objective in notifying the relevant government agencies is to ensure the security of the accident site. Key reasons why this needs to be done as soon as possible are:

A. Ensure the safety of the emergency responders, investigators, and the public.

B. Protection of evidence from contamination and destruction.

2.4.9 In most cases, the PDRM shall be the primary agency responsible for securing the accident site. Other government agencies may assist in providing security, particularly in areas not typically under the jurisdiction of the PDRM.

Objective No.2: To ensure the safety of the accident site.

2.4.10 The second objective in notifying the relevant government agencies is to ensure the safety of the accident site, particularly for the emergency responders and the investigators. This action is generally carried out in conjunction with the site security efforts.

2.4.11 Depending on the location, an accident site may contain hazards such as structural instability, fire risks, live electrical components, dangerous wildlife or environmental contaminations. Normally, the primary government agency responsible for ensuring the safety of the accident site is the JBPM. Based on the specific location and types of hazards present, other government agencies may provide assistance to the JBPM in ensuring safety at the accident sites. The table below provides a general guideline on the agencies that may be involved in ensuring the safety of the accident site, depending on its location and associated hazards as per Table 1.

Table 2 Agencies involved, depending on the location and hazards.

Location or Hazards	Agencies involved
Urban and Suburban	JBPM
Rural	JBPM
Jungle	JBPM ATM
Mountain	JBPM ATM
Island	JBPM ATM APMM
Maritime	JBPM ATM APMM JLM
Lake	JBPM ATM
River	JBPM ATM
Radioactive hazards	JBPM ATOM Malaysia
Flammable or Explosive hazards	JBPM PDRM
Biological hazards	JBPM KKM
Chemical hazards	JBPM JAS KIMIA Malaysia JKKP

Objective No.3: To ensure the preservation of the evidence.

2.4.12 The third objective in notifying the relevant government agencies is to ensure the preservation of the evidence. Ideally, the space accident investigators should arrive at the accident site as soon as possible, preferably at the same time as the first responder. This enables the investigator to immediately document and collect vital evidence that may be contaminated or destroyed.

2.4.13 Pending the arrival of the investigator at the accident site, no person shall:

A. Modify the state of the accident site.
B. Take samples from the site.
C. Move or remove the space object, its wreckage or its contents.

unless with authorisation from the SRD.

2.4.14 This, however, should never interfere with the duties of emergency responders' tasks or the objective of ensuring the safety and security of the accident site. Therefore, a person may take actions mentioned in the paragraph above for the purpose of:

A. Assisting individuals with an injury.
B. Ensuring the safety of the accident site.
C. Removing obstruction to the public if necessary.

2.4.15 The PDRM and the JBPM will probably be the first government agencies to arrive at the accident site, followed by the Department of Atomic Energy Malaysia (ATOM Malaysia) to ensure it is free from radiation. Therefore, during notification to the PDRM or the JBPM, they may be enlisted to ensure that vital evidence is not lost through interference with the space object or other potential evidence. Their cooperation may also be facilitated through liaison at the headquarters level.

2.4.16 Where the accident site or evidence cannot be left undisturbed until investigators arrive, appropriate arrangements should be made to document the scene to later enable reconstruction of the circumstances of the accident. Damaged or failed components should be kept in a secure location until the appointed investigators have had the opportunity to examine them.

2.4.17 Some evidence may have a short life, for example, leaking fuel or data recordings, which can be overwritten. This type of evidence is often prioritised, and efforts must be made to isolate and collect it during the early stages of the investigation. As investigators may not always be able to arrive at the accident site within a few hours after the accident happened, cooperation with the on-

site agencies to document the evidence in detail, preferably through photographs or video recordings, is essential.

2.4.18 If there are witnesses to the accident, their names and addresses should be recorded and obtaining early statements from these witnesses could limit the risk that their accounts of the accident will become contaminated over time.

Objective No.4: To coordinate with judicial and other investigations.

2.4.19 The fourth objective in notifying the relevant government agencies is to ensure coordination with judicial and other investigations. In some accidents, there may be a requirement for multiple investigations. At a minimum, if there is a crime suspected, the PDRM will initiate their own judicial investigation.

2.4.20 If the space accident also involved aircraft or ships, the Air Accident Investigation Bureau or the Malaysia Marine Department will also initiate their respective investigation. Coordination between authorities shall be established as early as possible to ensure that investigations proceed in parallel without interference or obstruction.

Objective No.5: To support arrangements for the conduct of the investigation.

2.4.21 The last objective in notifying the relevant government agencies is to arrange for necessary support for the conduct of the investigation. The investigator may require support from multiple government agencies to throughout the investigation process.

2.4.22 The support may be in terms of:

A. Investigator Health and Safety.
B. Equipment.
C. Transport.

Note: Details of the support required can be found in Part 3: Organisation and Planning.

Notification to the Relevant Foreign State's Space Authority.

2.4.23 Due to the nature of the space industry, it is likely that there will be an international element to an investigation. In such cases, the SRD may be required to notify any other state concerned with the space accident through the Ministry of Foreign Affairs. States concerned in relation to a space accident include:

A. The state in or over which the space accident occurred.
B. The state from which the launch vehicle was launched.
C. The state in which the launch vehicle was designed.
D. The state in which the launch vehicle was manufactured.

2.4.24 The investigator may request assistance from other states as the investigation progresses. Such assistance may range from gathering evidence on behalf of the investigator to providing specialised technical expertise. Due to the sensitive nature of space operations, such cooperation may involve the sharing of confidential or proprietary information. Any information provided to the SRD as part of a safety investigation shall be used solely for the purpose of the safety investigation.

Appointment of the Investigator-In-Charge.

2.4.25 Once a decision has been made to institute a space accident investigation, the Space Regulator shall appoint an Investigator-In-Charge who shall be responsible for the day-to-day management of the investigation.

2.4.26 The Investigator-In-Charge should be an investigator who has an understanding of applicable national legislation and regulations; a sound understanding of the international standards, recommended practices, guidelines and protocols; and experience in the conduct of investigations into accidents involving space objects.

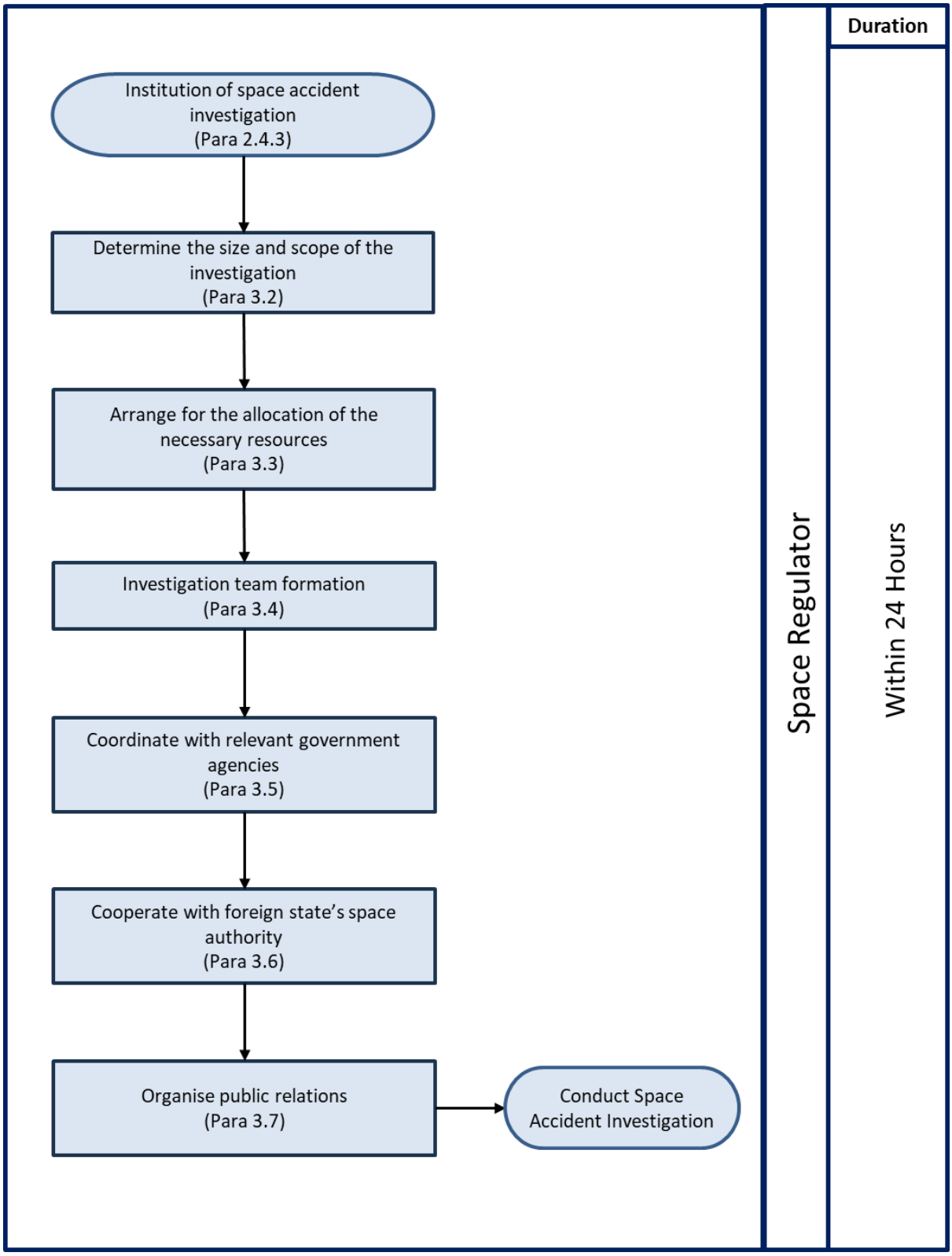
Note: The functions of the Investigator-In-Charge are outlined in the section on the Investigation Team Formation, para 3.4.

PART 3

ORGANISATION AND PLANNING

PART 3

ORGANISATION AND PLANNING



3.1 General

3.1.1 This part provides guidelines on how the SRD shall organise and plan the conduct of a space accident investigation. The process under this part should be carried out within 24 hours from the time the accident is notified.

3.2 Scope and Size of the Investigation

3.2.1 Based on the initial information provided in the accident report, along with any relevant data available, the Space Regulator shall determine the scope and size of the investigation. The scope and size of the investigation should be sufficient to eliminate ambiguity to the maximum extent possible and should enable robust logical assessments to be made of what led to the space accident. It is essential that the scope of the investigation and the magnitude of the tasks be assessed at an early stage to facilitate proper planning of the investigation team and ensure that the required technical expertise can be secured. The scope and size of the investigation should be based on the circumstances of the accident, and it may be influenced but not limited to, the following factors:

A. Nature of the accident.
B. Size and type of the space object.
C. The probability of recurrence and the severity of adverse consequences.
D. Actual and potential deviations from industry safety and operational regulations, standards, procedures and practices.
E. Identified potential safety issues underlying the accident.
F. Injuries, deaths and damage caused by the accident.
G. Presence and description of dangerous substance (radioactive, flammable, explosive, biological or chemical).
H. National or public interest.

3.3 Resource Allocation

3.3.1 The SRD shall allocate the necessary resources for the conduct of the investigations. The resources that are normally required for an investigation are:

A. Financial
B. Personnel
C. Investigator's Health and Safety
D. Equipment
E. Transport

3.3.2 The resources required shall be determined based on the scope and size of the investigation. Furthermore, throughout the investigation, the SRD should be able to acquire and allocate more resources if necessary.

3.3.3 The Investigator-In-Charge shall keep the SRD apprised of any major shift in the size and scope of the investigation and of any other situations that may result in a significant change to the resources required for the investigation.

Financial Allocation

3.3.4 The SRD should have access to sufficient funds for conducting accident investigations, as necessary. Where additional funding is required, the SRD shall take appropriate measures to secure the necessary funds.

Personnel

3.3.5 The SRD shall assign the necessary number of qualified investigators for the accident investigation.

3.3.6 Before a person is qualified as an investigator, he/she must undergo proper training in accident investigation techniques and procedures. Once qualified, the investigator shall be formally appointed by the Ministers in accordance with Act 834 and shall be issued with government credentials which specify the legislative and regulatory basis for their authorities and responsibilities.

3.3.7 The names of all qualified investigators will be entered into the SRD Pool of Investigators, where these investigators may be assigned on short notice to conduct space accident investigations. Such personnel should be relieved of their regular duties for the duration of the investigation or as required.

