NPA No. 01/2013
ATS IN-FLIGHT EMERGENCY RESPONSE MANUAL

Release Date: 27 January 2013

The General Civil Aviation Authority (GCAA) intends to issue a manual providing formal guidance for ATC staff to enhance responses to in flight emergencies.

The manual will support CAR Part VIII, subparts 4 (ATS) and 8 (SAR).

The enclosed IFER shall be issued as an ANSIN once the NPA process is complete and any accepted amendments have been incorporated into the document.

This notice is published to announce this proposed manual to the aviation industry and to entitle all concerned parties, especially appropriate local authorities in each Emirate and air navigation service providers, to:

1. Review the attached proposed manual;
2. Submit their comments online through the GCAA website within 30 days from the date of this NPA.
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Chapter 1 INTRODUCTION

1.1 General

This manual answers the need for formal procedures for In-Flight Emergency Response (IFER) by air traffic controllers to act as an aid to enhance and standardise the service provided by air traffic controllers managing in-flight emergencies. As a result of investigation findings of a series of accidents and serious incidents a growing awareness amongst air traffic services providers and regulators has arisen of a need for well-developed IFER procedures and training as an integral part of an ATS provider’s safety culture.

The IFER service has come to be widely accepted as a necessary adjunct to ATC and SAR services in consideration of an identified risk that an insufficient ATC response or assistance to a pilot experiencing an in-flight emergency which results in loss of life, injury or damage to property could have severe safety, business and political consequences.

The IFER service is designed as an effective bridge between the provision of regular ATC, when aircraft are operating normally, and the SAR service, that is needful at the onset of any situation that portends grave and imminent danger. IFER services serve that critical period of flight in which an aircraft’s operations are identified as being abnormal while not necessarily being so immediately critical as to suggest the imminence of a crash, ditching or forced landing.

1.2 Documentation

UAE Civil Aviation Law at Chapter 2 (General) Article 19 states that “The Chicago Convention and other protocols and agreements pertaining to civil aviation and its protection, of which the State is a party, shall be considered complementary to the provisions of this Law in as much as they do not contradict its provisions”.

ICAO PANS-ATM Doc 4444 at paragraph 8.8.1.1 states that “In the event of an aircraft in, or appearing to be in, any form of emergency, every assistance shall be provided by the air traffic controller, and the procedures prescribed herein may be varied according to the situation”. This implies a high service priority requirement but allows for application of procedures, perhaps spontaneously developed by individual controllers, of varying appropriateness and standards.

Although there are clear demands made of air traffic controllers to respond to in-flight emergencies in several ICAO annexes and documents, it may be concluded that they lack specificity. Guidance material directly related to management of in-flight emergencies is lacking.

It is intended that this GCAA IFER manual should provide sufficient IFER structured processes, procedures and guidance to ATS Providers to allow them to enhance IFER Service and ATC...
emergency handling skills and knowledge, through a well-documented and structured IFER System.

1.3 Nature of service

In-Flight Emergency Response (IFER) is defined as a service provided by air traffic controllers that provides reasonable advice and actions to assist a pilot who is or may be in distress or not operating under normal safe conditions to enable them to:
   a) operate in safe airspace (e.g. VFR aircraft to re-establish flight in VMC);
   b) resume normal operations; or
   c) land the aircraft safely.

IFER is also significantly important for handling incidents of unlawful interference, which can rapidly change from a situation of aeronautical emergency to one with serious significance for national defence and the safety of many lives on the ground. Of special importance, then, is the requirement for rapid transfer of information to State security forces and the enactment of extraordinary procedures, including relegation of management responsibility to designated external personnel.

There is a similar need for rapid and effective information transfer between ATS units and RCCs across the whole range of emergency situations when RCCs will have to assume operational responsibility after an aircraft in an emergency situation is subject to a SAR Phase Declaration.

1.4 Stress factor

In view of the potentially traumatic situations that may develop out of in-flight emergencies, it is important that consideration be given to the impact of stress and shock on air traffic controllers’ response in the development of IFER procedures. For the same reason, attention should be given to the need for psychologically based air traffic controller training that is designed to increase controllers’ ability to cope and to effectively assist flight crews confronted with extraordinary emergencies. While it is not suggested that this manual meets these needs in their entirety, the procedures listed here have been developed with these imperatives in mind.

The adverse effects of nervousness in humans are well documented. Stress and “the startle factor” cause the sympathetic nervous system (SNS) to activate the fight-or-flight syndrome.

The activation of the SNS in air traffic controllers responsible for responding to in-flight emergencies can be an impediment to their effective performance. Just when controllers’ cognitive processing should be at its peak, the fight-or-flight syndrome can degrade the response capacity and memory recollection of controllers and jeopardize the quality of their assistance.
It is important that controllers are aware of this prospect whenever emergencies arise and that they take special counter-active measures to ensure that vital actions are not forgotten and critical coordination is not overlooked.

One effective means of ensuring that vital actions are appropriately taken is to use memory aids or, as they are sometimes called, mnemonics. Situations can, however, arise that defy the application of such simple aids and require that controllers, as for pilots on the flight deck, take recourse to comprehensive checklists. Checklists, therefore, are an important inclusion in this manual and a vital part of IFER. Their use, however, should not be indiscriminate or slavish. It is recommended that they be consulted after the initial stage of notification and acknowledgement has passed and the situation has stabilized to the point where assessment and review of the situation can be systematically accomplished. Check lists, at this time, can serve as a valuable purpose in jogging controllers’ memories and drawing attention to actions worthy of controllers’ consideration.

1.5 Complementary training

It is strongly recommended that this manual be complemented with regular training of controllers that takes into account:
   a) ATS / RCC interface;
   b) coordination and communication requirements with aircraft operators, external emergency authorities and other concerned parties;
   c) aviation human factors considerations and lessons from research and development activities; and
   d) procedures already developed for the management of in-flight emergencies by flight crews.

This training should be conducted in, but not limited to, classrooms and simulators for both ab-initio training and regular refresher training for ATC Officers.

Computer based training (CBT) is a very useful and cost effective training method because it can partly replace classroom training (with all its rostering difficulties and costs) and it can be easily “path-tracked” for currency record keeping. It is, however, evident that CBT on its own does not suffice for effective refresher training. A team learning environment with discussion of case studies and participation in desktop scenarios that illustrate application of basic principles is also required.

There has been an acceptance by ATS Providers that it is impracticable to develop procedures and train controllers for response to all conceivable abnormal or emergency events. It is, however, desirable and possible to develop generic skills and procedures which have application in a wide range of scenarios. It has become increasingly accepted that a helpful means of optimising such an affective practical awareness is to involve controllers in simulated emergency situations.
It is recommended that ATC Unit Training Departments consider development of emergency simulation training programmes, directly linked with local airline operators. Airline operators provide emergency simulation training for pilots on a regular basis and would normally welcome direct involvement of ATC during the simulation to act as the communicator to the pilot. This would result in an improved awareness by ATC of the issues faced by pilots during emergency situations and would permit valuable practical emergency handling practise by the ATC Officers. However to ensure that the involvement of ATC during such simulations did not negatively disrupt or distract the exercises from the operator’s training objectives, close coordination and preplanning would be required with the Airline’s and ATC Unit’s training departments to ensure maximum benefit to both parties.

1.6 IFER Management in UAE

In order to standardise the level of performance delivered within the UAE, ATC Units shall endeavour, wherever practicable, to provide necessary training to senior ATC Staff and Management to enable them to accept the role of IFER Manager. This role would normally be taken by ATC Supervisors and appropriately trained senior ATC Staff with the responsibility to manage the handling of the emergency situation by providing coordination and guidance, supported with the use of IFER checklists, to assist the controller in communication with the pilot confronted with the emergency.

