ACCIDENT INVESTIGATOR'S EVENT CHECKLIST

DOC 9756 Part II and AIID MOP Part 2 Appendix 2

EVENT 1. Initial Response

1. Gather as much accident-related information as practicable from the reporting source and relevant authorities (include SASAR, ATNS, SAPS etc.);
2. Contact the local police or other authority responsible for site security to determine what actions have been taken and convey the intentions and requirements of the accident investigation authority, in particular the safeguarding of recorders and other perishable investigation evidence;
3. As appropriate, advise the pathologist (SA Forensic Pathology), the police of the requirements of the investigation authority regarding the recovery and handling of the human remains, in particular the safeguarding of perishable investigation evidence;
4. Determine from the air operator if hazardous material, such as chemicals, explosives, biological and radioactive materials, were carried on the aircraft;
5. Determine the composition of the investigation team, taking into account pre-assignments, such as a go-team;
6. Make arrangements for travel, accommodation, and facilities required for meetings, briefings, and other investigation activities; and
7. Complete and dispatch the notification to other States involved and to ICAO as per Chapter 4 of Annex 13, CA Act 13 of 2009, CAR 2011 Part 12and AIID MOP.

EVENT 2. Initial actions at the site

1. Review the guarding arrangements and adjust the limits of the site as required;
2. Arrange for guarding of the site for the time period envisaged for the field investigation;
3. Obtain a briefing from the local authorities on actions taken at the site; and
4. Make a preliminary survey of the site with the investigation team.

EVENT 3. Secure flight operations documents

1. Obtain and secure the following documents, as appropriate:
a) From the operator/company:

- (Air Operator Certificate, Air Operator Operations Manual; Flight Manual (FM);
- Flight crew and cabin crew members' training records;
- Aircraft Operating Manual (including Standard Operating Procedures);
- Copy of current cockpit checklists (normal, abnormal and emergencies);
- Pilot log books;
- Pilot's flight log;
- Pilot flying schedule for the last six months;
- Aircraft Journey Log Book;
- Minimum Equipment List (MEL);
- Air Operator dispatch logs;
- Daily dispatch logs, including the week prior to and the day of the accident;

- Mass and balance and centre-of-gravity calculations for the accident flight and previous flight;
- Passenger and freight manifests;
- Air Operator schedules and aircraft schedules;
- Air Operator Route Manual;
- National and international agreements associated with the transfer of some or all of the State of Registry's responsibilities (if applicable);
- Refuelling documentation; and
- Record of pertinent communications.

b) From the Regulator (SACAA):

- Flight crew personnel licensing file;
- Copy of approved Flight Manual (FM);
- Copy of approved Minimum Equipment List (MEL);
- Copy of company Master Minimum Equipment List (MMEL);
- Files on chief pilot, chief inspector, cabin crew, chief flight engineer and chief of maintenance;
- Copy of in-flight inspections covering the last six months;
- Documentation in support of applications for the Air Operator Certificate;
- Copy of any civil aviation authority Policy Letters applicable to the company;
- National and international agreements associated with the transfer of some or all of the State of
- Registry's responsibilities (if applicable);
- Copy of the last company audit by the civil aviation (regulatory) authority; and
- Air operator files.

EVENT 4. Human remains recovery

Note: In South Africa, this is the competency of the Forensic Pathology under the Department of Health)

1. Identify and assign personnel for human remains recovery and preservation, in part and such as pathologists, and dentists; (This is normally the tasks of the appointed police official or pathologist.)
2. Determine and obtain material resources for human remains recovery and preservation, in part and such as vehicles and morgue facilities; (This is normally the task of the appointed police official or pathologist.)
3. During the recovery, photograph the remains and record their location; and
4. Prepare a plot of the locations of the human remains.

EVENT 5. Eyewitness interviews

1. Search for eyewitnesses;
2. Interview eyewitnesses, at their location of observation, if feasible;
3. Obtain photographs and videos taken by witnesses, and those recorded by security or operations monitoring devices; and
4. Develop an initial plot of the aircraft flight path.

EVENT 6. Flight recorder recovery

1. Locate the flight recorders, as well as any other recorders such as standby recorders and quick-access recorders;
2. Photograph the flight recorders in situ;
3. Examine and record the condition of the flight recorders;
4. Recover the flight recorders;
5. Prepare the flight recorders for transportation;
6. Arrange for the timely and secure transport of the flight recorders to the playback facility; and
7. Carry the flight recorders by hand to the readout facility (if practical to do so).

EVENT 7. Secure weather documents

1. Determine where the flight crew obtained a weather briefing;
2. Interview the individual(s) who provided the weather briefing;
3. Secure copies of briefings and other weather documentation given to the flight crew;
4. Obtain and secure the following documents, as appropriate:

- The actual and forecast weather conditions for the route, area, terminal, destination, alternate and site of the accident;
- Hourly and special reports;
- Weather radar reports;
- Pilot weather reports (PIREP);
- Surface observations, logs and records;
- Precipitation records;
- Barograph records;
- Wind records;
- Synoptic charts;
- Upper air charts;
- Runway Visual Range (RVR) records;
- Satellite pictures;
- Conditions of natural light and sunrise/sunset;
- Special weather observations;
- Significant Meteorological Information (Sigmets) weather advisories; and
- Witness weather reports.