3.3.8 Where external expertise is required to assist with the investigation, such engagement shall be formalised through written contracts and/or Memorandum of Understanding (MoU). These agreements shall include provisions ensuring that seconded personnel are relieved of their regular duties for the duration of the investigation.

3.3.9 The independence and objectivity of seconded experts are essential. Measures must be taken to ensure that no actual or perceived conflicts of interest exist. Seconded investigators should be given proper credentials and should sign written agreements to comply with Malaysian laws, regulations, policies and procedures, and to demonstrate their independence and objectivity, and that there are no conflicts of interest during the period of the secondment.

3.3.10 The number of investigators appointed to conduct any investigation depends on the available resources, the size of the investigation, the need for speed, the impact of the investigation, the location of the accident, and the individual skills and strengths of the investigators. These considerations shall be addressed during the preparation of the investigation plan.

3.3.11 At one extreme, a large-scale safety investigation may require a multi-disciplined team of investigators, supported by technical and human factors specialists and administrative staff. A small-scale safety investigation will normally require a lower level of response, typically at least three (3) investigators in cases where an on-site investigation is justified, and witnesses are to be interviewed. Although far from ideal, one investigator may be all that is available to deploy to the scene of an accident. In such cases, it is especially important that there is no pressing time constraint, as it will take longer to

ensure the investigator has retrieved all the necessary evidence from the scene of the casualty.

3.3.12 If more than one (1) investigator is being deployed, it is important that one (1) investigator is appointed as the lead investigator. This enables a single point of contact for information during the investigation and a sense of ownership for that investigator. Proper planning and preparedness are essential in facilitating the prompt arrival of investigators at an accident site.

Investigator's Health and Safety

3.3.13 Health and safety are the responsibilities of everybody; however, the SRD has a specific responsibility to ensure the health and safety of its investigators. It is the policy of the SRD to provide all investigators with both initial and recurrent training on "Health and Safety Practices" when conducting space accident investigations."

3.3.14 Investigators must be fit and able to carry out their duties. During the course of the investigation, especially when conducting the on-site investigation, the investigators may need to go through various physical activities depending on the conditions of the investigation sites. This does not necessarily mean they must have medical or fitness certificates, but during the assignment of the investigators, the SRD may take the health level of the investigator as a factor.

3.3.15 There are also possibilities that investigators are exposed to psychological stress when conducting the investigation, especially if it involves the loss of human life. In this regard, psychological assessment and counselling support should be provided to the investigators.

3.3.16 To ensure the health and safety of the investigators, especially when conducting on-site investigations, the SRD are to provide the necessary:

A. Personal Protective Equipment (PPE) suitable for the type of hazard found at the accident site.
B. Inoculations and medicine, as necessary.
C. Insurance.

3.3.17 The SRD will not assume responsibility for other personnel that involved in space accident investigations. Those who are involved with space accident investigation, who are not investigators for the SRD, are required to make their own arrangements with regard to their health and safety. The SRD shall remind all participants to use extreme care and provide for their own needs on site. Any safety concerns should be promptly expressed to the Investigator-In-Charge.

Equipment

3.3.18 As part of its management plan, it is the policy of the SRD to properly equip its investigators. The SRD shall ensure that there is a periodic review of the technical investigation equipment to be used by the investigators at an accident site.

3.3.19 A field kit equipped with standard investigation equipment is in a state of readiness. Specialised equipment is stored at the office, or it may be purchased as needed. Regular maintenance of the equipment should be carried out by the SRD.

3.3.20 The nature of the accident site being visited will determine the equipment to be carried by the investigator. In case the investigators require specialised equipment, which may not be practical for the SRD to acquire, agreements or MoU can be made with other government agencies to loan the equipment to the investigators.

Transport

3.3.21 The SRD shall arrange for a standby vehicle to be used as road transport for its investigators. For other types of transportation, the SRD needs to manage the travel based on the needs of the investigations, including the need to have an agreement or an MoU with other government agencies for the provision of the necessary transportation for its investigators.

3.4 Investigation Team Formation

3.4.1 Normally, the Investigation Team structure consists of:

A. The Space Regulator.

B. Investigator-In-Charge.

C. Investigation Groups.

D. Support Coordinator.

Note: Appendix III contains a diagram of the recommended organisation structure for major accident investigation.

The Space Regulator

3.4.2 The Space Regulator is the person responsible for the overall conduct of the investigation.

Investigator-In-Charge

3.4.3 The function and responsibility of the Investigator-In-Charge is the day-to-day management of the investigations and updating the SRD as necessary.

Investigation Groups

3.4.4 The investigation groups consist of three (3) main groups, and each group will consist of specific units.

Note: The units may be combined or removed depending on the scope and size of the investigation.

A. Evidence Collection Group
   i. Site Survey Unit
   ii. Photo and Video Unit
   iii. Witness Unit
   iv. Space Data Unit

B. Technical Group
   i. Meteorology and Space Weather Unit
   ii. Operations and Human Factors Unit
   iii. Space Object Unit

iv. Ground Control System Unit
v. Maintenance Unit
vi. Space Surveillance System Unit
vii. Air and Space Traffic Services Unit

C. Specialised Group
i. Space Object Forensic Unit
ii. Medical Unit
iii. Survivability Unit

3.4.5 **The Site Survey Unit** is responsible for producing, in pictorial and graphic format, a description of the accident site, showing the location and distribution of the debris, human remains and other associated items, such as impact marks.

3.4.6 **The Photo and Video Unit** is responsible for ensuring that a systematic photographic record of the accident is created. This unit would also provide photo/video support to the other groups during the field phase and post-field phase, including the documentation of teardowns, examinations and testing of components, and the analysis of photo/video records.

3.4.7 **The Witness Unit** is responsible for contacting and interviewing all persons who may have witnessed the accident, survivors of the accident or who may have relevant knowledge relevant to the investigations.

3.4.8 **The Space Data Unit** is responsible for collecting, examining and analysing the recorded space data, such as telemetry data and system health data. The unit will normally require cooperation with the manufacturers, vendors or the operator, and therefore require coordination with the SRD. This unit will normally be working closely with other technical units, especially the Space Object unit, the Ground Control System unit, and the Space Surveillance System Unit.

3.4.9 **The Meteorology and Space Weather Unit** is responsible for the collection and compilation of meteorological data and space weather data pertinent to the accident. This unit is only formed when the atmospheric and space weather conditions are considered as an important factor in the accident. This unit would also be responsible for investigating the systems, sensors, equipment and processes used to generate and provide meteorological and space weather data.

3.4.10 **The Operations and Human Factors Unit** is responsible for collecting and analysing facts concerning the space flight and ground control operations. This unit also investigated human factors issues since it is normally related to operational issues. The operations under the purview of this group include, but are not limited to:

A. Pre-launch (Planning and Integration).
B. Countdown and Lift-offs.
C. Ascent phase.
D. Orbital Insertion (or Trajectory Adjustment).
E. Post-Launch & Operations.

3.4.11 **The Space Object Unit** is responsible for investigating the design, manufacturing and performance of the space object, which includes its system, structures and propulsion design. This unit will coordinate with other groups to gather the basic information and will determine if there is a need to conduct performance-related tests or simulator tests.

3.4.12 **The Ground Control System Unit** is responsible for investigating the performance of the ground control system.

3.4.13 **The Maintenance Unit** is responsible for reviewing the maintenance records to ascertain the maintenance history of the space object and its support system.

3.4.14 **The Space Surveillance System Unit** is responsible for investigating the performance of the space surveillance system in detecting and tracking artificial space objects.

3.4.15 **The Air and Space Traffic Services Unit** is responsible for the review of the air and space traffic records. This unit is only formed when air and space traffic services are involved in an accident. This unit should provide, when appropriate, a reconstruction of the history of the flight based on air and space traffic data. In addition, the Air and Space Traffic Service Unit should determine the operating status of all equipment used to manage the air and space traffic, such as radars, communication equipment, Radio Frequency (RF) Sensors, etc.

3.4.16 **The Space Object Forensic Unit** is only formed when the origin of the space object cannot be determined, or as required. The Space Object Forensic Unit is responsible for conducting forensic investigations to determine the origin of the space object or any other required information regarding the space object.

3.4.17 **The Medical Unit** is only formed when there is a requirement to conduct an in-depth examination of the medical or crash injury issues. The Medical Unit is responsible for gathering and analysing evidence associated with the pathological, space-medical and crash-injury aspects of the investigation, including the identification of the crew, their location at the time of the accident, and by reviewing their injuries, their position and their activity at the time of the impact. This unit will cover matters involving autopsies of crew and passengers, as appropriate, not only to identify the victims and to assist in legally determining the cause of death, but also to obtain all possible medical evidence which may be of assistance in the investigation. The unit will also investigate the design factors related to human engineering that may have contributed to the causes of the accident, and the survival aspects.

3.4.18 **The Survivability Unit** is only formed when there is a need to investigate the evacuation, the crash response, the firefighting, the survival and the rescue issues. The activities of this unit also include an examination of the respective equipment and of the manner in which it was used.

Support Coordinator

3.4.19 Support coordinators are usually individuals belonging to the SRD. The coordinators support the Investigator-In-Charge in all endeavours, act in direct support of the investigation process, and liaise with different groups, organisations and States.

3.4.20 For a large space accident investigation, the coordinator who could be involved may include:

A. Head of Office Coordinator.
B. Administration Coordinator.
C. Public Relations Coordinator.
D. Site Safety Coordinator.

Note: For smaller space accident investigations, the functions of each coordinator may be assumed by a single person or the investigator. Appendix IV contains a diagram of the recommended organisation structure for minor accident investigations.

3.4.21 The function of the **Head of Office Coordinator** is to assist the Investigator-In-Charge in coordinating both internal and external support for investigators in the field and in keeping the various agencies involved in the accident informed as to the progress of the investigation.

3.4.22 The function of the **Administration Coordinator** is to provide administrative support to the investigation team, including the establishment of a secure on-site office for the collection, retention and distribution of material collected during the onsite investigation.

3.4.23 The function of the **Public Relations Coordinator** is to provide expertise and advice to the SRD concerning the handling of the media and their requests, arranges media events, provides advice on community relations, assures that media requests and community queries are followed up, and promotes a positive public image for the accident investigation authority.

3.4.24 The function of the **Site Safety Coordinator** is to ensure that all the activities at the accident site are properly coordinated, with specific emphasis on site security and site safety. This role should include, but not necessarily be limited to, the following:

A. Review of any dangerous substance declared in relation to the space object.
B. Conducting an initial assessment of the circumstances of the accident site(s), the geography and condition of the site(s), and the hazards that exist, including biohazards.
C. Defining the boundary(ies) of the site(s) required for the investigation, and the hazardous zones within the site(s).
D. Assuming responsibility for the custody of the site(s).
E. Taking action to mitigate the risks within the site(s), to the degree possible.
F. Determining the safety equipment and safety procedures for investigators operating on the site.
G. Establishing and maintaining the safety of operations and of personnel at the accident site(s).

3.5 Coordination with Relevant Government Agencies

3.5.1 The circumstances of each accident are different, and this will affect which government agencies will be involved in the accident investigations.

3.5.2 To ensure proper coordination in the accident investigation, the SRD has a formal understanding with various government agencies. The formal understanding may also include assistance that may be provided to the SRD during the course of accident investigations by the government agencies.

3.5.3 An effective meeting or briefings after arriving at the accident scene can go a long way to avoid conflicts and unnecessary duplication of work. The meetings or briefings should seek to set out and explain, as appropriate:

A. The objective and status of the accident investigation.
B. The safety and security procedures at the accident site.
C. The intended extent of cooperation with other investigations.
D. The legal powers held by the investigator(s).
E. The intended procedure for witness interviews.
F. The intended procedures for dealing with witness and material evidence.
G. The intended arrangements for updating next-of-kin and other interested parties on the progress of the accident investigation.

3.5.4 When coordinating with other government agencies, the SRD should ensure effective coordination in terms of:

A. Site security.
B. Site safety.
C. Other investigations conducted.
D. Evidence controls and handling.
E. Investigation resource assistance.