ATC Units shall ensure that whenever practicable, an IFER Manager, preferably with appropriate training, shall provide assistance in the management of an emergency situation, to relieve the pressure from the ATC Officer communicating directly with the pilot subject to the emergency, to enable the best possible service to be provided. This is particularly important during emergencies which extend over a prolonged period.

It is understood that during the initial stabilisation phase of an emergency and in cases where a controller is operating in an operational position, such as a single man tower, where a senior staff member with IFER Manager training may not be available, that the IFER Service needs to be managed, at least in the short term by the ATC Officer communicating with the pilot in distress. However in these cases the ATC Unit’s IFER checklist, relevant to the type of emergency, shall be utilised by the ATC Officer.

It is envisaged that some specialist skills for the IFER Manager role should be developed through specific IFER Manager training, including assistance to lost aircraft, plotting of intercept and escort procedures and particular skills associated with communicating with an aircraft subject to unlawful interference.
1.7 Checklists

IFER Checklists shall be made available to, and used by ATC Officers for use in the handling of aircraft emergency situations.

Chapter 10 of this manual includes examples of generic checklists that may be used by ATC Units as guidance material to respond to various in-flight emergencies. These checklists are comprehensive and describe proposed mandatory required actions, possible required actions and highlights cautions which IFER Managers and ATC Officers need to adhere to and take into account during the handling of an emergency. These are however generically based and in most cases it is expected that the ATC Units develop specific tailored IFER Checklists to best suit their ATC unit requirements.

It is not possible to prescribe checklists to cater for every possible emergency or aircraft impairment or malfunction that may arise without prejudicing the brevity required for controllers to quickly respond to an emergency. A failure of one aircraft system may cause impairment of another and emergencies often escalate unpredictably. IFER Managers and ATC Officers should receive instruction and training to understand that apart from mandatory required actions, the IFER Checklists serve as a memory tool to assist in the provision of the best possible quality of IFER Service.

No claim is made for the checklists being exhaustive, and ATC Units should regularly review and update their unit specific IFER Checklist and ATC Officers shall be required to exercise discretion in their use.
Chapter 2  GLOSSARY

AEP  Airport Emergency Procedures
Adequate aerodrome  An aerodrome approved by an air operating company for emergency use
AGL  Above ground level
AIP  Aeronautical Information Publication
ATC  Air Traffic Control
ATCO  Air Traffic Control Officer
ATS  Air Traffic Service
ANSP  Air Navigation Service Provider
ATSP  Air Traffic Service Provider
ADS – B  Automatic Dependent Surveillance (Broadcast)
ADS – C  Automatic Dependent Surveillance (Contract)
APU  Auxiliary Power Unit
ACAS  Aircraft Collision Alerting System

CISM  Critical Incident Stress Management
CPDLC  Controller Pilot Data Link Communications
COSPAS – SARSAT  Space System for Search of Craft in Distress - Search and Rescue Satellite-aided Tracking

DH  Decision Height
EAT  Expected Approach Time
EST  Estimate(d)
ETA  Estimated Time of Arrival
ELT  Emergency Locator Transmitter
EPIRB  Emergency Position Indicating Radio Beacon

FANS1  Future Air Navigation System
Forced landing - A landing necessitated by failure of engines, systems or components that makes continued flight impossible, and which may or may not result in damage or injury.

FPL  Flight Plan
GA  General Aviation

HVDF  High Frequency and Very High Frequency Direction Finding

IFE  In-flight Emergency
IFER  In-flight Emergency Response
IMC  Instrument Meteorological Conditions

JBAR  Jet Barrier
JRCC  Joint Rescue Coordination Centre
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>Km</td>
<td>kilometer(s)</td>
</tr>
<tr>
<td>MDA</td>
<td>Minimum Descent Altitude</td>
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<tr>
<td>MDH</td>
<td>Minimum Descent Height</td>
</tr>
<tr>
<td>MEA</td>
<td>Minimum En-Route Altitude</td>
</tr>
<tr>
<td>MSA</td>
<td>Minimum Safe Altitude</td>
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<tr>
<td>NAVAID</td>
<td>Radio Aid to Navigation</td>
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<tr>
<td>Nm</td>
<td>nautical mile(s)</td>
</tr>
<tr>
<td>NOTAM</td>
<td>Notice(s) to Airmen</td>
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<tr>
<td>Precautionary Landing</td>
<td>A landing necessitated by apparent impending failure of engines, systems or components or incapacitation of the flight crew, or, in the case of a VFR pilot, encounter with adverse meteorological conditions that makes continued flight inadvisable.</td>
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<tr>
<td>POB</td>
<td>Persons On Board</td>
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<tr>
<td>RA</td>
<td>Resolution Advisory</td>
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<tr>
<td>RCC</td>
<td>Rescue Coordination Centre</td>
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<tr>
<td>RFFS</td>
<td>Rescue and Firefighting Service</td>
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<tr>
<td>RSC</td>
<td>Rescue Sub-Centre</td>
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<tr>
<td>SAR</td>
<td>Search and Rescue</td>
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<tr>
<td>SMC</td>
<td>Search and Rescue Mission Coordinator</td>
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<tr>
<td>SID</td>
<td>Standard Instrument Departure</td>
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<tr>
<td>SKEDS</td>
<td>Scheduled Radio Reports</td>
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<tr>
<td>SPL</td>
<td>Supplementary Flight Plan</td>
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<tr>
<td>Suitable aerodrome</td>
<td>An aerodrome approved by an air operating company for normal use</td>
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<tr>
<td>TA</td>
<td>Traffic Advisory</td>
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<tr>
<td>TCAS</td>
<td>Traffic Collision Avoidance System</td>
</tr>
<tr>
<td>UHF</td>
<td>Ultra High Frequency</td>
</tr>
<tr>
<td>VFR</td>
<td>Visual Flight Rules</td>
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<tr>
<td>VHF</td>
<td>Very High Frequency</td>
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Chapter 3  AN OVERVIEW OF FLIGHT CREW ACTIONS DURING AN IN-FLIGHT EMERGENCY

3.1  INTRODUCTION

3.1.1  In order to be better prepared to support aircraft in distress, it is important for ATCs to have an understanding of the general ways in which flight crews can be expected to react in various emergency situations. It is therefore appropriate that ATCs become familiar with flight crew emergency response actions on the flight deck. One of the aims of this manual, therefore, is to provide an affective knowledge of flight crew emergency procedures and, thus, establish a foundation for cooperative and effective interaction between ATCs and flight crews during in-flight emergencies.

3.1.2  Chapters 3 through 7 provide general knowledge relative to many emergencies. Together, these chapters provide a basis for broad, effective response by ATCs to in-flight emergencies by detailing a basic set of knowledge-based skills.

3.1.3  When confronted by an in-flight emergency, it is generally acknowledged that flight crews should set the following priorities in taking actions:

- Aviate;
- Navigate; and
- Communicate.

3.2  AVIATE

3.2.1  The flight crew’s immediate priority is to safeguard their aircraft’s flying condition and to ensure that it follows a safe flight-path. The flight crew needs to complete checklist drills whilst continuing to maintain a safe profile. In some circumstances, a rapid descent may be initiated.

3.2.2  On modern aircraft operating with two pilots on the flight deck, the work-load will be distributed as evenly as possible. One flight crew member, for example, may take responsibility for the aircraft’s flight path and the conduct of radio communications while the other may consult the checklist and perform the listed actions.