EVENT 8. Secure air traffic services and airport documents

1. Obtain and secure the following documents, as appropriate:

- Flight plan;
- Flight plan message;
- Departure message;
- Notices to Airmen (NOTAMs);
- Pertinent air traffic services and airport recordings;
- Aerodrome control progress strips;
- Area control progress strips;
- Approach control progress strips;
- Approach terminal progress strips;
- Radar recordings (including military recordings, if available);
- Names and files of air traffic services personnel on duty;
- Unit logs;

- Pertinent manuals and directives;
- Pertinent outage reports;
- Airport Certificate;
- Airport certification safety standards/reports;
- Braking action reports;
- Master airport plan;
- Station logs;
- Equipment inspection documents;
- Airport manager's log; and
- Names and files of airport personnel on duty.

EVENT 9. Search and rescue operations

1. Determine and record the following:

- How and when the search operations were initiated;
- What units or agencies participated in the search operations;
- Search means and methods adopted, in part and such as visual, electronic, and infrared;
- The environmental conditions at the time of the search, such as weather, ground or water conditions;
- Any factors which facilitated or hindered the search effort; and
- The time at which the accident site was located.

2. Review search and rescue procedure manuals, and operations logs and recordings; and
3. Determine the adequacy of the search actions.

EVENT 10. Secure pertinent cabin documents

1. Liaise with Operations, and Maintenance and Records Group Chairpersons to locate and secure the following documents:

- Air Operator Operations Manual;
- Cabin crew training records;
- Air operator and aircraft standard operating procedures (SOPs);
- Cabin crew log books;
- Pilot's flight log;
- Cabin crew flying schedule (last six months);
- Aircraft Journey Log;
- Air operator dispatch logs;
- Maintenance release forms;
- Passenger and freight manifests;
- Air operator's Maintenance Control Manual;
- Air operator schedule;
- Air operator Route Manual;

Record of pertinent phone calls;

- Cabin Crew Manual;
- Cabin Crew Emergency Manual;
- Air operator approved aircraft Safety Announcements;
- Air operator passenger safety briefings and video, if applicable;
- Copy of approved Aircraft Flight Manual;

- Copy of approved Minimum Equipment List (MEL);
- Copy of the applicable Master Minimum Equipment List (MMEL);
- Cabin crew licensing and medical status;
- Copy of any civil aviation authority Policy Letters applicable to the company;
- Copy of last air operator audit by the civil aviation (regulatory) authority;
- Air operator files; and
- Civil aviation authority approved cabin crew training curriculum.

2. Locate and secure the following information:

- The aircraft cabin furnishings;
- Pre-flight servicing documents;
- Snag rectification sheets;
- Cabin-related outstanding and recurring snags and un-serviceability's; and
- Cabin and freight configurations;

3. Obtain the autopsy results of cabin crew members and passengers; and
4. Obtain a transcript of the cockpit voice recorder and conduct a preliminary review of the recorded information for cabin-related factors.
5. Submit all original documents to the Administration Coordinator.

EVENT 11. Secure maintenance documents

1. Obtain and secure the following documents, as appropriate:

a) From the air operator:

- Air Operator Certificate;
- Certificate of Airworthiness;
- Certificate of Registration;
- Aircraft Journey Log;
- Aircraft Technical Log;
- Maintenance Control Manual;
- Maintenance Log;
- Airframe Log;
- Engine Log(s);
- Propeller Log(s);
- Pre-flight servicing logs;
- Snag rectification sheets;
- Airworthiness Directives records;
- Standards and procedures;
- Quality assurance;
- Personnel and training;
- Equipment and facilities;
- Extended-range Twin-engine Operational Performance Standards (ETOPS) maintenance requirements (Annex 6, Attachment E); Flight recorder files, including documents associated with flight data recorder data-frame and periodic calibrations;
  - Major repairs or alterations;
  - Major work done by approved maintenance organization or sub-contractor;
  - Hazardous material cargo records;

- International leasing arrangements;
- Mandatory Occurrence Reporting (trend analysis) reports; and
- System Difficulty Reporting (SDR) reports.

b) From the pertinent civil aviation authority:

- Technical personnel files;
- Air Operator Certificate;
- Aircraft files;
- Copy of the Master Minimum Equipment List (MMEL);
- Maintenance reliability information on aircraft fleet;
- Mandatory Occurrence Reporting reports; and
- System Difficulty Reporting (SDR) reports.

EVENT 12. Examination of systems

1. Prepare a checklist of systems to be investigated from the following general list:

- Hydraulic power;
- Flight controls;
- Ailerons;
- Elevators;
- Rudder;
- Horizontal stabilizer;
- Trims;
- Flaps;
- Speed brakes;
- Spoilers/lift dumpers;
- Autopilot/stability augmentation/stall avoidance;
- Landing gear/wheels/brakes;
- Fuel;
- Electric power distribution;
- Aircraft computers (such as flight management systems, traffic collision avoidance system, and terrain awareness and warning system);
- Other electronics;
- Ice and rain protection;
- Pneumatics;
- Instruments/pitot-static/caution and warning (light bulb analysis);
- Navigation systems;
- Portable navigation systems, photo and video cameras, and cell phones;
- Communications;
- Emergency Locator Transmitter (ELT);
- Fire detection and protection;
- Air conditioning and pressurization;
- Oxygen; and
- Thrust reversers.

2. Locate and identify all systems and components;
3. Determine the requirements for special handling of system computers to preserve memory;
4. Record and photograph the systems and components prior to safeguarding;
5. Safeguard and deactivate hazardous systems and components;

6. Conduct a detailed examination of all systems and components, including flight controls, hydraulics, pneumatics, electrical, electronics, instruments, communication, navigation, air conditioning, pressurization, ice and rain detection, airframe, fuel, fire protection and oxygen;
7. Document all systems selections, indications, positions and condition;
8. Photograph in detail the components suspected of failure; and
9. Request special technical assistance, if required.