<u>Site Security</u>

3.5.5 During the initial notification and response, the government agency responsible for site security should have already been notified and have established site security. Before the investigator arrived at the accident site, communication with the government agency in charge of the site security should be established, and the Person-In-Charge of the site security should be identified. A list of investigators who will be conducting the on-site investigation, as well as any other person accompanying the investigators, shall be given to the Person-In-Charge of the site security. It is recommended that the Person-In-Charge for the site security provide a briefing to the investigators on the security arrangements at the accident site when the investigators arrive at the accident site for the first time.

Site Safety

3.5.6 Similar to site security, during the initial notification and response, the government agency responsible for site safety should have already been notified and have established site safety. It is recommended that the Person-In-Charge of the site safety provide a safety briefing to the investigators when the investigators arrive at the accident site for the first time.

Other Investigations

3.5.7 In some accidents, there may be a requirement for multiple investigations. The PDRM may carry out their own investigation to determine whether there are criminal elements surrounding the cause of the accident. The Malaysian Air Accident Investigation Bureau and the Malaysia Marine Department may also conduct their investigation if the accident also involved an aircraft or a ship. The SRD will establish and maintain liaison and coordination with the other investigating authorities throughout the technical investigation. The aim is to ensure that investigations proceed in parallel without either body obstructing the other. To accomplish this, the SRD is required to engage with relevant authorities in advance of any spaceflight accident investigation to define how coordination will be achieved in practice. With the aim of avoiding conflicts and duplication of work, the appointed investigator(s) should endeavour to hold one or more briefings with interested parties as soon as possible after arriving at the accident site.

Evidence Controls and Handling

3.5.8 The investigator should carry out proper control and handling of the evidence. The investigator may need to coordinate and seek assistance from other government agencies for this purpose. In case multiple investigative authorities are involved in the accident investigation, it should be decided which authority has the primary responsibility for the control and handling of the evidence.

Investigation Resource Assistance

3.5.9 The SRD, depending on the investigation requirements, shall arrange for the necessary resources and seek assistance from other government agencies as necessary. Common resources that may be required are, but not limited to:

A. Investigator health and safety requirements, such as specialised PPE, medicine and inoculations.
B. Specialised investigation equipment.
C. Transport for the investigator.
D. Transport for the wreckage.
E. Evidence testing.

3.6 Cooperation with Foreign State's Space Authority

3.6.1 Due to the nature of the space industry, it is likely that there will be an international element to an investigation. It is therefore possible that cooperation with a foreign state's space authority is needed to conduct the investigation. Such cooperation may include assistance in acquiring information and evidence that would otherwise be unavailable to the SRD. The effectiveness of this cooperation is subject to bilateral arrangements, agreements of international understandings that have been sealed between Malaysia and the countries involved.

3.7 Public Relations

3.7.1 With the ease of communication and an explosion of social media platforms, it is very important for the SRD to have a responsive and efficient public relations policy and procedures. Any mistake or delay when dealing with public relations may undermine the investigations and the public's confidence in the investigations. When it comes to public relations, there are two parties that the Space Accident Investigations need to deal with:

A. Accident Victim's Next of Kin.
B. Media.

Accident Victims' Next of Kin.

3.7.2 The SRD should establish liaison with relevant family members, or their representatives, to facilitate the provision of briefings on the investigation findings and the progress of the investigation.

Media

3.7.3 Most major accidents generate a high degree of interest from both the public and the media, and a good rapport with the media is usually an asset to the investigation. Guidelines should be adopted regarding the release of information to the media about the accident or the progress of the investigation. To promote the dissemination of factual information and to minimise speculation and rumours about the accident, the media should be provided, on a regular basis, with all those facts which can be released without prejudice to the investigation. For this reason, the SRD should consider establishing a single point of contact for media inquiries.

3.7.4 Other organisations involved or affected by the accident, such as space object manufacturers, space launch facilities, space object operators, and emergency services, may also be required to release information to the media, and such efforts should be coordinated, to the extent possible, amongst the organisations and agencies involved.

3.7.5 A press bulletin should be brief and concise. It should recount only confirmed facts. A first press bulletin should be considered once there is sufficient information available on the occurrence and the situation. The purpose of the first bulletin is to announce that the SRD is aware of the situation and has launched an investigation. The following information, where relevant, could be considered for the first bulletin:

A. What had occurred?
B. Where did it occur?
C. When did it occur?
D. What are the immediate consequences?
E. What can still be expected?
F. Launch of an investigation?

G. What is the time and location of any press conference?

3.7.6 The names of any victims, next-of-kin or other interested parties should not be disclosed in any bulletin issued by the SRD.

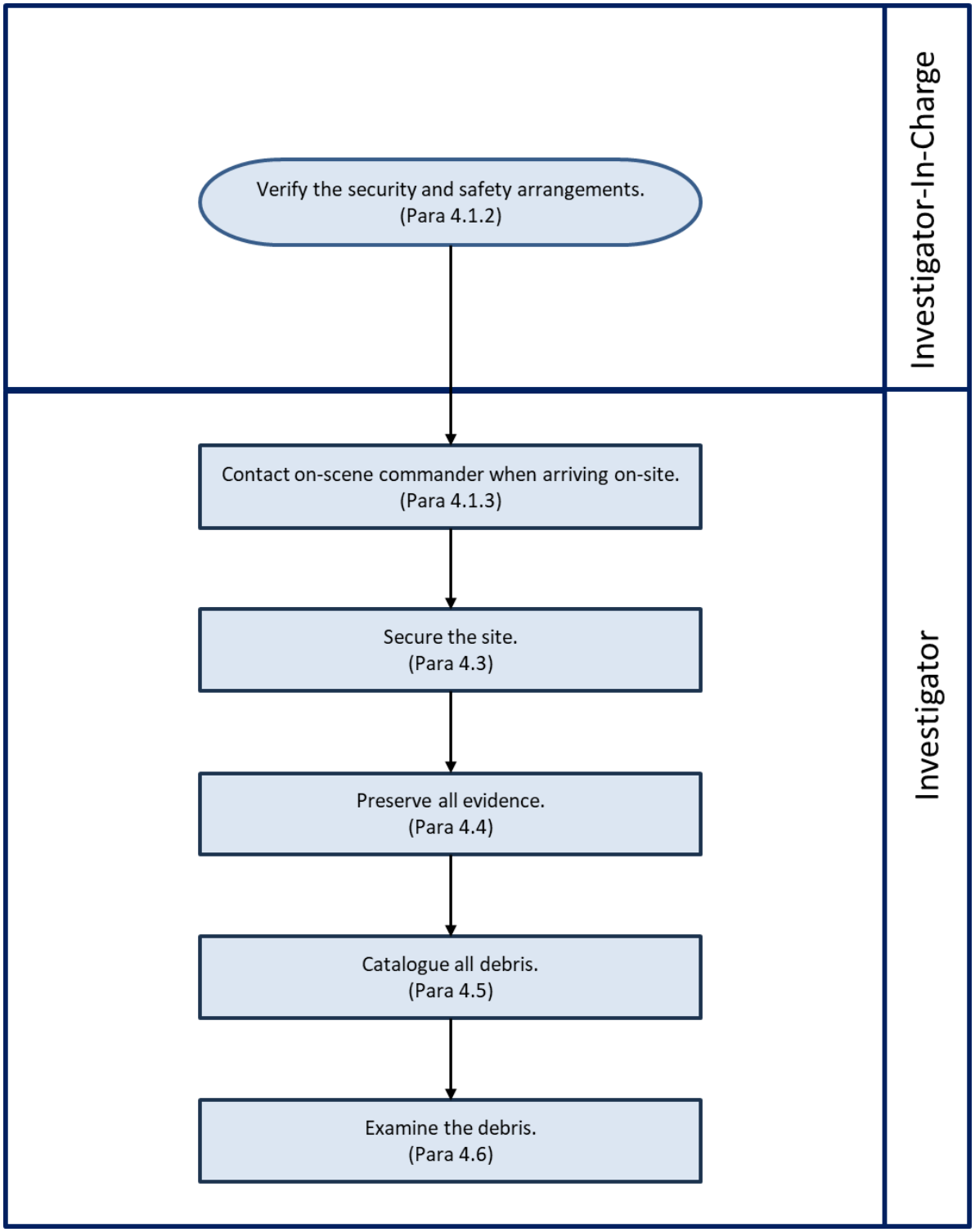
3.7.7 Further bulletins may be issued as and when necessary. The content of further bulletins should consider reporting on the established sequence of events, the circumstances of the events and the progress of the investigation. Care must be taken not to speculate on the causes of the accident.

PART 4

SITE SECURITY AND EVIDENCE PRESERVATION

PART 4

SITE SECURITY AND EVIDENCE PRESERVATION



4.1 General

4.1.1 This part provides general guidelines on site security measures in order to maintain not just the security but also the integrity of evidence at the site and in transit to the examination facility.

4.1.2 Investigator-In-Charge or the designated Site Safety Coordinator should immediately verify that arrangements have been made to ensure the security of the wreckage. This is usually arranged through the PDRM, but in some cases, military personnel or specially recruited civilians may be employed.

4.1.3 When arriving at the site of the occurrence, investigators should meet the on-scene commander to determine the accident site situation regarding the status of security and the status of wreckage. Security and access control procedures should be established in coordination with the on-scene commander.

4.1.4 In the event of an accident classified as a disaster, the NADMA Directives No.1 shall take effect.

4.2 Initial Action On-site

4.2.1 When it is suspected that the wreckage may have carried a dangerous payload such as radioactive material, immediately engage ATOM Malaysia to verify the radiation level and further management. Special precautions should be taken to station the guards at a safe distance from the wreckage. Signs indicating a potentially dangerous area should be posted until the relevant authority has thoroughly evaluated the danger involved.

4.2.2 The Investigator is not required to attempt a detailed examination at this stage. The initial aim is to obtain as complete and clear a picture as possible of the circumstances that occurred. A general survey of the wreckage and the knowledge gained of the terrain will assist the Investigator-In-Charge in planning the investigation and assessing priorities in the work to be undertaken.

4.3 Securing the Site

4.3.1 Clear and specific instructions should be given to those guarding the wreckage site on the need for authorised persons to have proper identification. In the case of major or multi-site investigations, this should be accomplished through the issuance of photographic identification badges or some form of security pass to all authorised persons.

4.3.2 Coordinate to expand the cordoned area by the first responder if required. The PDRM can be of considerable assistance in liaising with the local population, particularly with regard to locating outlying pieces of wreckage.

4.3.3 While persons living in the neighbourhood should be encouraged to report the discovery of pieces of space object wreckage, the importance of leaving these pieces undisturbed should also be impressed upon them. Collecting outlying pieces of space object wreckage and arranging them into neat piles alongside the main wreckage is sometimes done with good, but misguided, intentions. With no record of where such pieces were found, their value to the investigation is diminished. Similarly, the removal of pieces of space object wreckage by souvenir hunters must be prevented.

4.3.4 The space object wreckage is guarded until the Investigator-In-Charge is satisfied that all evidence at the site has been gathered and recorded.

4.3.5 After the initial study of the general scene of the accident and photographs taken, one of the steps is to plot the distribution of the wreckage from a convenient datum. The completed chart may later suggest patterns or sequences. This data can be referred frequently during the investigation, and it will supplement the written report.

4.4 Responsibility to Preserve Material

4.4.1 Preservation of Evidence and Records

A. All physical evidence and deductions made by Investigators must be recorded. Investigators should use notes to conveniently record details at the accident site.

B. Determine and record the precise location of evidence within the accident site and preserve impact marks. In difficult terrain, this could be done using a Global Navigation Satellite System (GNSS).

C. Determine the site elevation and significant terrain gradient, as both may be relevant to the accident.

D. Ensure that all aspects of the wreckage trail are preserved, photographed, and their description and location have been recorded.

E. Special handling and preservation precautions are needed if the recorders are recovered from the sea (salt water).

4.4.2 Personnel helping with the evidence gathering should pay special attention to handling various articles, which may be required as evidence. When using assistance from security or rescue personnel, investigators must therefore:

A. Ensure that the integrity of these potential exhibits is preserved.

B. Try to handle evidence as minimum, and retain it as closely as possible in its original condition.

C. Make immediate arrangements for appropriate preservation and safe storage.

D. Guide and communicate helping first responders.

4.4.3 The Investigator-In-Charge must record the movement once it is removed from the location where it was found, where it is going and who is handling the evidence.