3.2.3  Controllers should be aware that the flight crew work-load during the initial stages of an in-flight emergency may be high with many prioritized actions placing stressful demands on pilots.

3.2.4  Once the flight crew have completed the checklist actions and established a safe flight-path, they will normally reassess the emergency situation.
3.2.5 The reassessment process normally involves a systematic thought process that is aided by a mnemonic. Typical of the mnemonics used by aircraft operating companies are the following:

D diagnose the problem;
O options available;
D decide what to do;
A allocate tasks; and
R review;

or;

G gather information about the problem;
R review the information;
A analyse the situation and consider alternative course of action
D decide on a solution and implement it; and
E evaluate the solution for effectiveness and appropriateness.

3.2.6 By using mnemonics, flight crews are enabled to take action then review it, and continually recycle through the process to ultimately ensure the best outcome.

3.3 NAVIGATE

3.3.1 During the decision-making process, the flight crew will determine whether to continue the flight to destination or alternate aerodrome, return to the departure aerodrome or make a forced landing.

3.3.2 While the decision to divert to an alternate aerodrome may be almost immediate, the actual diversion of the flight will usually require coordination with ATS and other agencies. The flight crew may require extra information before a plan is agreed upon and request assistance from ATS before advising their intentions. While the flight crew may derive some of the information they require by direct communication with the operating company or other sources, the most accessible and most likely provider will be the ATS system.

3.4 COMMUNICATE

3.4.1 “Communicate” may be last action to be taken by flight crews experiencing a high workload in-flight emergency, thus controllers may not be made aware of an in-flight emergency until either the flight crew has stabilized the situation or it has become seriously adverse.
3.4.2 Pilots subject to an emergency, once they have analysed the circumstances and have initially stabilised the situation, are required to notify ATC either verbally or through selection of emergency transponder code.

3.4.3 Controllers should be aware that, in practice, flight crews may be reluctant or overlook to use the standard phraseology: MAYDAY MAYDAY MAYDAY for distress, and PAN PAN PAN for situations of urgency. They may, rather, use a phrase such as, “We have a problem”.

3.4.4 If, however, flight crews do not formally declare a distress or urgency condition when controllers have a realistic concern, controllers should consider making a specific request to the flight crew to confirm the state of operations.

3.4.5 In the extreme circumstance of a flight crew declining to declare an emergency when the controller has reason to believe that an emergency does, in fact exist, the controller should carry out the actions appropriate to an emergency whilst maintaining a completely supportive role to the flight crew.
Chapter 4  In-Flight Emergency Response Techniques

4.1  INITIAL ACTIONS: A GENERAL OVERVIEW

4.1.1 Immediately upon receipt, ATCs should acknowledge any MAYDAY, PAN or less formal call notifying an emergency. This is an important initial action by the controller, particularly in the scenario of a single piloted aircraft, where the confidence of the pilot subject to an emergency normally is raised after hearing the controllers voice and understanding that every assistance will be provided.

4.1.2 As a general early response, if the subject aircraft is within ATS surveillance system coverage, ATC should advise the flight crew of their position and the nearest suitable and/or adequate aerodrome. In doing so, however, controllers should be careful not to initiate communications that may interfere with flight crew activity or cause an unnecessary burden. In this regard, controllers should, at first, limit their input to responses to flight crew requests and only go on to provide further information as the situation requires and seems to reasonably allow.

Note.– The nearest suitable aerodrome is the closest aerodrome to the aircraft’s position that has the required manoeuvring dimensions, surface bearing capacity and available emergency services and is approved by the aircraft’s operating company for normal use. An adequate aerodrome is one approved by the aircraft’s operating company for emergency use.

4.1.2.1 After the crew has notified its intentions, controllers should provide flight crews with accurate range checks to their selected diversion or destination aerodrome, or, alternatively, the distance to travel if a significant turn is involved.

4.1.3 If the subject aircraft is not within ATS surveillance system coverage, controllers should notify the flight crew of the nearest suitable aerodrome from their estimated position.

4.1.4 Controllers should make provision to reduce their workload as much as possible by immediately alerting the supervisor and requesting assistance. Switching from headphones to loudspeaker operation will attract the attention of other colleagues and the supervisor.

4.1.5 If the emergency is likely to be of more than a short duration, the support of an IFER Manager should be requested whenever practicable.

Note.—The responsibilities of an IFER Manager are listed at paragraph 4.2 below.

4.1.6 Just as flight crews use memory aids (mnemonics) to govern their response to IFEs, so can ATCs use similar aids to facilitate their response.

4.1.6.1 An example of the mnemonic aids that may be used by ATCs is ASSIST:
A - **Acknowledge.** Controllers should ensure that they understand the nature of the emergency and acknowledge accordingly.

S - **Separate.** Controllers should continue to establish and maintain separation.

S - **Silence.** Consideration should be given to imposing silence on the IFE frequency. Flight deck activity should not be disturbed by unnecessary transmissions.

I - **Inform.** Notify appropriate parties as required by the relevant IFER Checklist.

S - **Support.** Maximum support should be given to the IFE flight crew. Check lists should be consulted.

T - **Time.** The flight crew should be allowed sufficient time to stabilise or resolve their emergency situation.

4.1.7 Controllers should ensure that the vital task of separating aircraft continues throughout the above initial actions bearing in mind that in rare cases, separation standards may need to be reduced.

4.1.8 To provide clear airspace in which the subject aircraft may manoeuvre, and to provide maximum support for its crew, the IFER Manager or responsible controller should consider:

- a) If the subject aircraft is within or adjacent to an area of ATS surveillance coverage, requesting the flight crew to squawk 7700;
- b) Holding or diverting other aircraft clear of affected airspace or hold aircraft on the ground;

*Note.* — *It is relatively easy for modern aircraft to set up non-standard holding patterns.*

- c) Reserving a runway for the exclusive use of the subject aircraft;
- d) Using a discrete radio frequency for communicating with the subject aircraft if its selection will not impose an undue workload on the flight crew;
- e) Transferring other aircraft from the frequency being used by the aircraft subject to an emergency to another frequency;
- f) Imposing radio silence.

*Note.* — Annex 10, Volume II, Chapter 5 refers to imposition of radio silence. Caution should be exercised in Class E, F and G airspace since pilots depend on radio monitoring to ensure situational awareness in effecting their own separation.

4.1.9 On-going considerations for the IFER Manager or the responsible controller should include:
a) minimisation of frequency changes;
b) meteorological and operational conditions at the nearest adequate aerodrome;
c) meteorological and operational conditions at the nearest suitable aerodrome;
d) the prospect of the subject aircraft either continuing to destination or diverting to an alternate;
e) the estimated time required to stabilize, improve or resolve the emergency;
f) the vectors or tracks required to minimise the subject aircraft’s flight over populous areas;
g) the flight crews’ awareness of the full extent of the damage to or unserviceability of the aircraft and the effect that it may have on its handling characteristics.

4.1.10 The subject aircraft’s flight crew may need time to isolate the problem(s) and decide on their best course of action.

4.1.11 Communication difficulties may be experienced, particularly if dependent on a second language during a time of stress and/or if the flight crew is wearing oxygen masks.

4.1.12 To minimize potential communication overload, controllers should not request too much information at any one time. Standardized phraseology should be used whenever appropriate.

4.2 THE IFER MANAGER

4.2.1 During an aircraft emergency it may be advantageous to have a single person appointed to assume overall command of the ATS response, particularly in an emergency situation that is likely to be prolonged. Ideally, the IFER manager should have immediate responsibility for no other duties throughout the duration of the emergency or until responsibility is handed-over to an adjacent ATS unit.