EVENT 13. Examination of structures

1. Conduct an overall examination of the complete airframe, including the flight control surfaces;
2. Determine the involvement of the structure in the accident;
3. Select the components that require examination and testing;
4. Prepare detailed statements of requirements for examination and testing; and
5. Assess the requirements for wreckage reconstruction.

EVENT 14. Examination of engine(s) and propeller(s)

1. Locate the engine(s) and verify make, model and serial number(s);
2. Record the position and the condition of the engine(s);
3. Determine the engine(s) pre-impact integrity;
4. Locate the propeller(s) and verify make, model and serial number(s);
5. Record the position and the condition of the propeller(s);
6. Determine the propeller(s) pre-impact integrity;
7. Locate and identify all major engine and propeller components, such as engine controls, auxiliary fuel, oil and coolant components, and instruments;
8. Record the position of engine and propeller controls, components and reading of related instruments;
9. Determine the pre-impact serviceability of the controls, components and related instruments;
10. Photograph engine(s), propeller(s), components, and instruments in situ
11. Obtain oil and fuel samples;
12. Determine the engine power developed at impact, if feasible;
13. Select the engine(s), propeller(s) and components for examination and testing; and
14. Prepare detailed statements of requirements for examination and testing.

EVENT 15. Initial survey of the accident site

1. Determine the probable distribution of wreckage by cursory examination of angle of impact, speed and pre-impact integrity indications;
2. Delineate the area requiring search for components and evidence;
3. Determine the method and intent of search for debris;
4. Determine the material and personnel resources required;
5. Obtain the material and personnel resources;
6. Identify significant components; and
7. Mark and tag components.

EVENT 16. Site photography (Phase 1)

1. Establish photographic priorities;
2. Photograph the general wreckage from at least four directions;
3. Photograph human remains in situ in relation to other objects;
4. Photograph easily perishable evidence, in part and such as ground impact marks and the presence/absence of fire;
5. Photograph flight recorders in situ prior to removal;
6. Photograph hazardous systems and components in situ prior to deactivation or removal;
7. Photograph the terrain and general impact area;
8. Photograph the general components in part and such as wings, engine(s), and empennage;
9. Determine the requirements for aerial photography;
10. Elaborate photo coverage of any suspect areas or components
11. Liaise with the Site Survey Group Chairperson for photographic requirements such as:
    - Significant ground features;
    - Point of initial impact;
    - Location of major components;
    - Ground fire areas;
    - Serious property damage;
    - Flight path to impact; and
    - Witness locations.

13. In conjunction with the Operations Group Chairperson, photograph the cockpit environment with particular attention to:

    - Instruments;
    - Position of controls;
    - Switch positions;
    - Circuit breaker panels;
    - Radio settings;
    - Automatic pilot setting;
    - Fuel control positions;
    - Pilot seats, seat belts, harness; and
    - Maps, charts.

14. Liaise with the Operations Group and Systems Group chairpersons for additional specific photo requirements of the cockpit area;

15. Liaise with the Medical/Human Factors Group and Structures (Crashworthiness) Group chairpersons for requirements for photos of items with possible design deficiencies such as:

    - Design/location of instruments;
    - Design/location of controls;
    - Work space incompatibility;
    - Visual restriction due to structure;
    - Lack of cockpit standardization;
    - Personal equipment interference; and
    - Seat design/configuration.

16. Liaise with the Medical/Human Factors Group and Structures (Crashworthiness) chairpersons for photo requirements of:

    - Cabin environment;

- Unsecured interior equipment;
- Seats, seat structures;
- Belts, seat belt anchorages;
- Belt buckles;
- Cabin floor;
- Cargo restraint; and
- Emergency exits.

17. Liaise with the Structures (Crashworthiness) Group Chairperson for photo requirements of:

- Terrain angle;
- Angle of impact;
- Width, length and depth of ground scars;
- Depth of damage to underside of aircraft;
- Compression of energy-attenuation devices;
- Initiation and propagation of fire;
- Smoke smears, soot, discoloration
- Surface pitting; and
- Evidence of explosion.

18. Liaise with the Air Traffic Services and Airports Group Chairperson for specific photo requirements of:

- Runway or taxiway;
- Aerodrome layout;
- Obstructions to air traffic services and airport controllers' vision;
- Aerial photo record of access routes; and
- Tower cab layout.

19. Liaise with the Powerplants Group, Systems Group and Structures Group chairpersons for specific photo requirements of selected aircraft components.

EVENT 17. Review of operations documents

Event 3 refers.

1. Review all the documents obtained from the operator and summarize the pertinent information;
2. Review all the documents obtained from the civil aviation authority and summarize the pertinent information; and
3. Compile in chronological order, the history for each flight crew member and for the operator.

EVENT 18. Crew member medical examinations

Event 4 refers.

1. Obtain the list of flight crew and cabin crew members (names and positions);
2. Determine the location and condition of the surviving flight crew members;
3. Obtain the permission of crew members to submit to medical examination;
4. Arrange for examinations of the flight crew members by a competent medical practitioner, including blood and urine samples, and obtain the following information:

- Medical status and history, including medications;
- Personal history, including habits; and
- Pre-flight activities with human factors significance.

5. If relevant, arrange for examination of the cabin crew members by a competent medical practitioner, including blood and urine samples, and obtain the following information:

- Medical status and history, including medications;
- Personal history, including habits; and
- Pre-flight activities with human factors significance.

EVENT 19. Plot flight path

Event 5 refers.