4.5 Debris Cataloguing and Data System

4.5.1 It is important to have a system to catalogue the individual pieces of wreckage. Of primary importance is noting the geographic location where the particular wreckage was recovered by reference to a wreckage map grid, latitude and longitude, or other appropriate reference system. A brief summary of any significant evidence should also be included. Reference to photographs or sketches might also be recorded in the wreckage catalogue. Additional information, such as time and who recovered the item, must also be recorded.

4.5.2 Proper records should be kept of the items found from the recovery operation. The records should contain details related to each piece, such as recovery location, extent and type of damage, photographs, and sketches.

4.5.3 For a large accident, a debris data management team should be set up to systematically record all the wreckage pieces recovered.

4.6 Examination of Pieces

4.6.1 Debris collected will be examined thoroughly. Where identifying marks are unavailable (identifiable writing or graphics) to determine its origin, material testing should be performed.

4.6.2 Investigator-In-Charge may have to approach an appropriate research facility (government agency, university) to test the material. Information gathered can be used for further analysis to find the origin and/or composition material of the debris.

4.6.3 The trend toward more exotic materials will require expansion of existing investigation techniques.

PART 5

IMMEDIATE ASSESSMENT AND RESPONSE

PART 5
IMMEDIATE ASSESSMENT AND RESPONSE

5.1 General

5.1.1 This part provides general guidelines for on-site assessment before proceeding with investigation activities. Investigators must be trained and evaluate each event according to site-specific variables. The Investigator-In-Charge ultimately has the authority over the investigation activities. The investigation team shall be equipped with suitable resources before entering the crash site to commence investigation activity.

5.1.2 To avoid any overlapping of jurisdiction, varying health and safety legislative requirements must be identified and met. A routinely revised plan and procedure should be made available to address all the requirements. Duty, responsibility and process must be clarified. Efforts should be made to obtain input from other agencies to ensure the process developed is efficient and practical.

5.1.3 In the event of an accident classified as a disaster, the NADMA Directives No.1 shall take effect.

5.1.4 On-site investigation is a risky activity that must be managed to reduce exposure to an acceptable level for investigators and all involved parties. Risk must be identified and evaluated to determine appropriate control measures. The Investigator-In-Charge must coordinate with the on-scene commander to obtain relevant details.

5.1.5 When there is a presence of public or onlookers, the Investigator-In-Charge must request security assistance from the relevant security agency/authorities.

5.1.6 Investigators must be equipped with proper tools (PPE) to perform their duties while managing identified risks.

5.1.7 A prolonged duration of accident site operations, assessments will need to be reviewed and revised frequently to take account of changes to weather, site operations, personnel, and other associated aspects.

5.1.8 When the risk remains unacceptably high, activities must be delayed or modified, and a new risk assessment carried out.

5.2 Pre-departure Consideration

5.2.1 Preparation for an investigation begins before on-site and includes planning of the following:

A. Consideration of the terrain at the occurrence site.
B. Weather and location.
C. Magnitude of the task.
D. Resources necessary for the investigation.
E. Organisational resource on-site (first responders and other agencies on-site).

5.2.2 It is the investigator's responsibility to be ready at all times with their individual Field Kits ready to be deployed upon receipt of notification of any accident.

5.2.3 Others include the following:

A. Obtain appropriate equipment, tools, checklists, and clothing.
B. Preparation of support equipment needed at the site.
C. Carrying of authority card.
D. Carriage of a communication device, such as a mobile telephone, VHF radio.
E. Arrangement for necessary transport - Arrangement of accommodation and site support.

5.2.4 Given the variable nature of accidents and the conditions in which investigators work, it is difficult to produce a definitive list of PPE. Advice should be sought from health and safety specialists to confirm the suitability of any changes or to help identify additional suitable equipment. A wide range

of support equipment is often required to ensure that an operating base can be established in any location.

5.3 Initial Action On-Site

5.3.1 When notified of an accident, the Investigator-In-Charge or the designated accident site safety and security coordinator should immediately verify that arrangements have been made to ensure the security of the wreckage.

5.3.2 The local JBPM and the PDRM will probably be the first authorities to arrive at a space object accident site. It is therefore important to enlist the cooperation of these authorities in order to ensure security and control of accident sites and cooperation during investigations. It is essential that vital evidence is not damage or lost through interference with the wreckage.

5.3.3 The JBPM and the PDRM should be aware of what is expected of them during an accident. This is to coordinate its needs in advance with relevant search and rescue organisations.

5.3.4 Plans and arrangements for the following essential tasks should be in place so that they can be accomplished without delay:

A. Notification to other authorities, as necessary.
B. Securing the wreckage from fire hazards and further damage.
C. Checking for the presence of dangerous payload, such as radioactive.
D. Placing guards to ensure that the space object wreckage is not tampered with or disturbed.

5.3.5 Listed below are activities to be carried out. The list shall be updated by the investigation team according to lessons learned on-site to improve efficiency and practicability of the safety assessment process. The list suggests basic on-site assessment activities that can be done, execution wise, investigators may add or leave activities according to suitability, whilst maintaining an acceptable level of risk.

A. Identify the investigation task, location and description.
B. List identified hazard.

C. List control measures.
D. Identify who will act and implement control measures.
E. Identify and plan emergency procedures and contact.
F. Plan and identify circumstances that may require emergency termination.
G. Identify prevailing legislative regulation/authority on-site and coordinate with the relevant party.
H. Identify the central administrative point for the investigator to collect, process and record the information and also to request for other assistance.

5.4 Hazard Identification and Site Precautions

5.4.1 All Investigators must be familiar with the regulations and guidelines and established safety procedures. Investigators must exercise caution and use all appropriate protective devices when working at the occurrence site.

5.4.2 An occurrence site presents a number of potential hazards, each of which requires that appropriate procedures to be followed. Terrain, environmental conditions, wreckage, and hazardous materials such as chemical, explosive, biological and radioactive items all have considerable potential to cause serious physical injury. In addition, critical accident stress has the potential to cause both emotional and physical damage to individuals during and following an occurrence site visit.

5.4.3 Given the wide range of potential hazards at an accident site, it can be helpful to categorise typical hazards to better manage the accident site.

5.4.4 Hazards have been categorised as follows:

A. Environment — location (both geographic and topographic), fatigue (effects of travel and transportation), insects/wildlife, climate, security and political situation.
B. Physical — sharp object, fire, stored energy.
C. Biological — pathogens from debris or collateral damage surrounding the impact site, and the state of local hygiene.

D. Materials — exposure and contact with radioactive and toxic materials and substances at the site.
E. Psychological — stress and traumatic pressures imposed by exposure to the accident, and interaction with those associated with the space object.

5.4.5 Investigators should not normally work alone at an isolated occurrence site. An isolated site, which would take considerable travel time to an appropriate medical facility, or which would otherwise present difficulties if immediate removal of an investigator were necessary.

5.5 Health and Safety On-Site

5.5.1 These guidelines apply to all who are likely to face exposure to potentially infectious or injurious substances or objects when conducting occurrence investigations. Each person has a responsibility to ensure that he or she works safely. Adherence to the work practices described, together with the use of appropriate PPE, will reduce on-job risk for all persons exposed to the occurrence site hazards.

5.5.2 Reasonable arrangements shall be made to ensure compliance with occupational health and safety legislation to maintain a safe working environment and without risk to health.

5.5.3 As part of the on-site safety process, the Investigator-in-Charge shall conduct pre-entry briefings as necessary for all personnel entering the occurrence site. The intent of these briefings from a safety point of view is to inform all the investigators, staff and approved visitors of potential hazards and ways of avoiding or combating them, including the wearing of minimum protective clothing.

5.5.4 An Investigator should not work alone at an occurrence site unless the site location and circumstances adequately provide for his or her personal safety.

5.5.5 Investigators are responsible for ensuring that they are fit enough to endure the sometimes arduous conditions found at an occurrence site. Each

investigator should be aware of the effects of fatigue long before exhaustion sets in.

5.6 Wreckage in Water

5.6.1 As soon as it has been determined that the wreckage is in water, efforts must be made to obtain the appropriate technical expertise available. The services of the military and other agencies and resources with specialised expertise to ensure that the wreckage underwater is found and recovered in a timely manner may be necessary. As part of its contingency planning for an accident in the water, the SRD has to pre-arrange agreements with relevant organisations to obtain the necessary specialised assistance.

5.6.2 The circumstances and location of an accident should determine whether salvage of the wreckage is practicable and necessary. If the wreckage is likely to contain radioactive material, the investigator should provide the impetus needed to ensure that action is promptly taken to recover the wreckage. Such action includes obtaining the necessary funding and specialised equipment, and personnel for the tasks.

5.7 Liaison with other Agencies

5.7.1 The SRD shall arrange for an understanding with other agencies and authorities in Malaysia to prepare for the eventuality of an accident. Information concerning the role and responsibility of each agency, for each type of emergency, shall coincide with other relevant regulations and directives recognised by the law, such as NADMA Directives No.1.

5.7.2 Although it is recognised that the circumstances surrounding each accident are different, the importance of proper planning and establishing good liaison with other authorities, particularly the PDRM, the JBPM and the search and recovery services, cannot be overemphasised.

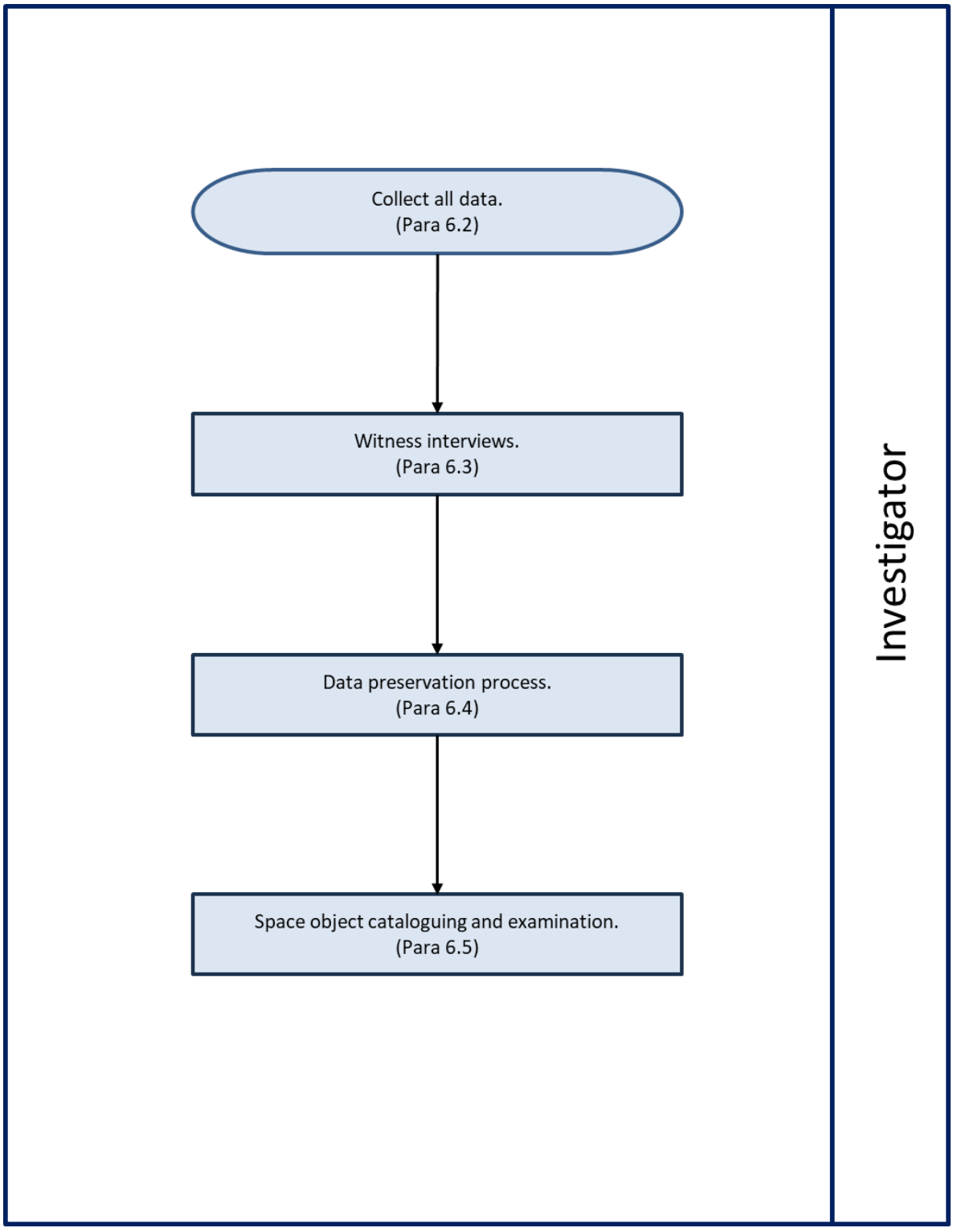
5.7.3 The SRD should likely have to rely on assistance from other civil and military agencies to provide facilities, equipment and additional personnel, i.e. helicopters, heavy lifting and moving gear, metal detectors, communication equipment, radar, and divers. It is important that heavy salvage equipment, such as cranes, bulldozers, or lifting helicopters, is readily available. In some cases, a full-scale expedition may have to be organised, requiring additional transportation, food, lodging, etc.