4.2.2 As a general rule, the role of IFER manager should be assumed by a senior ATC Officer or supervisor of the unit, with appropriate IFER training and assessment. A supervisor may elect to dedicate themselves to the handling of emergency situation and may call for support to conduct other supervisory activities.

4.2.3 In any case, because of the high workload customarily generated by an emergency situation and the need to control other traffic, the controller communicating with the
pilot/s involved in an emergency should not retain responsibility for management of the handling of the emergency for a prolonged period.

4.2.4 The responsibilities of the IFER Manager should include, but not be limited to:
- obtaining all relevant information;
- coordinating emergency relevant information with other ATC units or organisations;
- monitoring the workload of the controller and providing assistance when necessary;
- declaring SAR Phases if necessary;
- conducting briefings;
- managing ATC resource acquisition and tasking;
- oversight of the ATC delivery of assistance;
- assessing the effectiveness of the ATS response;
- modifying response as necessary, and
- administrative follow-up
- handing over the responsibility for IFER Management to another unit if necessary.

4.2.5 The ATC in communication with the subject aircraft should remain responsible for:
- direct communication with the pilot subject to the emergency;
- providing every assistance in a timely manner;
- the safe management of the airspace and ensuring that separation and/or traffic information, as appropriate, continues to be provided to all traffic within that airspace;
- the coordination of level, route and estimates for the subject aircraft if it will cross or fly adjacent to an airspace boundary;
- acting as a communications link between the IFER Manager and the subject aircraft.
Chapter 5  HUMAN FACTORS AFFECTING IN-FLIGHT EMERGENCY RESPONSES

5.1  GENERAL

5.1.1 The human body’s performance of voluntary and involuntary actions is controlled by the nervous system. Some aspects of the nervous system require conscious control but others, known as autonomic functions, are governed unconsciously.

5.1.2 At any given time, the state of the human body is dependent on a variety of inputs to its nervous system.

5.1.3 Stress and “the startle factor” activate a gland known as the adrenal medulla. This gland floods the bloodstream with neurotransmitters and the hormones of adrenaline and noradrenalin that prepare the body for the fight-or-flight response.

5.1.4 The following effects can result:
- loss of short vision;
- disruption of depth perception;
- reduction in the peripheral vision field (i.e. tunnel vision);
- loss of colour and night vision in low light conditions and at night;
- degradation in performance of fine motor skills; and, importantly, in the context of IFER, inhibition of higher brain function in the cerebral cortex leading to an impeded ability to decide upon optimal response action and to communicate complex concepts,
- degradation of memory.

5.2  FLIGHT CREW

5.2.1 Flight crews managing in–flight emergencies are frequently subjected to very high workload. Some of the human factors that affect flight crews during an in-flight emergency are:
- high stress levels;
- distortion of time perception - time appears to be compressed;
- language problems, especially if communicating in a second language.

5.2.2 ATCs may notice:
- a reluctance by the flight crew to acknowledge the extent of a problem; and
- that communication with ATC is given a low flight crew priority.

5.2.3 Being aware of the possibility of the above is the first step in neutralizing their effects. With practice and preparation, pilots and controllers can become quite adept at consciously
reducing their negative effects and performing their duties in a calm and effective manner. Participation in simulated exercises in controlled environments has proven to be an excellent means of preparing operational personnel for effective emergency action by reducing the adverse effects of autonomic nervous system responses.

5.2.4 Commercial pilots are exposed to frequent checks of their proficiency in handling simulated emergencies. However, private pilots often do not receive the same degree of training and controller should be aware that they may need more assistance when confronted with an emergency situations.

5.3 HYPOXIA

5.3.1 Hypoxia is a state of oxygen deficiency in the body sufficient to impair functions of the brain and other organs. Because of the nature of flight, it is vital that flight crews maintain a high level of competency and mental performance. Knowing what to look for and how to react to resolve a situation which may induce hypoxic effects is essential to maintain flight safety.

5.3.2 In aeronautics, hypoxia typically results from a decompression or lack of pressurization of the aircraft cabin. If there is a cabin rupture or other cabin depressurization that occurs extremely quickly, hypoxia can occur within a few seconds, especially if cabin pressure altitude is higher than 7,500 m (about 25,000 ft). This sudden onset hypoxia is termed fulminant hypoxia. At high altitudes, loss of consciousness could occur within a few seconds without any warning symptoms. At lower altitudes a person may generally will feel certain signs, such grogginess, dizziness or a feeling of overconfidence or complacency. Flight crews should always be vigilantly watching for any abnormal symptoms being experienced by themselves or other crew or passengers which may raise suspicion to a hypoxic event.

5.3.3 There is no way for physiological adaptation to prevent hypoxia effect in the aeronautical environment when there is a rapid decrease in barometric and lung pressure. Pressurization of the aircraft cabins together with numerous alerts and warnings act as the first line of defense against hypoxia. In case of a significant cabin pressurization failure in commercial aircraft, supplemental oxygen is provided. Pilots must be aware of issues related to hypoxia and trained on the correct use of oxygen masks.
Chapter 6: AIRCRAFT MALFUNCTION AND IMPAIRMENT AND UNUSUAL CIRCUMSTANCES

6.1 GENERAL

6.1.1 This chapter briefly sets out some situations that ATCs may expect during aircraft malfunctions or impaired operation.

6.1.2 The last section of the chapter contains information relevant to unusual circumstances that may arise during aircraft operations.

6.2 REJECTED TAKE-OFF

6.2.1 Flight crews may reject a take-off in the event of a serious warning such as engine failure or fire warning or because of imminent danger arising from, for example, a runway incursion.

6.2.2 Maximum use of brakes may be required to bring a large aircraft moving at high speed and at maximum take-off weight (MTOW) to a halt. This may cause aircrafts’ tires to burst or ignite or the brakes to over-heat.

6.2.3 In the event of a serious emergency, the aircraft may be brought to a stop either on a runway or in an overrun area, and the passengers may need to be quickly evacuated via the emergency escape slides. If passengers are evacuated onto operational areas of an aerodrome, care will need to be exercised to ensure their safety after they have left the aircraft.

6.2.4 If a take-off is rejected within normal operating confines, once normal taxiing speed is achieved, the flight crew may position their aircraft on a taxiway, clear of the runway, and any danger to aircraft occupants can be more easily managed and mitigated.

6.2.5 Controllers should be aware that after a rejected take-off, even if there is no obvious tyre burst or fire, pilots often need to request a period of delay, due to ‘Hot Brake’ indications. Controllers should consider the need to adjust the traffic sequence and position the subject aircraft in a suitable location while the brakes are cooled. Consideration should also be made to conduct a runway inspection for tire FOD.

6.3 FLIGHT CONTROL SYSTEMS

6.3.1 Flight control systems consist of the flight control surfaces, their respective flight deck controls, connecting linkages and the necessary operating mechanisms to move the
aircraft about the three rotational axes. The elevators control an aircraft’s rotation about the pitch axis, the ailerons the roll axis and the rudder the yaw axis.

6.3.2 In light aircraft, the flight control surfaces are operated by direct pilot input to mechanical linkages and wire cables.

6.3.3 Most larger aircraft require flight control surfaces of such a size that, if mechanical, they would need unreasonable physical effort to move them. Thus, some form of power assistance is needed to augment pilots’ physical input. Power assistance is often achieved by using hydraulic (hydro-mechanical) actuators.