1. Plot the aircraft flight path from eyewitness information showing:

- Aircraft flight direction, altitude and attitude;
- Aircraft configuration, in part and such as position of flaps, spoilers, and gear;
- Evidence of fire or explosion;
- Evidence of structural failure; and
- Point(s) of collision or impact.

EVENT 20. Read-out of flight recorders

Event 6 refers.

1. Obtain the most recent flight recorders' calibration information from the operator;
2. Copy and play back the CVR data and provide the Investigator-in-charge with an initial written précis of the information;
3. Copy all CVR channels separately and present them on a storage medium in a format applicable for the Investigator-in-charge, normally a four-channel copy;
4. Make a transcript of the CVR and transmit it to the Investigator-in-charge;
5. Contact the Investigator-in-charge to determine the gross FDR requirements;
6. Copy the FDR data and provide the Investigator-in-charge and the pertinent group chairpersons with the required initial data plots, along with an appropriate written briefing;
7. Using crosschecks and data obtained from other group chairpersons, determine the reliability of the flight recorder data, and refine the FDR data and CVR transcripts;
8. Synchronize timing of the FDR and CVR records together with the air traffic services data, if possible; and
9. Forward the refined information to the Investigator-in-charge, the Operations Group Chairperson and other group chairpersons needing this information.

EVENT 21. Review of weather documents

Event 7 refers.

1. Review all the documents and summarize the pertinent information;
2. Arrange for a qualified meteorologist to review and analyse all the documents;
3. Consider the following hazardous phenomena:

- Mountain wave effect;
- Revolving storms;
- Severe turbulence;
- Freezing precipitation;
- Wind shear;
- Subsidence; and
- Electrical storms.

EVENT 22. Review air traffic services and airport documents

Event 8 refers.

1. Review all the documents obtained from the air traffic services and airport authorities, and summarize the pertinent information;
2. Make copies of the air traffic services recorded data from the originals;
3. If air traffic services data are not available in a digital form for copy, playback and analysis, make a video copy of the air traffic services display screens for playback; and
4. Make transcripts from the air traffic services recorders (all channels).

EVENT 23. Evacuation operations

Event 9 refers.

1. From information derived from survivors' interviews and/or the cockpit voice recorder, determine and record the following pre-accident actions:

- General briefing of the passengers regarding the various safety and rescue equipment at their disposal, in part and such as seat belt, oxygen supply, and life jacket;
- Member(s) of the crew who gave the briefing, time of the briefing, its intelligibility and audibility (pertinent language[s]) to all passengers;
- Special instructions given regarding the removal of dangerous articles, in part and such as spectacles, ties, and shoes; the tightening of seat belts; the cushioning of each passenger in part and such as with pillows and blankets; and clarity and understanding of these instructions;
- Special instructions regarding emergency exits, measures taken to free the access to all emergency exits;
- Type of the emergency equipment available, in part and such as portable fire extinguishers, axes, crowbars, flashlights, and first-aid kits;
- Measures taken by the crew with respect to the emergency equipment; and
- Assistance provided by passengers, either requested, offered or given, and behaviour and morale of the passengers prior to the accident.

2. Evaluate the crew training and implementation of emergency procedures, particularly by cabin crew members, as well as the adequacy of these procedures;

3. In the case of ditching, evaluate the following:

- Special instructions on the location, donning and use of life jackets;
- Action by the crew to ensure that each passenger had properly donned and adjusted the life jacket;
- Precaution to have extra life jackets available near the emergency exits; and

- Special instructions given to the passengers regarding which life raft, when, and how to board after the ditching.

4. Determine the relationship to regulatory requirements of the following items and assess their adequacy:

- Number, location and design of emergency exits;
- Presence of placards near each exit;
- Clear and readable instructions on the operation of the opening mechanisms, including location and lighting;
- Number and location of exits used, number of persons who used each exit, and reasons for not using a particular exit;

The emergency equipment used, in part and such as portable extinguishers, axes, escape ropes, and chutes;

- Presence and effectiveness of instructions on how to use the equipment;
- Adequacy and functioning of the equipment; and
- Additional equipment that would have been helpful.

5. The following information should be recorded:

- Passengers injured in relation to their location;
- Injuries sustained during the evacuation;
- Help provided by the crew, passengers and third parties;
- Time required to complete the evacuation, by exit if relevant;
- Difficulties encountered such as:
  - language problems;
  - presence of fire and smoke;
  - failure of emergency lighting;
  - abnormal position of aircraft;
  - distance from the ground;
  - aged, infirmed or infant passengers;
  - injured passengers;
  - panic among passengers or crew; and
  - debris, including luggage.
  - In the case of ditching:
  - water conditions, such as roughness and temperature;
  - light conditions;
  - type and number of life jackets available;
  - number of passengers inflating life jackets prior to egress;
  - effectiveness of life jackets;
  - difficulties in locating passengers;
  - type and number of life rafts used, including position in the aircraft, difficulties in launching, inflating, locating and boarding;
  - number of survivors in each raft;
  - adequacy of instructions on use of rafts and life-saving equipment.

6. Evaluate the effectiveness of the following:

- Emergency escape hatches;
- Emergency lights;
- Fire extinguishers;

- Fire extinguishing systems;
- Fire detectors or alarms;
- Megaphone(s);
- Oxygen bottles;
- Smoke mask(s) and oxygen bottle(s);
- Smoke hoods and personal breathing equipment;
- Flashlights;
- Escape tapes/reels;
- Vivopak/Physician's kit;
- Medical kit;
- First aid kit;
- Resuscitation mask;
- Protective gloves;
- Search mirror; and
- Portable radio beacons.