PART 6

DATA COLLECTION AND PRESERVATION

PART 6

DATA COLLECTION AND PRESERVATION



6.1 General

6.1.1 These guidelines are intended to be followed in all investigations involving space-related accidents. This includes accidents during spacecraft launch operations, reentry catastrophes, space object crashes, spaceport accidents, and mishaps involving space objects.

6.1.2 Investigators must be equipped with the necessary PPE to protect themselves from hazards at the accident site, such as toxic materials, sharp debris, or unstable wreckage.

6.1.3 Ensure that Search and Rescue (SAR) operations are immediately initiated to locate and recover individuals or crucial debris. Coordination with local SAR teams and agencies is essential.

6.1.4 Document the site and any findings during SAR activities, while preserving the integrity of the wreckage for the investigation.

6.1.5 Conduct a comprehensive risk assessment of the site, identifying environmental, physical, and safety hazards.

6.1.6 Implement necessary precautions to mitigate identified risks, ensuring the safety of investigators and preserving the evidence for later analysis.

6.1.7 Maintain a detailed inventory log of all data collected during the investigation. This includes telemetry data, mission logs, satellite imagery, and witness statements. Ensure that each data entry is linked to the corresponding physical evidence collected at the accident site.

6.1.8 The final investigation report should provide a clear and comprehensive summary of the findings, conclusions, and safety recommendations. The report must comply with all relevant legal and regulatory requirements and should be made available to relevant stakeholders, including the government, space agencies, and the public, where appropriate.

6.2 Data Collection Process

6.2.1 Telemetry data should be collected directly from spacecraft, launch vehicles, or any involved space object.

6.2.2 Information on the object's speed, altitude, trajectory, and velocity during the mission phases, such as launch, orbit, or reentry, should be collected. This data is essential for tracing the object's path and identifying any anomalies or deviations.

6.2.3 The investigator should collect data on the spacecraft's propulsion system, including thrust, fuel levels, fuel consumption, and engine performance. Engine failure or inefficiency is often a key factor in space accidents.

6.2.4 The investigator should collect data on the logs of communications between mission control and the spacecraft. This is particularly useful in understanding decision-making processes during an emergency or in identifying any operational issues that arose during the mission.

6.2.5 The investigator should collect data on the onboard sensor data related to temperature, pressure, fuel levels, and others. This helps identify potential system failures, overheating, or pressure-related issues.

6.2.6 All telemetry data must be securely transmitted and stored to prevent tampering or loss. Redundant data collection systems should be used to ensure no data is missed due to equipment failure.

6.2.7 If the accident involves a mission from Malaysia, the investigator should collect data on the mission logs and provide a record of all decisions made by mission control, as well as any changes to the planned mission.

A. Pre-launch Logs

- These logs document the setup and configuration of the spacecraft or launch vehicle, including mission parameters, safety checks, and final pre-launch tests. This information helps investigators understand the

planned mission and the operational context at the time of the accident.

B. Flight Logs

- These logs include any modifications made during the flight, such as course adjustments, system malfunctions, or emergency protocols that were activated in response to an anomaly. These logs help identify potential deviations from the mission plan and the reasons for those changes.

C. Critical Communications

- Collect all communications between mission control and the spacecraft, especially those relating to emergency procedures, technical difficulties, or the final moments leading up to the accident. These communications may provide critical insights into operational failures or decisions made under duress.

6.2.8 The investigator should collect the Visual records, such as satellite images, photographs, and videos, which are vital for corroborating the data collected from telemetry and mission logs. The process should involve:

A. Satellite Imagery

- Obtain high-resolution satellite images that track the space object during its flight, reentry, or post-impact. This can help verify the trajectory and impact site, and also identify any irregularities in the object's path or the conditions at the crash site.

B. Eyewitness

- Photos and Videos: Gather visual records from witnesses, especially those located near the accident site. This can include photographs taken by people on the ground or by nearby monitoring stations.

C. Space Surveillance Data

- Obtain tracking data from international space agencies or commercial monitoring organisations that track space objects. This data is useful for corroborating telemetry information and confirming the space object's location and movements.

6.3 Witness Interviews

6.3.1 Witness statements should be collected as soon as possible to minimise memory distortion and avoid contamination by external influences.

6.3.2 Witnesses are individuals who are present at the scene of the accident or in the vicinity where the accident occurred. They may have seen the space object during launch, in-flight, reentry, or the moments before or after impact. The witnesses can provide critical audio and visual details about the space object's movements, trajectory, and any unusual behaviour or signs of failure, such as smoke, erratic flight, debris falling from the object or a loud bang.

6.3.3 In cases where the accident involved crewed missions, interviews with the crew members onboard the spacecraft or involved in the operation of the vehicle are essential. Crew members can provide valuable details about the spacecraft's status, the crew's actions during the emergency, and any systems that failed during the mission.

6.3.4 The case involving the spaceport accident, personnel at spaceports, satellite tracking stations, or any mission control teams involved should be interviewed to understand the operational protocols, what went wrong during the mission, and any deviations from standard procedures. Investigation on the pre-launch checks, onboard systems, and operational failures.

6.3.5 The process of collecting witness statements must be systematic and thorough to ensure accuracy, avoid bias, and preserve the original account of the events.

6.3.6 Witnesses should be contacted as soon as possible after the accident to ensure that their memories are fresh. Delaying interviews can lead to inaccuracies or lost details. The witness should be informed of the purpose of the interview, the importance of their statement, and how it will be used in the investigation.

6.3.7 Witnesses should be briefed on the process and asked to recall the accident as clearly and accurately as possible. They should also be informed that their statements will be recorded, and they may be asked to clarify any details or to provide additional information if needed.

6.3.8 Interviews should be conducted in a controlled, quiet, and neutral environment to avoid distractions and external influence. Open-ended questions should be used to allow witnesses to provide as much detail as possible. Avoid leading questions that may bias the witness's response.

6.3.9 All witness statements should be recorded, preferably through digital means (audio/video), to capture every detail of the interview. Notes should also be taken by the investigator to supplement the recordings. All recordings should be stored securely, as they may serve as evidence during legal proceedings or in court.

6.3.10 The investigator should review the recorded statement to ensure it is complete and accurate. In cases where multiple witnesses provide similar statements, their accounts should be cross-referenced to confirm consistency. Any discrepancies or conflicting statements should be identified and clarified in subsequent interviews.

6.3.11 The investigator should compare witness statements with physical evidence, such as satellite images, telemetry data, mission logs and others.

6.3.12 Witness identities should be protected where necessary, especially for individuals who may be involved in ongoing operations or who provide critical information regarding safety or operational failures. Confidentiality agreements should be made to ensure witness protection.

6.3.13 All witness statements should be documented in full, with copies retained in the official investigation records. These statements should be included in the final investigation report to provide transparency and support the conclusions drawn from the technical evidence.

6.3.14 In cases where witnesses are located in remote areas, interviews may need to be conducted via video conference or over the phone. In these situations, the investigator should ensure that the witness is in a safe environment and can communicate freely without external interference.

6.3.15 In some cases, witnesses may have only partial information or may not have seen the entire event. It is important to acknowledge the limits of their observations and to seek additional corroborating evidence from other sources, such as telemetry data, satellite imagery, or further witness statements.

6.4 Data Preservation Process

6.4.1 All collected data, including telemetry, mission logs, satellite imagery, and witness statements, shall be securely stored, for example, using a blockchain-based system. Blockchain technology ensures that data, once recorded, cannot be altered, preserving its integrity and transparency throughout the investigation process.

6.4.2 To prevent data loss, critical data should be stored in multiple locations, including both on-site servers and cloud-based storage systems. Redundant storage ensures that data is accessible and recoverable, even in the event of a system failure or disaster.

6.4.3 All data must be encrypted during storage to prevent unauthorised access and ensure its confidentiality.

6.4.4 Regularly test backup systems to ensure they are functional and capable of restoring data if necessary.

6.4.5 Implement a Data Access Classification Matrix to regulate who can access different categories of collected data. This ensures that sensitive information is only available to authorised personnel and prevents unauthorised disclosure of confidential data.

6.4.6 Classify data into categories such as public, restricted, and classified based on its sensitivity.

6.4.7 Assign access rights based on the roles and responsibilities of personnel involved in the investigation, ensuring that sensitive data is protected at all times.

6.4.8 Verification of data should be conducted by cross-referencing it with multiple sources to ensure its consistency and authenticity. This may include comparing telemetry data with satellite images, cross-checking witness statements with physical evidence, and validating mission logs against other documentation.

6.5 Space Object Cataloguing and Examination

6.5.1 Upon arrival at the accident site, the investigation team must coordinate with the on-scene commander to secure the site and establish safety perimeters. Unauthorised access must be prevented to protect critical evidence.

6.5.2 Use photographs, videos, and sketches to document the condition of the site and the wreckage. This will help preserve evidence for multiple analysis.

6.5.3 Collect any transitory evidence immediately, such as weather-related changes, movements in debris, or damage caused by external factors.

6.5.4 Catalogue each piece of wreckage, noting its location using GPS coordinates. This ensures that every piece of evidence can be tracked and analysed.

6.5.5 Examine each piece for signs of failure, material composition, and any unique markings that may link it to the space object involved in the accident.

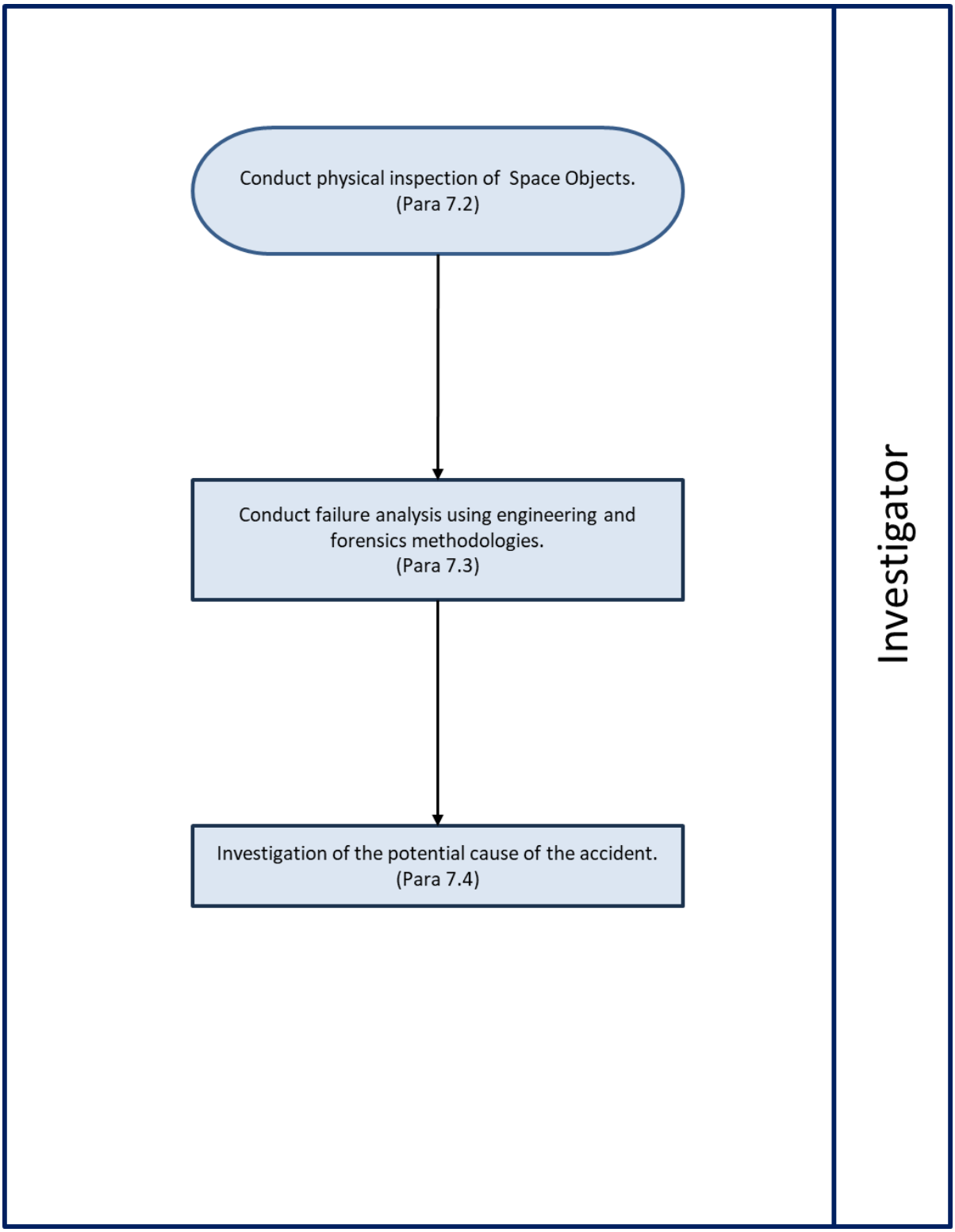
6.5.6 Use barcode systems, geotagging, and photographs to ensure accurate and reliable tracking of debris.