6.3.4 Some aircraft have been built with electrically operated servo-tabs attached to their control surfaces. These tabs operate in the airflow in such a manner as to move the control surface in the required direction. Since the pilot has no direct linkage connection to the control surfaces, it has become necessary to build in a “feel simulator” to replicate the resistance usually felt by the pilot when moving the controls.

6.3.5 Many modern aircraft employ “fly-by-wire” flight control systems. In some of these aircraft, the flight control surfaces are operated by self-contained, electrically driven pumps that move hydraulic actuators. Computers monitor the operation of the systems and provide “feel simulation”.

6.3.6 “Feel simulators” provide feedback to the control column and rudder bar, (or to the side-stick, as it is in some modern aircraft types), so that increasing resistance is felt as the control column and rudders are moved toward the extremity of their travel, thus they guard against excessive control inputs.

6.3.7 Failure of “fly-by-wire” systems is virtually unknown since they are usually triplicated or sometimes quadriplexed.

6.3.8 There have been some emergency situations arise in which, when damage was sustained to flight control surfaces, asymmetric engine thrust was used to control the direction of flight.

6.3.9 The protrusion of trim-tabs into the airflow around aircraft control surfaces can induce drag, thus increase fuel consumption. To reduce this drag, some modern turbo-jets employ fuel pumps to move fuel between internal fuel tanks, thereby reducing the extent of trim input required. Onboard computers continuously monitor the trim of the aircraft and automatically distribute the fuel between the tanks to maintain optimum trim.
6.4 FLAPS

6.4.1 To provide greater lift at slow speeds, flaps are lowered or extended to change the effective aerofoil shape of aircraft wings. The extended flaps increase the drag of the wing, consequently higher engine power settings are needed when the flaps are lowered. The construction of trailing edge flaps varies, some of their type names are: normal flaps, simple split flaps, slotted flaps, zap flaps, fowler flaps, and extending flaps.

6.4.2 Many aircraft types have, in addition to trailing edge wing flaps, flaps on the leading edges of their wings. These leading edge wing flaps are variously named according to their style of construction. They are: slats, Kruegers, variable camber flaps, and droops or profiled leading edge flaps. On most modern turbo-jet aircraft, the leading edge flaps are deployed when the first trailing-edge flap setting is selected, usually ten to fifteen degrees.

6.4.3 Flaps on light aircraft are usually extended by the pilot moving a lever or depressing an electric switch. Flap retraction is achieved by moving the lever in the opposite direction or depressing the electric switch.

6.4.4 On large aircraft, flaps are deployed by hydraulic or electrical systems. Failure of the electrical or hydraulic systems that operate the flaps in larger aircraft will prevent flap extension, thus higher approach and landing speeds will become necessary. High landing speed will require a greater landing distance and may need excessive braking that could cause brake overheating. The brakes may need time to cool before taxiing can be resumed.

6.4.5 In extreme circumstances, brake fires may result. These are extinguished with dry powder, not liquid based suppressants, to avert explosive fracturing of brake disks.

6.5 SPEED CONTROL SURFACES

6.5.1 Small flat surfaces that can be extended vertically from the upper surface of the wings of aircraft are known as spoilers and are used to decrease lift and thus control the glide angle of the aircraft. After landing with spoilers up, lift is quickly lost and an aircraft is enabled to more easily settle onto its landing gear without bouncing. Some large commercial turbo-jet aircraft have spoilers that operate in concert with the ailerons at low speeds. These spoilers can dump lift on only one wing and so assist the action of the ailerons.

6.5.2 Some civil aircraft are fitted with speed brakes. They take the form of panels on either side of the rear fuselage that are deployed by hydraulic actuators. They enable the aircraft to quickly lose altitude without increasing speed. This prevents possible engine damage from shock cooling if the power were to be rapidly reduced to a minimum to
maximise rate of descent. The speed brakes enable rapid loss of height while maintaining moderate engine power settings.

6.6 ENGINE FAILURES

6.6.1 Engine failure in a single engine aircraft is critical. In many instances, engine failures occur as a result of human factors. An engine failure immediately after take-off will normally force a pilot to commit to a crash landing in an area within approximately 45 degrees either side of the extended runway centre-line. If sufficient height has been achieved, the pilot may request a contraflow landing (i.e. on the reciprocal runway).

6.6.2 If an engine failure occurs en-route, there may be a loss of cabin pressure in a pressurised aircraft that may require an emergency descent and or landing at the nearest available aerodrome.

6.6.3 Further effects of engine failure may be;

- failure of the attitude indicator and directional indicator if they are suction driven from an engine pump. If they are electrically operated, they will continue to function while battery power lasts;

- a requirement to manually extend the landing gear, (although this may not be advisable before a crash landing or ditching due to the risk of a “nose-over”).

6.6.4 Beside taking the actions set out in Checklists 10.4.1, “Aerodrome Emergency Landing” or 10.4.2, “Forced Landing or Ditching”, ATCs may suggest that the pilot:

- check that the fuel selector is set to the fullest fuel tank;
- ensure that the booster pump is set to “on”;
- ensure that the mixture is set to rich;
- ensure that both magnetos are on;
- that if a restart fails, the aircraft is trimmed to its best gliding speed.

6.7 ENGINE FAILURE IN A MULTI ENGINE AIRCRAFT

6.7.1 If an engine becomes inoperative in a multi-engine aircraft, flight crews may have a very high workload. To work through the checklists may take up to 10 minutes on some types. As a consequence, ATC may not be informed until well after the occurrence of the event.

6.7.2 When advised of the circumstances, ATCs should not engage in radio communication with the flight crew until the crew open communication or for some compelling reason.
6.7.3 If an engine fails immediately after take-off, flight crews will often maintain runway heading and discontinue climb at 1000 to 1500 ft AGL after the landing gear has been retracted. When the aircraft has accelerated to flap retraction speed, climb will be resumed. The pilot can then, on request, be given appropriate instructions to re-join the landing sequence with priority if required.

6.7.4 Engine failure during cruise in both turbine and piston powered aircraft will normally result in descent to a lower cruising level.

6.7.5 Piston powered aircraft experiencing an engine failure may have pressurisation difficulties that require a lower cruising level.

6.7.6 After engine failure, turbine engine aircraft may need to descend to a lower level in order to put the APU into operation and, if a decision is made to attempt a restart of the failed engine, to achieve an increased airflow through the failed engine.

6.7.7 With some aircraft types, usually piston engine powered, it may not be possible to make steep, small radius turns, in the direction of an inoperative engine. ATCs should check with flight crews about the feasibility of making turns in the direction of the inoperative engine before issuing instructions for them to do so.

6.7.8 In the event of engine failure, ATCs may expect:
- high flight deck workload;
- the possibility of a landing at the nearest suitable aerodrome;
- pressurisation problems;
- deviation from assigned track or SID; and
- an immediate levelling-off or descent.

6.7.9 An engine failure in a multi-engine aircraft may result in:
- a rejected take-off;
- fuel dumping; and
- pressurisation difficulties.

6.8 ENGINE ON FIRE or APU ON FIRE

6.8.1 An engine fire or APU fire is a serious emergency.

6.8.2 ATCs may expect:
- a heavy flight deck workload;
- the possibility of a landing at the nearest adequate aerodrome;
- engine shutdown and fire extinguishing procedures;
- loss of altitude;
- high vertical rates of descent commensurate with restricting the spread of the fire;
- an emergency landing;
- once the aircraft is on the ground, passenger-escape slides may be deployed and the passengers evacuated; and
- the runway may be blocked.

6.8.3 The fire may result in:
- a crash landing;
- engine failure;
- rejected take-off;
- smoke or fire in the cockpit;
- pilot incapacitation;
- difficulty in maintaining pressurisation; and
- brake/anti-skid problems.