EVENT 24. Review pertinent cabin documents

Event 10 refers.

1. Review all the documents obtained from the air operator and summarize the pertinent information;
2. Review all the documents obtained from the civil aviation authority and summarize the pertinent information; and
3. Compile, in chronological order, the history for each cabin crew member and for the operator.

EVENT 25. Review of maintenance documents

Event 11 refers.

1. Review all the documents obtained from the air operator and summarize the pertinent information;
2. Review all the documents obtained from the civil aviation authority and summarize the pertinent information;
3. Compile, in chronological sequence, the history of the powerplants, airframe and their major components, complete with incorporated modifications;
4. List all outstanding powerplant and airframe modifications;
5. Record all outstanding and recurring snags and unserviceabilities;
6. Record all snags that may be related to the accident; and
7. Summarize all irregularities.

EVENT 26. Examination and testing (Systems)

Event 12 refers.

1. Select the components that require more detailed examination;
2. Prepare statements of requirements for examination and testing;
3. Arrange for the transportation of selected components to a suitable location for the required examination and testing; and
4. Arrange for investigators to be present at all examinations and testings.

EVENT 27. Fire and explosion

Event 13 refers.

1. Photograph all evidence having a direct bearing on the fire before the wreckage is removed;
2. Review maintenance and parts manuals to gain information on the aircraft structure and systems

3. Review the following information:

- Survivor statements;
- Eyewitness statements;
- Type of cargo carried;
- Quantity and type of fuel on board;
- Air traffic services recorded data;
- Flight recorders information; and
- Pathological

- Pathological information for evidence of smoke or soot in the respiratory system, carbon monoxide or other toxic chemicals, and indications of in-flight explosion such as ruptured eardrums or penetration by small fragments.

4. Determine the requirements for expert technical assistance;
5. Prior to removal of fire extinguishing agent, consider all options in order to reduce destroying evidence;
6. Complete a wreckage diagram including burned areas;
7. Determine if the fire was in-flight or post-impact by reviewing the following:

- Survivor and eyewitness evidence;
- Cockpit configuration;
- Mishap circumstances;
- In-flight fire effects;
- Ground fire effects;
- Crash dynamics, such as location of burned parts with respect to burn areas; and
- Impact effects.

8. Determine if there was an in-flight explosion by the presence of:

- Omnidirectional fire pattern;
- “Opening up” effect;
- Unusual damage to heavy structures;
- Fragmentation of structures; and
- High-speed penetration by fragments.

9. Reconstruct the area where the in-flight fire or explosion is suspected; and

10. Determine the point or area of origin, fuel type and ignition source.

EVENT 28. Examination and testing (Powerplants)

Event 14 refers.

1. Forward engine(s), propeller(s), components and instruments to the appropriate testing facilities;
2. Arrange for investigators to be present at all examinations and testing;

3. Monitor and photograph all phases of examinations and testings;
4. Determine if power was being developed at impact;
5. Select components for further examination and testing; and
6. Interview witnesses with powerplant information.

EVENT 29. Wreckage distribution plotting

Event 15 refers.

1. Plot wreckage distribution to include:

- Significant ground features;
- Point(s) of initial impact;
- Location of major components and pieces;
- Impact direction;
- Ground fire areas;
- Ground scars;
- Indication of serious property damage; and
- Witness locations.

2. Determine the flight path from the first contact with a ground object, to ground contact, to position of rest; and

3. In a mid-air collision, reconstruct the path by using trajectory analysis based on radar plots, flight recorder data, satellite navigation systems data and witness statements.

EVENT 30. Site photography (Phase 2)

Event 16 refers.

1. Photograph wreckage recovery operations;
2. Photograph re-assembly operations (if applicable);
3. Photograph engine tear down operations (if applicable);
4. Photograph components under examination and testing; and
5. Provide analysis of photo/video evidence.

EVENT 31. Flight crew members interviews

Events 3 and 17 refer.

1. Obtain and review flight crew statements; and
2. Conduct individual interviews.

EVENT 32. Victim identification

Events 4 and 18 refer.

1. Collaborate with the coroner and police authorities in the identification of victims; and
2. As appropriate, assist in providing victim identification information such as wallets, clothing, jewellery, age, sex, face, complexion, colour of hair and eyes, height, weight, dental records, scars, growths, skeletal deformities, medical disorders, tattoos, blood group, identification tags and medical files

EVENT 33. Interviews of next of kin

Events 5 and 19 refer.

1. Complete interviews of next of kin of crew members, covering:
   - Personal habits;
   - Personal background;
   - Current medication; and
   - Psychological problems.

EVENT 34. Analysis of flight recorders data

Events 6 and 20 refer.

1. In concert with designated group chairpersons and assigned specialists, conduct a detailed examination of the flight recorders information;
2. In coordination with the Structures Group, Systems Group and Powerplants Group determine the in-flight serviceability of the aircraft, systems and powerplants; and
3. In coordination with the Operations Group, Witness Group, and the Air Traffic Services and Airport Group, reconstruct the flight path, taking into account the satellite navigation systems data, if available.

EVENT 35. Interviews (Meteorology)

Events 7 and 21 refer.

1. Conduct interviews of witnesses, such as:
   - Eyewitnesses;
   - Other flight crews;
   - Weather forecasters or observers; and
   - Weather broadcasters.

2. Review and assess personnel qualifications;
3. Determine the accuracy of weather measuring equipment; and
4. Update the cross sectional weather profile.

EVENT 36. Interviews (Air Traffic Services and Airport)

Events 8 and 22 refer.