PART 7

ANALYSIS AND ROOT CAUSE DETERMINATION

PART 7

ANALYSIS AND ROOT CAUSE DETERMINATION



7.1 General

7.1.1 This section focuses on the analysis and determination of the primary causes of the accident. This process involves physical examination, reconstruction of the space object wreckage, forensic analysis and assessment, as well as other investigations to determine the cause of the accident.

7.2 Physical Inspection of Space Objects

Investigator to manage the detection, tracking, trajectory analysis or space object by;

7.2.1 On-orbit Inspection: Utilise remote sensing, satellite imaging, or robotic inspections to assess visible damage, structural integrity, or functional anomalies. This can be performed using onboard diagnostic tools, ground-based telescopes, or space-based inspection assets.

7.2.2 Recovery and Examination (if possible): If the space object re-enters Earth and is retrievable, conduct a detailed physical examination in a controlled laboratory environment to assess impact damage, material degradation, or any mechanical or electrical system failures.

7.2.3 Material and Structural Analysis: The found object composition should be analysed using a spectrograph (spectroscopy technique), scanning electron microscope (SEM), chromatography (for biological test), and X-ray diffraction to determine material fatigue, corrosion, or foreign object impact.

7.2.4 Reconstruction of wreckage:

(i) Reassemble recovered object and fragments to approximate the original structure and assess the failure point.

(ii) Compare damage pattern with known failure modes such as explosion, structural fatigue, high-velocity impact, or thermal degradation.

(iii) Use 3D modelling and simulation techniques to virtually reconstruct the event and evaluate the most probable cause of failure.

7.3 Failure Analysis Using Engineering and Forensics Methodologies

7.3.1 Data collection and reconstruction – the investigator shall gather telemetry data, mission logs, and sensor readings to reconstruct the sequence of events leading to failure and accident.

7.3.2 Forensic Investigation – the investigator shall apply forensic engineering techniques to trace the failure point, whether due to structural fatigue, propulsion malfunctions, avionics failures, or composition of the object, to determine the cause of the accident.

7.3.3 Forensic analysis:

(i) Materials Analysis – to conduct forensic analysis on the object to identify the materials (e.g., metals, ceramics) and determine if it came from a known satellite, rocket or space mission.

(ii) Trajectory Reconstruction – to work with experts to simulate the orbit and descent of the space objects. This can help determine any anomaly during the re-entry of the space object. (e.g., collision in space, deliberate deorbit or satellite breakup).

7.3.4 Comparative Assessment – the investigator shall compare the observed failures with past accidents to identify common trends and possible flaws.

7.3.5 The investigator shall conduct an Impact Assessment by evaluating the extent of damage to infrastructure, the environment, and any potential casualties.

7.4 Investigation of the Potential Causes of the Accident

The investigator shall conduct an investigation of the potential causes of the accident by:

7.4.1 Space object impact asses – evaluate whether collision with micrometeorites or space object caused failures. This involved trajectory modelling, impact analysis, and reviewing orbital conjunction assessments.

7.4.2 Propulsion System Failure – investigate whether issues such as fuel leakage, combustion instability, or thruster contributed to mission failure.

7.4.3 Structural Integrity Evaluation – analyse potential weaknesses in materials expansion effects, or manufacturing defects that could have led to failure under space conditions.

7.4.4 Explosive or Fragmentation Events – determine if an onboard explosion, pressure build-up or structural disintegration led to debris dispersion. This includes reconstructing wreckage to assess whether overpressure, overheating, or a self-destruction mechanism was involved.

PART 8

REPORTING AND CORRECTIVE ACTION

PART 8

REPORTING AND CORRECTIVE ACTION

8.1 General

8.1.1 This section focuses on the documentation of findings from an accident investigation and the subsequent implementation of corrective measures. The goal is to ensure lessons are learned, improvements are made, and similar accidents are prevented in the future. The early analysis report must be submitted to the SRD within 30 days. Time extension may be granted in complex cases that require further analysis.

8.1.2 The SRD shall make the Final Report publicly available as soon as possible within 12 months. If, for some reason, the Final Report cannot be made publicly available within 12 months, the SRD should make an interim statement publicly available on each anniversary of the occurrence, detailing the progress of the investigation and any safety issues raised.

8.1.3 The timelines ensure the timely dissemination of critical information and allow for prompt action to mitigate future risks.

8.1.4 A comprehensive Final Report must contain a key section that provides a structured and detailed understanding of the accident. The components include executive summary, analysis and root cause determination and corrective actions.

8.2 Executive Summary for Final Report

8.2.1 Provide a concise overview of the accident, including the date, time, and location of the space object landing.

8.2.2 Summarise key findings, such as whether any damage or injuries occurred, and whether the object is identified as part of a known space objects.

8.2.3 Recommend a specific corrective measure to prevent similar accidents in the future.

8.2.4 Intended for policymakers, regulators, and stakeholders who need a concise understanding of the accident.

8.3 Introduction

8.3.1 Briefly describe the background of the space object event and why the report is being written.

8.3.2 Provide an overview of the identity of the space objects (categories of space objects, missions of space objects, countries owning or operating space objects, etc), and any associated risks.

8.4 Accident Description

8.4.1 Date and time – record the precise date and time when the object was observed re-entering the atmosphere and landing or crashing on Earth.

8.4.2 Location – specify the geographical location of the space object landing or crashing (latitude, longitude, or city/country).

8.4.3 Initial observation – describe how the object was first detected (e.g., by tracking systems, radar, public reports, or visual observation).

8.4.4 Witness report – include any accounts from individuals' organisations who witnessed the event, including visual sightings of the re-entry and landing.

8.5 Space Object Identification

8.5.1 Object description – describe the physical characteristics of the object, such as its size, material, markings, and any identifiable features (e.g., serial numbers).

8.5.2 Tracking and prediction data – include data from tracking organisations (e.g., the U.S Space Surveillance Network, ESA) that provide predictions of re-entry and object trajectory.

8.5.3 Identification of space objects – determine whether the object can be linked to a specific spacecraft, satellite, rocket stage or space debris. This might involve correlating tracking data with known decommissioned or failed satellites.

8.6 Space Object Analysis and Root Cause Determination

8.6.1 Physical examination – detail the physical condition of the debris after it landed or crashed, such as signs of burning, fragmentation, or impacts with the ground.

8.6.2 Material composition – conduct material analysis and chemical analysis of the debris to confirm its origin (e.g., aluminium, titanium, or other space-grade materials).

8.6.3 Chemical reaction analysis – conduct chemical reaction analysis on the debris, whether dangerous or not.

8.6.4 Fragmentation – note if the debris is part of a larger fragmented space object and whether multiple pieces were recovered.

8.7 Impact Assessment

8.7.1 Environmental impact - assess any environmental damage caused by the object landing, such as forest fires, contamination of land or water, or damage to ecosystems.

8.7.2 Human safety – include details of any injuries or fatalities resulting from the space object landing or crash. If no harm occurred, mention the proximity of the debris to populated areas.

8.7.3 Response by local authorities – summarise the immediate actions taken by local authorities or emergency services in response to the object landing, such as evacuation or securing the site.

8.8 Corrective Actions and Regulatory Recommendations

Based on the root cause analysis, the report must recommend specific corrective actions to prevent similar accidents, which may include:

8.8.1 Re-entry tracking – Describe the accuracy and role of object tracking and re-entry prediction systems in predicting this event.

8.8.2 Mitigation measures – recommend future steps to mitigate the risk of uncontrolled re-entries, such as:

i. allocate the requirements for each space object to have a controlled re-entry system; and
ii. a more efficient early warning system from the launching country.

8.8.3 Future risks – assess whether more objects from the same mission are likely to re-entry, and what actions can be taken to prevent similar accidents.

8.8.4 Operational changes – modification of launch procedures, in-flight monitoring, or mission planning.

8.8.5 Design modification – engineering improvements to address weaknesses in spacecraft systems, propulsion and others.

8.8.6 Regulatory and policy update – recommendation for changes in safety standards, manufacturing practices, or certification requirements.

8.8.7 Training enhancement – addressing human factors by improving personnel training, decision-making protocols, and emergency procedures.

8.9 International Notifications and Responsibilities

8.9.1 Responsible nation/agency – identify the country or space agency responsible for the space object that produces the space debris. This information is critical for the assessment of actions in accordance with international law.

8.9.2 UN Registration and reporting – determine whether the object is registered with the United Nations Office for Outer Space Affairs (UNOOSA) under the Convention on Registration of Objects Launched into Outer Space, and also include any registration numbers.

8.9.3 Notifications – document any notifications or communications sent to international bodies line UNOOSA or other relevant space agencies.

8.10 Legal and Liability Considerations

8.10.1 Liability assessment – discuss the application of the 1972 Liability Convention, which outlines the responsibilities of spacefaring nations for damage caused by space objects.

8.10.2 Claims for damages – mention whether any claim for damages will be pursued by the affected state or individuals, and the process for filing such claims.

8.10.3 Diplomatic engagement – any diplomatic communications with the responsible nation regarding compensation or acknowledgement of the accident.

8.11 Conclusion

8.11.1 Summarise the key findings of the investigation, including the identification of the space object, its impact on Earth, and any legal or diplomatic steps to be taken.

8.11.2 Reiterate the importance of space debris tracking and mitigation to prevent future accidents.

8.12 Recommendations

8.12.1 Propose concrete actions or policy recommendations to minimise future risks. For example:

i. To equip Malaysia with its own space debris tracking system.
ii. Strengthening international cooperation on debris tracking and space accident management.
iii. Encouraging nations that own or operate space objects to become responsible space players by adhering to guidelines published by UNOOSA.
iv. Developing new technologies for active debris removal.

8.12.2 Suggestions for improvements in accident investigation management in the future, such as:

i. Strengthening the preparedness of the agencies involved in space accident management, as an example, developing guidelines, developing local expertise, investigation facilities, and others.

8.13 Appendices

8.13.1 Photographs of debris – include photos of the recovered debris and the wreckage found at the location, with a scale for size.

8.13.2 Tracking data – provide detailed tracking data, including orbital parameters and predicted re-entry windows, as provided by monitoring agencies.

8.13.3 Eyewitness accounts – include transcripts or notes from interviews with witnesses who observed the re-entry or debris landing.

8.14 Record Keeping

8.14.1 Archiving report and data - All documentation, including reports, data, and communications, should be securely archived for future reference.

8.14.2 Access Control - Restrict access to sensitive information to authorised personnel only, ensuring secure data security and confidentiality.

8.15 Formatting and Style

8.15.1 Clarity – instructions for writing clear, concise, and factual content with no assumptions or speculative language.

8.15.2 Technical accuracy – ensure all technical terms are used correctly and supported by data or evidence.

8.15.3 Diagrams and charts – guidelines for including diagrams, charts, and illustrations to enhance understanding of technical aspects.

8.15.4 Confidentiality – the importance of keeping sensitive data secure providing guidance on what can be shared publicly versus international.