6.8.4 If controllers sight flames or smoke, consideration should be given to advising the flight crew of the location on the aircraft and apparent source of the flames or smoke.

6.8.5 Pilots may put their aircraft into a sideslip to keep flames away from the cockpit.

6.8.6 Prior to a crash landing, once the pilot is committed, it may be desirable to suggest that the following checks are made:
- fuel pump off;
- fuel selector to off;
- cabin heating and venting off;
- just prior to touch down, electrical master switch off, and cabin door(s) unlocked to the first detent (to facilitate door opening in the event of frame distortion resulting from the crash).

6.9 LOW ENGINE OIL PRESSURE

6.9.1 If low engine oil pressure is indicated in a piston engine aircraft, the pilot will normally check the engine oil temperature. If the temperature remains constant, it is likely that the pressure gauge is defective.

6.9.2 In turbine engine aircraft, there are usually two independent oil pressure-monitoring systems. Flight crews’ normal procedure is to make a comparison of the engine power setting and the oil pressure indication. Only if there is an abnormal engine power reading will the engine be shut down.

6.9.3 When low engine oil pressure affects a single engine aircraft on take-off, controllers should expect that it may result in a request for a close circuit to return for landing or
perhaps a contraflow landing, and when en-route, a request may be made to maintain altitude for as long as is practicable and for a landing at the nearest suitable aerodrome.

6.9.3.1 In the case of a multi-engine aircraft, ATCs may expect the possibility of:

- a precautionary engine shut down;
- a request for a lower cruising level; and
- a landing at the next suitable aerodrome.

6.9.4 ATCs should follow the actions set out in Checklists 10.4.1, “Aerodrome Emergency Landing” or 10.4.2, “Forced Landing or Ditching”, as appropriate.

6.10 ELECTRICAL MALFUNCTIONS

6.10.1 If an aircraft sustains total failure of its generator(s) or alternators, the only power available will be from batteries. This is an emergency situation.

6.10.2 Depending on the number of electrically driven systems in use, batteries’ ability to deliver power is restricted to approximately 30 minutes, thus a landing will have to be made within this time. Flight crews will normally have access to an appropriate checklist indicating the systems that may be switched off to preserve electrical power.

6.10.3 If the radio navigation aids are switched off, ATCs may expect that surveillance system vectoring with continual position update information will be required. If available, primary radar will normally be used for surveillance to enable the aircraft’s transponder to be switched to “standby”.

6.10.4 ATCs should expect:

- high stress levels for the flight crew;
- a landing at the nearest suitable aerodrome;
- the inability of the aircraft to report its position, and;
- limited read back of instructions.

6.10.5 The situation may result in complete radio communication failure. The checklist 10.3.3 “Radio Communications Failure”, provides guidance. In this situation, there should be no expectation that the aircraft will necessarily hold or divert to an alternate aerodrome, neither should flight crews be requested to ‘squawk ident’.

6.11 HYDRAULIC MALFUNCTIONS

6.11.1 Malfunction or impairment of the hydraulic system may cause a complete or partial failure in the operation of:
- flight controls;
- leading and trailing edge wing flaps;
- speed brakes and spoilers;
- landing gear extension or retraction;
- wheel brakes; and
- nose wheel steering.

6.11.2 Some of the effects of impairment of these controls are listed at paragraphs 6.3.1 to 6.5.2 Flight Control Systems.

6.12 INSTRUMENT MALFUNCTIONS

6.12.1 The following guidance notes augment the checklist actions in Checklist 10.3.2, “Instrument Failure”.

6.12.2 Light aircraft instruments are usually electrically driven but some that are fitted in older aircraft rely on gyroscopic principles for their operation and are operated by an engine-driven air suction pump.

6.12.3 The gyroscopic instruments include the turn indicator that displays the degree of bank, the artificial horizon (AH) [also known as the attitude indicator (AI)] and the heading indicator (HI) [also known as the directional indicator or directional gyro (DG)].

6.12.4 In small aircraft, the pilot resets the HI to the reading of the magnetic compass at approximately 15 minute intervals. This procedure is necessary because the magnetic compass is affected by the dip or downward slope of the earth’s magnetic field. It is subject to acceleration errors when the aircraft is banked and, as a result, is difficult to use. The gyroscope in the HI drifts away from the magnetic heading because of the effects of friction and the earth’s rotation.

6.12.5 Failure to reset the HI can result in an aircraft becoming uncertain of its position. See Checklist 10.6, “Uncertain of Position”.

6.12.6 Larger aircraft have gyro-magnetic compasses that continually sense the earth’s magnetic field and contain a servomechanism that constantly corrects the heading indicator.

6.12.7 Most large modern turbo jets have ‘glass cockpits’. Electronic video display units have replaced the electro-mechanical instruments that were installed in older aircraft. The captain and first officer each have screens in front of them that show, on a video map, the aircraft’s attitude and horizontal situation, speed, position, time to the next waypoint and other data. These video displays are known as Electronic Flight Information Systems or EFIS.
6.12.8 Above the centre console are screens that display engine operating data and provide visual alerts when one of the engines or its associated systems requires the crew's attention. They are called either the Engine Indications and Crew Alerting System (EICAS) or Electronic Centralised Aircraft Monitor (ECAM). Failures of any of these screens are rare.

6.13 LANDING GEAR PROBLEMS

6.13.1 The flight deck display of the landing gear status appears during the undercarriage extension or retraction phase on approach or after take-off. If there is an unsafe indication when the aircraft is on final approach, a missed approach procedure will be followed.

6.13.2 Flight crews will usually attempt to recycle the landing gear by retracting it and then extending it again. If the recycling of the electrical or hydraulic extension system does not produce a safe indication, flight crews may attempt to extend it manually using a manual override system.

6.13.3 If manual extension is not successful, a ‘g-load’ manoeuvre may be attempted. This involves violent and abrupt flight manoeuvres to utilise gravitational and centrifugal forces to cause the undercarriage to extend and lock. Once the landing gear has been extended in this fashion, it cannot be retracted. When an aircraft is in this circumstance, an ATC instruction to “go around” should be avoided. With the undercarriage down, the aircraft performance is severely restricted.

6.13.4 Occasionally, a pilot will request a low fly past to facilitate a visual inspection. At pilot request, ATC should make arrangements for licensed aircraft mechanical engineer or type-familiar pilot to make the inspection from the control tower or alongside a runway. However, these inspections are often inconclusive. It should be noted that ATC should never confirm that the landing gear is down and locked as this can only be determined by an aircraft specialist.

6.13.5 When confronted with this type of situation, flight crews of a major air carrier will usually seek technical advice from company engineers over company radio frequencies. General aviation pilots, on the other hand, may request ATCs to seek engineering advice on their behalf.

6.13.6 In the case of GA aircraft, ATCs should consider requesting that the pilot confirm that all relevant emergency checks have been made, including checking or changing the landing gear indicator lights.

6.13.7 If flight crews decide to make a landing with an unsafe landing gear indication, the actions listed in Checklist 10.4.1, “Aerodrome Emergency Landing”, should be taken.
6.13.8 Nose wheel steering may become restricted or inoperative in the event of a hydraulic failure. If this happens, an uncontrolled excursion from the runway may occur after landing.

6.14 PRESSURISATION LOSS; SLOW, CATASTROPHIC AND EMERGENCY DESCENT

6.14.1 Depressurisation is experienced in the event of engine failure in a single engine, pressurised aircraft.

6.14.2 In multi-engine pressurised aircraft, loss of pressurisation is generally slow and usually caused by faulty operation of pressure regulating valves, permitting too much air to escape from the cabin.