1. Conduct interviews with those persons directly involved with the aircraft progress, such as:
   - Ground controller;
   - Tower controller;
   - Area controller;
   - Terminal controller;
   - Radio station operator;
   - Radar operator; Other flight crews who may have rendered assistance;
   - Other flight crews who may provide pertinent information on in-flight conditions, aircraft communications and serviceability of radio aids;

- Airport manager; and
- Other airport personnel.

EVENT 37. Rescue operations
Events 9 and 23 refer.

1. Determine and record the following:

- Time and means of alerting rescue units, in part and such as alarm bells, and telephone;
- First instructions given to rescue units, by whom and by what means;
- Number and location of rescue vehicles by type on standby and in reserve, including manpower and equipment;
- Access roads to the site;
- Environmental conditions during the rescue operations;
- Communications equipment on the various vehicles;
- Time at which the rescue units arrived on site;
- Difficulties in locating the site and bringing the injured out of the wreckage;
- The means and personnel providing first medical assistance;
- The arrangements to transport the injured to medical facilities, and adequacy of medical services available; and
- Time at which the rescue operations were completed.

EVENT 38. Cabin condition

Events 10 and 24 refer.

1. Review and record (in situ) the condition of:

- General cabin interior;
- Cabin structure;
- Floor structure;
- Aircraft doors;
- Air stairs;
- Emergency exits;
- Breaches of cabin structure;
- Passenger seats;
- Seat pitch for each class;
- Aisle width;
- Flight attendant seats;
- Seat belts (passengers and flight attendants);
- Overhead bins;
- Galleys, including controls and circuit breaker positions;
- Trolleys/carts;
- Public address system, including controls and circuit breaker positions;
- Life preservers;
- Seat bottom cushions;
- Safety features cards;
- Evacuation alarm system;

Emergency equipment:

- Fire extinguisher(s);

- Fire axe;
- Megaphone;
- Oxygen bottles;
- Smoke mask/oxygen bottle;
- Smoke hoods;
- Flashlights;
- Escape tapes/reels;
- Vivopak/physician's kit;
- Medical kit;
- First aid kit;
- Resuscitation mask;
- Protective gloves;
- Search mirror;
- Portable radio beacons;
- Cabin baggage;
- Floor level lights; and
- Seat blocking.

2. Determine the passenger/freight configuration.

EVENT 39. Interviews (Maintenance and Records)

Events 11 and 25 refer.

- Identify personnel to be interviewed;
- Coordinate the interviews with other group chairpersons;
- Prepare questions;
- Conduct the interviews; and
- Review and examine interviews for areas of conflict, errors and inconsistencies.

EVENT 40. Interviews (Systems)

Events 12 and 26 refer.

1. Identify personnel to be interviewed;
2. Coordinate the interviews with other group chairpersons;
3. Prepare questions;
4. Conduct the interviews; and
5. Review and examine interviews for areas of conflict, errors and inconsistencies

EVENT 41. Crashworthiness

Events 13 and 27 refer.

1. Determine the requirement for mechanical or aeronautical engineering assistance;
2. Assess the volume of liveable space remaining within the occupied section of the aircraft after impact forces had dissipated;
3. Determine the volume of liveable space which may have been compromised during the accident sequence, since ductile materials can rebound after impact forces leaving no traces of their invasion of liveable space;
4. Determine the space between seats and aircraft structures, in part and such as instrument panel, control column, seat backs, trays, and galley that may have contributed to the nature and extent of injuries;

5. Determine if the container was penetrated by objects from outside the aircraft;
6. Determine the effects of unsecured interior aircraft equipment or cargo acting as missiles, in part and such as serving carts and oxygen bottles;
7. Determine the effects of passenger luggage on liveable space;
8. Assess the adequacy of walkways and exits;
9. Record the original seating position of deceased passengers and positions where bodies came to rest after the accident;
10. Record the type of seat belt, seat belt anchorage, shoulder harness and anchorage, seat structure and anchorages, and floor installed in the aircraft;
11. Record the damage to each of the items in task 10 above;
12. Record the effects of webbing material on the nature and extent of injuries, in part and such as cotton/rayon, and nylon; as well as their flammability, elasticity, and adjustment-buckle slippage;
13. Record the type and load-limiting adequacy of cargo restraints, such as nets, lines and pallets;
14. Record the seat geometry for structural strength and energy absorption properties;
15. Record the seat cushions' energy absorption properties and flammability;
16. Assess the adequacy of the seat belt, seat belt anchorage, shoulder harness and anchorage, seat structure and anchorages, and floor installed;
17. Assess the effects of the cockpit and cabin environment on occupant survivability;
18. Record the following basic data for the determination of energy absorption:
    - Terrain angle;
    - Flight path angle;
    - Angle of impact;
    - Crash force resultant;
    - Crash force angle; and
    - Aircraft attitude at impact.

19. Record the width, length, depth and orientation of all gouge marks;
20. Record the depth of damage to the underside of aircraft, extent of compression of energy-attenuation devices;
21. Record the horizontal stopping distances, length of airframe compression in the horizontal plane, backward displacement of each wing and empennage surfaces;
22. Determine the direction, magnitude and duration of G-forces;
23. Determine the acceleration forces experienced by the aircraft occupants; and
24. Estimate the impact forces survivability potential.

EVENT 42. Aircraft performance

Events 3, 17 and 31 refer.