8.16 Example Outline for a Space Object Final Report

1. Executive Summary
    (1) Brief description of the space object landing or crash accident.
2. Introduction
    (1) Overview of the space object and why this report is needed.
3. Accident Description
    (1) Date, time, and location of the object landing or crash.
    (2) Eyewitness reports.
4. Spacecraft or Satellite Identification
    (1) Tracking and analysis to identify the debris source.
5. Debris Analysis
    (1) Examination of object, material composition, and any signs of fragmentation.

6. Impact Assessment
    (1) Evaluation of environmental, property, and human impacts.
7. International Notifications and Responsibilities
    (1) Notifications to international agencies and identification of the responsible nation.
8. Legal and Liability Considerations
    (1) Analysis under the 1972 Liability Convention and any legal claims for damage.
9. Space Object Analysis and Root Cause Determination
    (1) Review of the tracking and prediction process and suggestions for improvement.
10. Conclusion
    (1) Summary of findings and key points.
11. Recommendations
    (1) Actions to mitigate future space object accident risks and improvement to the space accident investigation management in the future.
12. Appendices
    (1) Supporting data, image, and witness statements.

APPENDIX

APPENDIX I

ACCIDENT NOTIFICATION FORM FOR FALLEN SPACE OBJECT IN MALAYSIA

Reference No.:
(For Office Use)

PART A: REPORTING PERSON INFORMATION

Name:_____

Telephone Number: _____ E-mail:_____

Organisation Name (if applicable):_____

Position (if applicable):_____

PART B: SPACE OBJECTS INFORMATION (if known)

Type of Space Object:_____

Space Object Identification (registration number, etc.):_____

Hazardous Materials Carried

Radioactive ☐ Flammable ☐ Explosive ☐

Biological ☐ Chemical ☐ None ☐

Description (if applicable):

_____

PART C: ACCIDENT INFORMATION

Date of Accident: _____/_____/_____ (DD/MM/YY)

Time of Accident: _____ (Local/UTC) (24-hour format)

Accident Description (provide a detailed description of the event)

_____

_____

Vehicles/Structures Damage

_____

_____

PART C: ACCIDENT INFORMATION (continue)

Occurrence Phase

Launch Phase ☐ Operational Phase ☐

Re-entry Phase ☐ Unknown ☐

Space Object Condition
(if known, describe the current state of the object, e.g., intact, fragmented, etc.)

_____

_____

Space Debris Information (if applicable**)**

Estimated Debris Size:_____ Estimated Quantity of Debris:_____

Location Details

Place/Area: _____

Geographical Reference Point Latitude: _____ Longitude:_____

Physical Characteristics of Area (terrain, accessibility, etc.)

_____

_____

Casualties/Fatalities (if any)

Number of Injuries/Fatalities:_____

Details (if any):_____

Additional Information (if any)

_____

PART D: DECLARATION

I declare that all information given in this notification is true.

Reported by:_____ Signature: _____

Date : _____/_____/_____ Time: _____

APPENDIX II

FIELD KIT

General

1. Identification papers, investigator's official tag, armband or high-visibility jacket
2. Relevant documentation (regulations, accident investigation manual, checklists, report forms, etc.)
3. Emergency funds

Survey Equipment

4. Large-scale maps of the accident area
5. Magnetic compass
6. Global positioning system receiver
7. Laser surveying equipment
8. Clinometer
9. Navigational computer, protractor and dividers
10. Measuring tape, at least 20 m long, and a 30-cm-long ruler
11. Reel of cord, 50 to 300 m long

Marking Equipment

12. Labels, tie-on tags and adhesive tags
13. Flag markers and stakes
14. Writing material, graph paper, waterproof notebooks and clipboards
15. Pens, pencils, grease pencils, indelible marking crayons and permanent markers

Tools and Sampling Materials

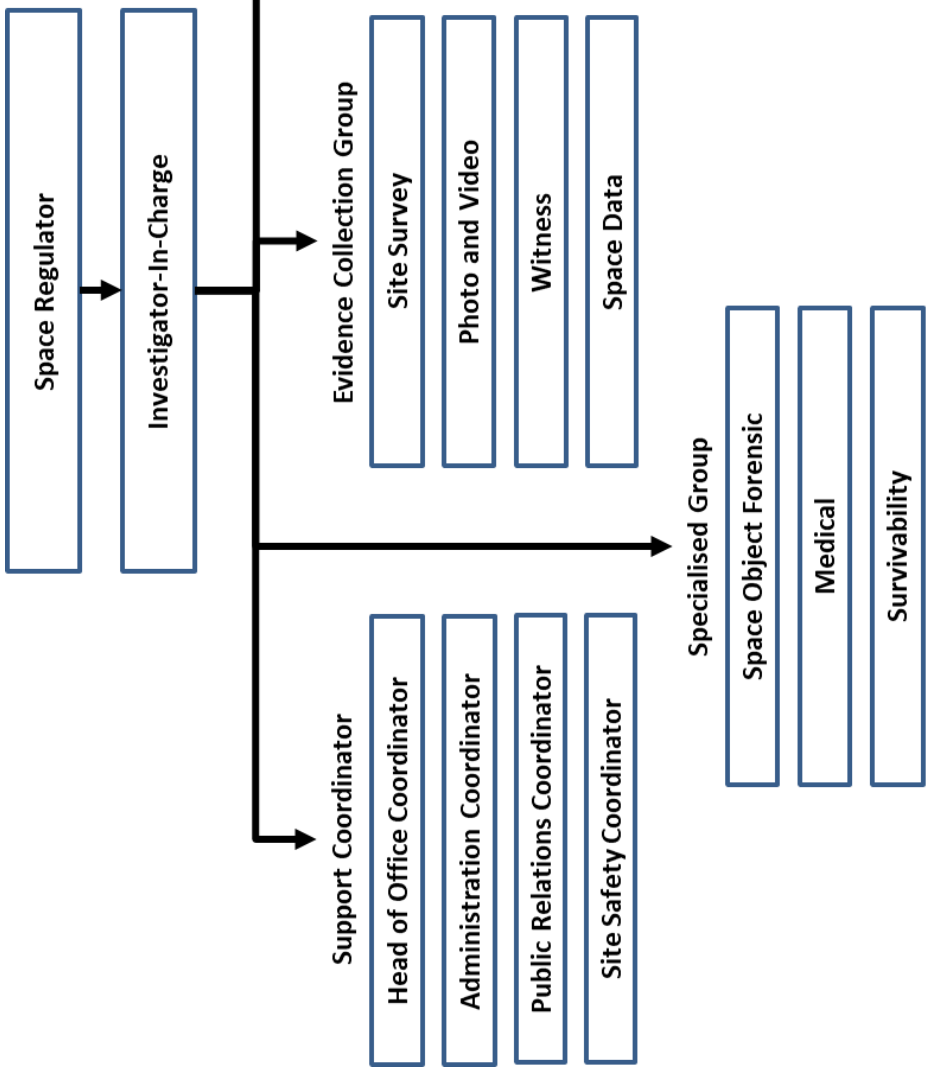
16. Toolkit with wrenches, screw drivers and drills (hand- and battery-powered)
17. Waterproof flashlight with spare batteries and bulbs
18. Small magnet
19. Multi-purpose knife
20. Inspection mirror
21. Magnifying glass (10 x to 30 x)
22. Assorted antistatic containers (for electronic components with non-volatile memory) and sterile bottles (for fluid samples)

23. Siphons and syringes
24. Plastic bags (assorted) and plastic sheets
25. Masking tape and duct tape

Miscellaneous Items

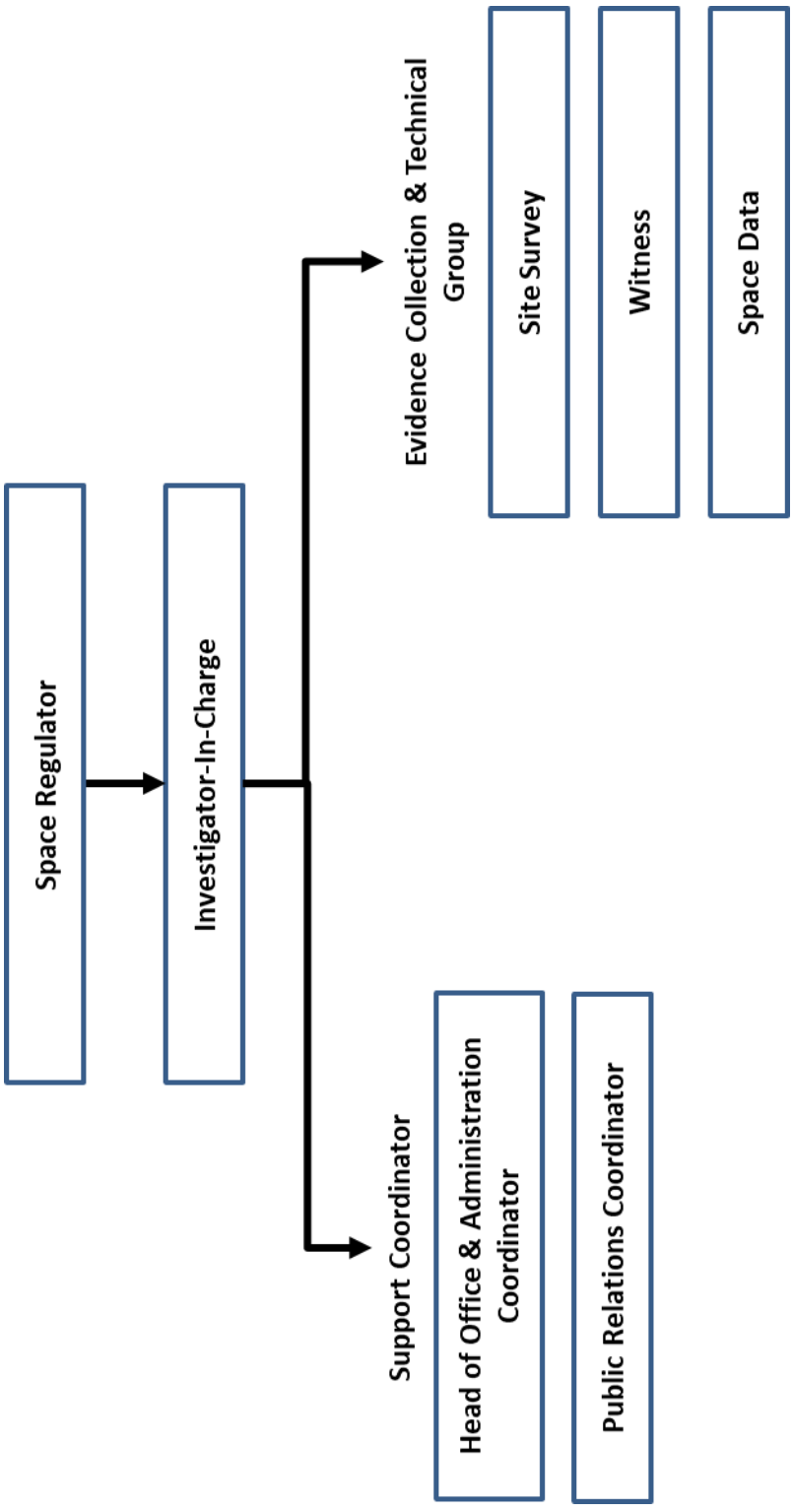
26. First-aid kit
27. Recording equipment, such as cameras, video cameras, audio recorders, spare batteries, and digital memory devices.
28. Miscellaneous photographic equipment, such as a zoom lens, macro lens, wide-angle lens and an electronic flash unit
29. Model space object
30. Heavy gloves, protective overalls and other protective equipment, such as hard hats, goggles and face masks
31. Protective clothing and equipment to protect against biological hazards
32. Binoculars with an integrated compass and distance measuring capability
33. Portable means of on-site communication, such as a cellular telephone and/or walkie-talkie, spare batteries and charging units
34. Notebook computer with high-speed Internet and wireless capability

MAJOR ACCIDENT INVESTIGATION ORGANISATION STRUCTURE



APPENDIX IV

MINOR ACCIDENT INVESTIGATION ORGANISATION STRUCTURE



APPENDIX V

CHECKLIST

PART 2

INITIAL NOTIFICATION AND RESPONSE

PART A: RECEIVING NOTIFICATION OF AN ACCIDENT		
No.	**Item**	**Tick (✓)**
1	Receive accident notification.	
2	Record the accident notification.	
3	Inform the reporting person that the telephone conversation is being recorded.	
4	Fill out the Accident Notification Form for Fallen Space Object in Malaysia.	
5	Request the reporting person to also file a report to the PDRM and the JBPM.	
6	Open a Case File.	
PART B: REVIEWING AND VERIFYING INFORMATION		
No.	**Item**	**Tick (✓)**
1	Review the description of the accident.	
2	If it is not an accident, close the case file and mark the case file as “No Further Action”.	
3	If it is confirmed to be an accident, inform the Space Regulator immediately.	
4	Space Regulator reviews and verifies information.	
PART C: Responding to the Accident Notification		
No.	**Item**	**Tick (✓)**
1	Determine whether a space accident investigation needs to be instituted.	
2	If space accident investigation does not need to be instituted, close the case file and mark the case file as “No Further Action”.	
3	If a space accident investigation is to be instituted, proceed with the procedures in the guideline.	
4	Notify the relevant government agencies as follows: i. The agency in charge of site security. ii. The agency in charge of site safety. iii. Other investigation authority as applicable.	

	iv. Agencies that may provide support to the SRD for the conduct of the space accident investigation.	
5	Notify the relevant foreign state's space authority.	
6	Appoint the Investigator-In-Charge.	