6.14.3 In large passenger turbo-jets, cabin altitude is maintained at about the equivalent of 7000ft, irrespective of the actual altitude. If cabin altitude pressure falls below that experienced at 14,000ft, oxygen masks are automatically deployed. In this circumstance, flight crews may be expected to make a rapid descent to 10,000 ft or lower.

6.14.4 ATCs may observe:
   - that the aircraft will stop climbing;
   - a rapid descent without warning, and
   - a turn away from the assigned track;
   - poor quality radio communications due to flight crew donning oxygen masks.

6.14.5 The crew may have no opportunity to squawk the emergency code before commencing emergency action.

6.14.6 The slow loss of pressurisation in smaller turbo-jets may not be readily detected although many aircraft are now being fitted with equipment that generates an audible warning if a significant drop in pressure occurs. A slow loss of cabin pressure, if made known to ATC, requires action to which the checklist at 10.5.1 “Hypoxia” refers.

6.14.7 If the pressure hull of a pressurised aircraft sustains a significant rupture, an explosive decompression may occur. The cabin may fog due to the reduced atmospheric pressure no longer being able to retain the same amount of water in vapour form. This cabin fog may take some time to dissipate. Dust, light objects and papers are likely to fly through the cabin, drawn to the site of the hull rupture by the outward flow of air. For flight crews experiencing an explosive decompression above 40,000 ft., their time of useful consciousness, without oxygen, will be limited to between 12 and 25 seconds. In this situation, an emergency descent may be expected to be commenced immediately while the crew takes access to oxygen.

6.14.8 ATCs may observe:
very high rates of descent at up to 8,000 ft/minute;
difficulty in communication because of high ambient noise levels.

6.14.9 Additional technical problems may occur if there is damage to aircraft systems. Flight crews may report feeling very unwell due to the expansion of gas within their intestines, caused by the rapid depressurisation of the cabin.

6.14.10 If an emergency descent is commenced above 25,000ft, medical problems such as burst eardrums and bleeding noses may occur and ATCs should alert the destination aerodrome to the possible need for medical aid.

6.15 SMOKE OR FIRE ON THE FLIGHT DECK OR IN THE CABIN

6.15.1 Smoke or fire on board an aircraft is a serious emergency. Flight crews should be expected to don oxygen masks and goggles as soon as they become aware of the situation. This support equipment tends to restrict the pilots’ vision and inhibit their performance. Increasing smoke may make the crew’s ability to see instruments and controls very difficult.

6.15.2 If the smoke or fire is of electrical origin, the crew will attempt to detect its origin and prevent its progress by shutting off individual electrically operated systems. This may mean the loss of navigation aids and/or radio communication.

6.15.3 ATCs should expect:
- high stress levels on the flight deck;
- a request for the shortest high-speed vector to a suitable aerodrome;
- poor or no radio communication and visibility;
- a need to set approach and runway lighting at high settings;
- deployment of emergency slides and immediate passenger evacuation after landing.

6.15.4 Flight crews should be advised, when appropriate:
- track miles to run to the closest suitable aerodrome;
- aerodrome operational and meteorological information;
- availability of any available automatic approach if the aircraft and aerodrome are appropriately certified.

6.15.5 ATCs should request:
- people on board (POB); and
- location and type of any dangerous goods.

6.15.6 ATCs should be careful not to be overly prescriptive in their instructions and to keep the number and length of transmissions to the minimum necessary.
6.16 WINDSHIELD/CANOPY CRACKS OR BREAKAGE

6.16.1 Windshield breakages and cracks are usually caused by bird strikes or hail. Cracks may appear in the windshield of a pressurised civil aircraft because of failure of the windshield heating system. Pilots of small civil aircraft and military aircraft with canopies may sustain injuries in the event of breakage. In the event that a pressure loss occurs through cracking/breakage, an emergency descent may be conducted. Flight crew experiencing a wind shield cracking without pressure loss will normally require descent to around 10,000ft to reduce the cabin differential pressure.

6.16.2 ATCs should be prepared to provide information on the nearest suitable aerodrome and its operational and meteorological conditions. ATCs should expect the likelihood of:
- an emergency descent;
- poor quality of radio communication due to the use of an oxygen mask;
- requests for radar vectors;

6.16.3 ATCs should alert emergency services at the destination aerodrome.

6.17 UNUSUAL CIRCUMSTANCES

6.17.1 LIGHTNING STRIKE

6.17.1.1 Aircraft lightning strikes usually occur around the freezing level. They may cause complete or partial failure of aircraft electrical systems. Structural damage to the wings, fuselage and radome may also occur.

6.17.1.2 The damage may cause:
- control problems for the flight crew;
- radio communication failure; and
- navigation difficulties, leading to track or altitude deviations.

6.17.1.3 ATCs should:
- consider the assistance of another aircraft to intercept, escort and provide navigational assistance to the damaged aircraft; and
- try to ascertain the extent of the precipitation area in which the lightning strike occurred, for relay to meteorological services and other aircraft in the vicinity.
6.17.2 BIRD STRIKE

6.17.2.1 Bird strikes sometimes occur during take-off or landing. Typically, at low altitudes, aircraft damage is caused by flocks of smaller birds, however single bird strikes also occur. Large birds, such as migratory geese that often fly as high as 8,000 ft, have caused significant damage to the airframe and engines of large turbo-jet aircraft. Ingestion of a medium to large size bird usually causes significant damage to the turbo-jet fan, and sometimes to the compressor and turbine, requiring the engine to be shut down.

6.17.2.2 A bird strike may cause:

- engine failure;
- airframe damage and control problems;
- hydraulic problems;
- brake problems;
- a broken windshield or canopy.

6.17.2.3 Multiple bird strikes may cause more than one engine failure in multi-engine aircraft.

6.17.2.4 ATCs may expect:

- reduced manoeuvrability if there is structural damage;
- the need to land at the nearest suitable aerodrome;
- the need for a long final approach to give the pilot time to check the handling of the aircraft;
- reduced forward visibility for the flight crew if there is significant carcase residue from the impact.

6.17.2.5 ATCs should consider the need:

- for an intercept and escort aircraft to provide navigational assistance;
- to provide medical or ambulance assistance if crew or passengers are injured;
- for a runway inspection after impact on take-off or landing to check for debris and identification of the bird type.

6.17.3 MULTIPLE LOCUST STRIKES

6.17.3.1 The density of some locust swarms has been estimated to be as high as 50 million insects per square kilometre. Some species are known to fly as high as 1,500 m above ground level. Inadvertent flight into a dense swarm of locusts can cause significant damage to small and medium sized aircraft. Dented
cowlings and wing leading edges may result. Forward visibility may be significantly reduced due to numerous insect smears across the windshield. Pitot tube blockage, caused by remains of insects, can cause erroneous readings or no readings at all on the airspeed indicator. The carcases and wings of locusts can block off the airflow through the oil coolers on piston engines and obstruct air-cooling ducts. These obstructions can give rise to engine overheating and may necessitate a precautionary landing.

6.17.3.2 ATCs may expect the possibility of:

- requests for information on and vectoring to the nearest suitable aerodrome;
- possible damage to radio antennas causing radio communication difficulties;
- possible pilot distraction, injury or incapacitation caused by the ingress of locusts through open direct-vision panels.

6.17.4 FUEL DUMPING

6.17.4.1 Fuel dumping may be necessary in the case of an aircraft sustaining an engine failure after take-off. In an emergency, the dumping may be initiated without prior approval to reduce the aircraft’s weight for an immediate landing.