1. Collect all information affecting aircraft performance, and review:
    - Flight crew and passenger interviews;
    - Air traffic services and cockpit voice recorder data;
    - Flight data recorder plots;
    - Flight data recorder information related to previous flights of the aircraft;
    - Eyewitness interviews;
    - Weather data;
    - Engine performance findings;
    - Structures findings; and
    - Systems findings.
2. For take-off or landing phase accidents, the following basic information is required:
    - Aircraft gross weight;
    - Aircraft configuration;
    - Airfield elevation;

- Temperature;
- Pressure and density altitudes;
- Wind direction and velocity;
- Runway slope;
- Runway surface (type and braking action);
- Runway length;
- Pertinent obstacles; and
- Engine thrust.

3. Complete a mathematical analysis of the theoretical take-off or landing performance of the aircraft;
4. Compare actual and theoretical flight path and assess the significance of differences;
5. Obtain specialist assistance as required;
6. Consider the requirement for the conduct of flight tests or simulator tests to determine the effects of various combinations of aircraft configuration, engine performance and pilot techniques; and
7. If required, assess accuracy of performance charts.

EVENT 43. Autopsies

Events 4, 18 and 32 refer.

1. Collaborate with the coroner and police authorities regarding the autopsy requirements, and specify a list of essential tissue and fluid specimens to be collected;
2. Request autopsies of the flight crew members, including the determination of the cause of death and the presence of any pre-existing disease;
3. Request autopsies of the cabin crew members and passengers, including the cause of death and the presence of any pre-existing disease;
4. For each flight crew and cabin crew member obtain the following information:
   - Position in the aircraft at impact and evidence of activity;
   - Position relative to angle of impact (to establish direction of forces on bodies);
   - Evidence of injury, incapacitation or any physiological or toxicological irregularities prior to impact;
   - Pre-impact physical or emotional stress;
   - Pre-impact impairment from disease, injury or abnormality;
   - Pre-impact impairment from alcohol, drugs, carbon monoxide, or toxic substances;
   - Pre-impact exposure to explosion and fire; and
   - Adequacy of restraint systems.

5. If feasible, for each passenger obtain the following information:
   - Position relative to angle of impact (to establish direction of forces on bodies);
   - Pre-impact injury of any kind;
   - Pre-impact exposure to explosion, fire, carbon monoxide or toxic substances;
   - Physiological or toxicological irregularities; and
   - Adequacy of seat belts.
6. Obtain the autopsy reports.

EVENT 44. Re-interviews (Eyewitnesses)

Events 5, 19 and 33 refer.

1. Compile a list of witnesses to be re-interviewed;
2. Prepare questions; and
3. Re-interview witnesses.

EVENT 45. Navigation aids and airport status

Events 8, 22 and 36 refer.

1. Obtain the appropriate navigation and approach charts;
2. Request ground and flight checks of pertinent navigation and approach aids for:
   - Location (geographic coordinates);
   - Identification signal;
   - Power output and supply;
   - Emergency equipment;
   - Radiation pattern;
   - Normal level of performance; and
   - Interference(s).

3. Review:
   - Operating and maintenance schedules;
   - Past complaints; and
   - Serviceability status.

4. Examine status of airport and associated facilities, such as:
   - Runway in use;
   - Apron and taxiways;
   - Lighting;
   - Rescue and firefighting services;
   - Station logs; and
   - Equipment inspection documents.

EVENT 46. Firefighting operations

Events 9, 23 and 37 refer.

1. This aspect of the investigation should, if applicable, be conducted in cooperation with the Structures Group responsible for investigating the initiation and spread of the fire;
2. Determine and record the following:
   - Time and means of alerting the various firefighting units;
   - First instructions given and how;
   - Number of vehicles by type on stand-by and in reserve;
   - Type, quantity and rate of discharge of extinguishing agents;
   - Special tools, in part axes, crow-bars, and powered tools;
   - Personnel available on each vehicle and their equipment;
   - Location of the various firefighting units that participated;
   - Route taken to the site by each vehicle and adequacy of the access roads;
   - Environmental conditions, such as weather, terrain, ground or water conditions;
   - Communications capabilities of each vehicle;
   - Time at which the firefighting vehicles arrived at the site; and
   - Difficulties encountered such as:
   - locating the site;
   - reaching the wreckage;
   - lack or poor detail of charts;
   - inadequately trained personnel;
   - intensity of the fire;
   - wind direction and strength;
   - temperature;

- availability of water and/or extinguishing agents;
- control and supervision;
- precautionary measures taken to prevent spreading or restarting the fire;
- time at which the fire was under control and completely extinguished; and
- training and standards of rescue and firefighting personnel

EVENT 47. Interviews (Cabin crew and passengers)

Events 10, 24 and 38 refer.

1. All cabin crew members should provide a written statement prior to the interview;
2. The cabin crew members should be questioned from a list of prepared questions covering:
   - General details of the operation;
   - Phase of flight at time of accident;
   - Weather conditions at time of accident;
   - Serviceability of aircraft;
   - Flight attendant's flying background and experience;
   - Crew rest periods;
   - Movements over the last 24 hours, and over 72 hours;
   - Post-accident activities, in part and such as physical condition, and evacuation; and
   - Any other question pertinent to the circumstances.
3. This interview could be followed at a later date by a more in-depth interview during which elements critical to the investigation should be discussed in detail;
4. Interview witnesses with cabin safety information;
5. Interview next of kin, company representatives and civil aviation authority personnel;
6. Interview as many passengers as possible; and
7. If required, mail questionnaires to surviving passengers not interviewed.

EVENT 48. Maintenance management

Events 11, 25 and 39 refer.