Organisation: _____ **Investigator's Name:** _____ **Designation:** _____ **Signature:** _____ **Date:** _____	Organisation Stamp:

PART 3

ORGANISATION AND PLANNING

No.	Item	Tick (✓)
1	Determine the scope and size of the investigation.	
2	Allocate the necessary resources.	
	Financial Resources.	
	Personnel.	
	Investigator's Health and Safety.	
	Equipment.	
	Transport.	
3	Form the investigation team.	
4	Coordinate with relevant government agencies.	
5	Cooperate with foreign state's space authority.	
6	Arrange for public relations.	

Organisation: _____ **Investigator's Name:** _____ **Designation:** _____ **Signature:** _____ **Date:** _____	Organisation Stamp:

PART 4

SITE SECURITY AND EVIDENCE PRESERVATION

No.	Item	Tick (✓)
1	Confirm with police/military/civil security that wreckage is under guard. (IMMEDIATE ACTION)	
2	Meet on-scene commander to assess current site security and access control. (HIGH PRIORITY)	
3	Confirm NADMA Directives No.1 protocol status (if disaster-classified). (ROUTINE)	
4	If radioactive or hazardous materials are suspected, contact ATOM Malaysia. (IMMEDIATE ACTION)	
5	Post warning signs and station guards at safe distances. (HIGH PRIORITY)	
6	Do not disturb or examine wreckage until danger is cleared. (ROUTINE)	
7	Issue or confirm ID passes, badges, armbands for all authorised personnel. (IMMEDIATE ACTION)	
8	Expand cordoned area as needed (coordinate with first responders). (HIGH PRIORITY)	
9	Prevent the public from relocating or collecting debris. (HIGH PRIORITY)	
10	Encourage reporting of found debris by locals but discourage disturbance. (ROUTINE)	
11	Take site photographs and record initial observations before evidence movement. (HIGH PRIORITY)	
12	Plot the distribution of debris from a fixed datum point (use sketches or GPS). (ROUTINE)	
13	Record GPS, elevation, and terrain slope of each key item. (HIGH PRIORITY)	
14	Ensure evidence is handled minimally and stored appropriately. (HIGH PRIORITY)	
15	Guide all assisting personnel in preservation methods. (ROUTINE)	
16	Catalogue debris: include GPS, time, finder, damage description, and reference photos/sketches. (HIGH PRIORITY)	
17	Establish or coordinate with a debris data management team (if major accident). (ROUTINE)	
18	Label and track chain of custody for each moved item. (ROUTINE)	
19	Identify materials lacking markings for lab testing. (ROUTINE)	
20	Coordinate testing with approved labs or research bodies. (HIGH PRIORITY)	

No.	Item	Tick (✓)
21	Record findings for use in origin and material assessment. (ROUTINE)	
22	Do not approach wreckage until hazards are cleared.	
23	Avoid touching evidence—use gloves and document handlers.	
24	Watch for local interference or media — coordinate security to manage this.	
25	Avoid collecting debris in isolated piles unless positions are precisely logged.	

Organisation: _____ **Investigator's Name:** _____ **Designation:** _____ **Signature:** _____ **Date:** _____	Organisation Stamp:

PART 5

IMMEDIATE ASSESSMENT AND RESPONSE

No.	Item	Tick (✓)
1	Check terrain, weather, site access and task scope. (IMMEDIATE ACTION)	
2	Prepare Field Kit with appropriate checklists, PPE, and tools. (HIGH PRIORITY)	
3	Arrange for transport, site support, and accommodation as needed. (ROUTINE)	
4	Ensure communication devices are packed (e.g. VHF, mobile). (HIGH PRIORITY)	
5	Carry an official authority card and identification. (ROUTINE)	
6	Confirm wreckage is secure before entry. (IMMEDIATE ACTION)	
7	Liaise with PDRM/JBPM/first responders to avoid evidence loss and contamination. (HIGH PRIORITY)	
8	Ensure security from further fire or damage. (HIGH PRIORITY)	
9	Confirm guard placements to prevent tampering. (ROUTINE)	
10	Identify site hazards (radiation, chemical, environmental, structural). (IMMEDIATE ACTION)	
11	Define control measures and assign responsibilities. (HIGH PRIORITY)	
12	Establish emergency procedures and contact points. (HIGH PRIORITY)	
13	Identify need for emergency termination triggers (weather, health risk, etc.) (ROUTINE)	
14	Locate and coordinate with the on-site administrative centre. (ROUTINE)	
15	Confirm applicable legislation/authority for site jurisdiction. (ROUTINE)	
16	Ensure all investigators are fit for field work and briefed. (HIGH PRIORITY)	
17	Conduct a safety briefing before entering the site. (IMMEDIATE ACTION)	
18	Assign buddy system—no one should work alone at isolated sites. (HIGH PRIORITY)	
19	Monitor for fatigue and signs of critical incident stress. (ROUTINE)	
20	Ensure PPE usage aligns with site hazards. (ROUTINE)	
21	If wreckage is in water, engage military or marine salvage specialists. (ROUTINE)	
22	Pre-check for radioactive materials before any salvage decision. (ROUTINE)	
23	Plan for cranes, divers, boats, and other logistics as needed. (ROUTINE)	

No.	Item	Tick (✓)
24	No solo work in remote locations — implement buddy system.	
25	PPE is mandatory — confirm with health & safety advisor for special hazards.	
27	Do not begin the investigation until all risk control measures are in place.	
26	Reassess site risks daily and after significant weather or personnel changes.	
28	Be alert for psychological stress triggers — activate support if needed.	

Organisation: _____ **Investigator's Name:** _____ **Designation:** _____ **Signature:** _____ **Date:** _____	Organisation Stamp:

PART 6

DATA COLLECTION AND PRESERVATION

PART A: GENERAL PREPARATION		
No.	**Item**	**Tick (✓)**
1	Ensure necessary PPE is available.	
2	Initiate Search and Rescue (SAR) operations immediately.	
3	Coordinate with local SAR teams and agencies.	
4	Document the site and findings during SAR activities.	
5	Conduct a comprehensive risk assessment of the site.	
6	Implement precautions to mitigate identified risks.	
7	Maintain a detailed inventory log of collected data.	
8	Ensure the final report is clear, comprehensive, and legally compliant.	
PART B: DATA COLLECTION PROCESS		
No.	**Item**	**Tick (✓)**
1	Collect telemetry data from spacecraft, launch vehicles, or space objects.	
2	Gather data on speed, altitude, trajectory, and velocity.	
3	Obtain propulsion system data (thrust, fuel levels, engine performance).	
4	Collect mission control communications logs.	
5	Gather onboard sensor data (temperature, pressure, fuel levels).	
6	Ensure telemetry data is securely transmitted and stored.	
7	For Malaysian missions, collect mission control logs and deviations.	
PART C: LOGS AND RECORDS		
No.	**Item**	**Tick (✓)**
1	Pre-launch logs: Document spacecraft setup, mission parameters, and safety checks.	
2	Flight logs: Record in-flight modifications, system anomalies, and emergency procedures.	
3	Critical communications: Collect all communications regarding emergencies or technical issues.	
PART D: VISUAL RECORDS		
No.	**Item**	**Tick (✓)**

1	Obtain high-resolution satellite imagery for trajectory and crash site verification.	
2	Collect photos and videos from eyewitnesses and nearby stations.	
3	Request tracking data from international space agencies or relevant states.	

PART E: WITNESS INTERVIEWS		
No.	**Item**	**Tick (✓)**
1	Collect witness statements as soon as possible to avoid memory distortion.	
2	Interview ground observers, crew members, and spaceport personnel.	
3	Ensure witness statements are systematic, accurate, and unbiased.	
4	Record and store witness statements securely (audio/video).	
5	Cross-reference witness statements with physical evidence.	

PART F: DATA PRESERVATION		
No.	**Item**	**Tick (✓)**
1	Store collected data securely in a blockchain-based system.	
2	Ensure data is backed up in multiple locations (on-site servers, cloud-based).	
3	Encrypt all stored data for confidentiality.	
4	Regularly test backup systems.	
5	Implement a Data Access Classification Matrix for data access control.	

PART G: SPACE OBJECT EXAMINATION		
No.	**Item**	**Tick (✓)**
1	Coordinate with the on-scene commander to secure the site and establish safety perimeters.	
2	Use photos, videos, and sketches to document the condition of the site and wreckage.	
3	Catalogue each piece of wreckage with GPS coordinates.	
4	Examine debris for signs of failure, material composition, and markings.	
5	Use barcode systems, geotagging, and photographs to track debris.	

Organisation: _____ **Investigator's Name:** _____ **Designation:** _____ **Signature:** _____ **Date:** _____	Organisation Stamp:

PART 7

ANALYSIS AND ROOT CAUSE DETERMINATION

PART A: GENERAL ACTIONS		
No.	**Item**	**Tick (✓)**
1	Analyse anomalies, failures, or unexpected behaviour in space objects.	
2	Perform physical inspection, wreckage reconstruction and forensic evaluation.	
PART B: PHYSICAL INSPECTION OF SPACE OBJECTS		
No.	**Item**	**Tick (✓)**
1	Perform on-orbit inspection using:	
	Utilise remote sensing, satellite imaging, or robotic inspections.	
	Asses visible damage, such as structural integrity, or functional anomalies.	
2	Conduct recovery and examination (if re-entry occurs).	
	Conduct a detailed physical examination in a controlled lab environment.	
	Assess impact damage, material degradation, or mechanical failures.	
3	Carry out material and structural analysis:	
	Spectroscopy.	
	SEM (Scanning Electron Microscopy).	
	Chromatography (if biological tests are needed).	
	X-ray diffraction.	
4	Reconstruction of wreckage:	
	Reassemble recovered objects to approximate the original structure.	
	Compare damage patterns with known failure modes.	
	Use 3D modelling and simulation for event reconstruction.	
PART C: FAILURE ANALYSIS USING ENGINEERING FORENSICS		
No.	**Item**	**Tick (✓)**
1	Data collection and reconstruction.	
2	Gather telemetry data, mission logs, and sensor readings to reconstruct events.	
3	Forensics Investigations:	
	Identify failure points (fatigue, propulsion, avionics, etc.).	
	Conduct materials analysis.	

	Confirm the source of the object (known satellite or mission).	
	Reconstruct the trajectory and descent.	
4	Conduct a comparison analysis on the past failures.	
5	Complete impact assessment.	
6	Evaluate infrastructure damage.	
7	Evaluate the impact on the environment and people.	

PART D: INVESTIGATION OF POTENTIAL CAUSES		
No.	**Item**	**Tick (✓)**
1	Space object or micrometeorite impact assessment:	
	Trajectory modelling.	
	Residue analysis.	
2	Propulsion system failure investigation:	
	Fuel leakage.	
	Combustion issues.	
	Thruster anomalies.	
3	Structural integrity evaluation:	
	Material expansion.	
	Defects or gradation.	
4	Explosion or fragmentation events:	
	Wreckage reconstruction.	
	Onboard explosions, pressure build-up, or self-destruction.	

Organisation: _____ **Investigator's Name:** _____ **Designation:** _____ **Signature:** _____ **Date:** _____	Organisation Stamp:

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