1. Review the following maintenance management aspects;
   - Standards and procedures;
   - Quality assurance programmes;
   - Equipment and facilities; and
   - Personnel and training.

EVENT 49. Wreckage reconstruction

Events 13, 27 and 41 refer.

1. Select a suitable re-assembly area;
2. Determine the method of reconstruction;
3. Obtain the personnel and material resources;
4. Complete the re-assembly;
5. Photograph the re-assembly operations;
6. Interview witnesses; and
7. Select components for examination and testing, if required.

EVENT 50. Analysis and report of the Operations Group

Events 3, 17, 31 and 42 refer.

1. Complete required air operator interviews;
2. Complete interviews of civil aviation authority personnel;
3. Review information from other groups;
4. Review, evaluate and analyse all information collected; and
5. Prepare and submit the group report to the Investigator-in-charge.

EVENT 51. Analysis and report of the Medical/Human Factors Group

Events 4, 18, 32 and 43 refer.

1. Assemble the medical data;
2. Review witnesses' statements;
3. Review, evaluate and analyse all information collected;
4. Prepare the group report using the following headings and sub-headings:
   - Crew:
   - personal history, including habits;
   - medical status and history, including current medication;
   - pre-flight activities having human factors significance;
   - physiological, psychological and toxicological irregularities;
   - incapacitation or injury prior to impact;
   - position in aircraft and crew activity at impact;
   - position of members relative to angle of impact; and
   - injuries resulting from the accident.
   - Passengers:
   - pre-accident physiological conditions; and
   - injuries resulting from the accident.
   - Human engineering:
   - instrumentation, controls, autopilot, crew seats, armrests, and other fatigue-combating devices.
   - Survival equipment performance:
   - seat belts and harnesses;
   - seats and anchorages;
   - escape devices;
   - dinghies;
   - food and clothing kits; and
   - medical kits; and
5. Submit the group report to Investigator-in-charge.

EVENT 52. Analysis and report of the Witness Group

Events 5, 19, 33 and 44 refer.

1. For ease of reference and if the number of interviews warrants, summarize each interview and attach a précis of the interview to the front of each interview record. Such a précis should also contain an assessment of the credibility of the information;
2. Prepare a matrix of witness testimonies that highlights critical issues; and
3. Prepare and submit the group report to the Investigator-in-charge.

EVENT 53. Analysis and report of the Flight Recorders Group

Events 6, 20, and 34 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 54. Analysis and report of the Meteorology Group

Events 7, 21 and 35 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 55. Analysis and report of the Air Traffic Services and Airport Group

Events 8, 22, 36 and 45 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 56. Analysis and report of the Survivability Group

Events 9, 23, 37 and 46 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and the submit group report to the Investigator-in-charge.

EVENT 57. Analysis and report of the Cabin Safety Group

Events 10, 24, 38 and 47 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 58. Analysis and report of the Maintenance and Records Group

Events 11, 25, 39 and 48 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 59. Analysis and report of the Systems Group

Events 12, 26 and 40 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 60. Analysis and report of the Structures Group

Events 13, 27, 41 and 49 refer.

1. Review, evaluate and analyse all information collected; and

2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 61. Analysis and report of the Powerplants Group

Events 14 and 28 refer.

1. Assemble examination and testing data;
2. Review, evaluate and analyse all information collected; and
3. Prepare and submit the group report to the Investigator-in-charge.

EVENT 62. Analysis and report of the Site Survey Group

Events 15 and 29 refer.

1. Review, evaluate and analyse all information collected; and
2. Prepare and submit the group report to the Investigator-in-charge.

EVENT 63. Analysis and report of the Photo/Video Group

Events 16 and 30 refer.

1. Complete photo and video requirements;
2. Review, evaluate and analyse all information collected; and
3. Prepare and submit the group report to the Investigator-in-charge.

EVENT 64. Operations analysis and findings

1. This event should be chaired by the Investigator-in-charge with the following group chairpersons attending:
   - Operations;
   - Medical/Human Factors;
   - Witness;
   - Flight Recorders;
   - Meteorology;
   - Air Traffic Services/Airport;
   - Survivability;
   - Cabin Safety; and
   - Other parties, as dictated by local regulations and procedures.

2. Review all group findings to determine adequacy of information, areas of conflict, errors and inconsistencies;
3. Identify the areas requiring clarification;
4. Determine the procedure for achieving clarification;
5. Complete the operations analysis and determine findings with assistance from the technical groups;
6. Identify safety hazards and deficiencies; and
7. Suggest safety recommendations.

EVENT 65. Technical analysis and findings

1. This event should be chaired by the Investigator-in-charge with the following group chairpersons attending:
   - Maintenance and Records;
   - Systems;
   - Structures;
   - Powerplants;
   - Site Survey;
   - Photo/Video; and
   - Other parties, as dictated by local regulations and procedures.
2. Review all group findings to determine adequacy of information, areas of conflict, errors and inconsistencies;
3. Identify the areas requiring clarification;
4. Determine the procedure for achieving clarification;
5. Complete the technical analysis and determine findings with assistance from the operations groups;
6. Identify safety hazards and deficiencies; and
7. Suggest safety recommendations.

EVENT 66. Report of the Investigator-in-charge

1. Organize the narrative;
2. Analyse the information;
3. Determine and assemble the findings;
4. Determine the causes;
5. Identify safety hazards and deficiencies;
6. Propose safety recommendations;
7. Organize and attach appendices;
8. Assemble the report;
9. Incorporate late information;
10. Submit report to investigation authority;
11. Following revision by the investigation authority, revise report as required; and
12. Submit the investigation report to investigation authority for approval.

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