Note. — The procedures to be followed during fuel dumping are set out in PANS – ATM, Doc. 4444, Chapter 15, 15.4.3.

6.17.5 PILOT INCAPACITATION

6.17.5.1 Pilot incapacitation can have a number of causes, for example, coronary attack, a sudden illness and food poisoning.

6.17.5.2 ATCs may expect the possibility:

- of a high workload on the pilot in normal health in an aircraft with two flight crew;
- of multiple distractions on the flight deck leading to poor attention to ATC instructions;
- of a declaration of an emergency and request for diversion to the nearest suitable aerodrome;
- that after landing, towing equipment may be needed if the nose wheel steering control is available only to the incapacitated pilot in an aircraft with two flight crew. Note some airline company policy requires that an
aircraft with only one pilot available shall be stopped on the runway and request a tow clear of the runway.

6.17.5.3 ATCs should check for any handling limitations of the aircraft.

6.17.5.4 ATC instructions should be kept simple.

6.17.5.5 Medical services should be arranged at the destination airport.

6.17.6 AIRBORNE COLLISION AVOIDANCE SYSTEM (ACAS) ADVISORIES

6.17.6.1 ACAS II equipment provides an independent, airborne, defence against collisions between aircraft.

When a collision risk is detected, ACAS II calculates the necessary avoidance manoeuvre and communicates the solution directly to the flight crew.

6.17.6.2 ACAS II can issue two types of advisory warnings:

The Traffic Advisory (TA) alerts the flight crew to a potential Resolution Advisory (RA) and helps the crew in visually acquiring the potentially conflicting aircraft. The TA is activated between 20 and 48 seconds before the Closest Point of Approach (CPA);

6.17.6.3 The Resolution Advisory alerts the flight crew to necessary avoidance manoeuvres in the vertical plane. The RA is activated between 15 and 35 seconds before the CPA.

6.17.6.4 The TA or RA is communicated directly to the flight crew by means of both a visual display and an aural alert.

6.17.6.5 ATCs can expect the possibility of:

- climb or descent without prior warning (normally only for RAs);
- two or more aircraft to be involved;
- notification from the flight crew of ACAS climb or ACAS descent

6.17.6.6 Emergency avoidance action is likely to be taken by the crew without selecting emergency squawk.

6.17.6.6 If an aircraft experiences severe turbulence that causes it to deviate vertically toward another aircraft, ACAS may detect a high vertical speed and may issue an alert. These incidents are rare but turbulence that affects aircraft at adjacent flight levels or altitudes may cause RAs or TAs.

Note. *Controller responsibilities in relation to a pilot reporting an ACAS advisory-induced manoeuvre are contained in PANS – ATM (Doc 4444), Chapter 15, 15.6.3.*
6.17.7 WINDSHEARS

6.17.7.1 Windshears are dangerous to aircraft on final approach and immediately after becoming airborne.

6.17.7.2 A flight crew experiencing a sudden downburst will apply maximum power and configure the aircraft for a maximum rate of climb. The crew will not be able to comply with ATC manoeuvring instructions until the windshear effect has abated. If the aircraft is on final approach, there is a likelihood of a go around.

6.17.7.3 Descriptions of windshears notified by aircraft should be relayed to following arriving aircraft and to departing aircraft.

6.17.8 ELT SIGNAL HEARD

Note.- Emergency Locator Transmitters (ELT) operate on the distress frequencies 406 MHz. The types of ELT that operate on the lower two frequencies do not transmit encoded signals that will identify the beacon or aircraft, whereas those that operate on 406 MHz emit digital signals that encode identifying data. These signals are received by the Cospas-Sarsat satellite system and the details of the process, while beyond the scope of this document, may be found in the IAMSAR Manual, Doc 9731, Volume II, Chapter 2. Many air carriers require their aircrews to monitor 121.5 MHz in addition to the ATS radio frequency in use. Aircrews will report hearing emergency voice transmissions to ATC.

6.17.8.1 The International Cospas-Sarsat (http://www.cospas-sarsat.org) system has ceased satellite processing of 121.5/243 MHz beacons since 01 February 2009 in response to guidance by the ICAO recognizing the limitations of the 121.5/243 MHz ELT and the superior capabilities of the 406 MHz ELT. Only 406 MHz beacons will be detected by the Cospas-Sarsat satellite system. This affects all ELTs using 121.5/243 MHz frequencies (TSO C91A).
Chapter 7  AIRCRAFT SUBJECT TO ACTS OF UNLAWFUL INTERFERENCE

7.1  GENERAL

7.1.1  This chapter sets out some principles of management of acts of unlawful interference. It is recognised that despite increasingly stringent efforts to make aircraft secure, both on the ground and in the air, threats and acts of unlawful interference are likely to arise from time to time. The timing, nature and potential outcome of such events is impossible to predict. Response plans should, therefore, be flexible, and in preparing the resources, facilities and personnel to be called upon in these contingencies. Administrations should ensure that they are attuned to the critical and unpredictable nature of such emergencies and are readily available, appropriately qualified, trained and responsive.

7.1.2  Acts of unlawful interference, perhaps more than any other emergency events, are likely to impact on a wide cross section of the community thus will be a legitimate concern of a broad range of authorities with various responsibilities. The need to closely define functions and responsibilities, establish lead agencies and agree upon a line of authority is paramount. The task of developing response plans is unusually complicated. They should take account of all possible outcomes, pay due regard to all interest groups’ concerns and prerogatives, and give greatest possible scope for optimal mitigation of risk.

7.1.3  Controllers should pay particular heed to any preferred actions expressed by the pilot-in-command of the subject aircraft and also to the views of the operator and the State whose airline is operating the aircraft.

7.1.4  The safety of the aircraft’s crew and passengers should, at all times, be paramount.

7.1.5  Controllers should be aware of some general principles of management that are commonly agreed upon by States. While these principles may not dictate specific actions to be taken by controllers in a particular situation or in the airspace of the UAE, they may establish a framework of reference for controllers’ responses.

7.1.6  Controllers should be mindful that it is common for absolute authority for management of acts of unlawful interference to be vested in a government agency not customarily involved in aviation emergency response procedures.

7.1.7  All parties involved in management of acts of unlawful interference, should take great care not to divulge sensitive information to third parties that might jeopardise safety. Relations with the media are critically sensitive in this respect.

7.1.8  Airport manoeuvring and movement areas should be left open during periods of unlawful interference. Similarly, all available communications facilities and navigation
aids, electronic and visual, should be left in working mode. Non-availability of facilities could add to the degree of hazard.

7.1.9 All personnel confronted with an emergency involving an act of unlawful interference should be alert to the risk of:

- injury to persons on board the subject aircraft;
- damage to the aircraft as a result of an in-flight explosion;
- mechanical or electrical failure;
- fuel shortage; and
- erratic behaviour on the part of the perpetrators.

7.1.10 Common wisdom is that the safest place for an aircraft subject to unlawful interference is on the ground and controllers should anticipate that the response effort will likely be directed towards detaining the aircraft on the ground without, however, taking any action designed to compromise the aircraft’s airworthiness or mobility which could add to the degree of hazard implicit in the situation.

7.1.11 Controllers should understand that the process of negotiation is a skilled activity that should be conducted only by persons specially trained. Overall response will likely be focused on the conduct of negotiations for the safe release of hostages and minimisation of damage to or loss of property. Untrained persons and persons not in a position to refer decisions to more senior personnel in a genuine position of authority should not, as a general rule, be directly involved in negotiations with perpetrators of acts of unlawful interference.

7.1.12 When on the ground, the subject aircraft, when possible, should be parked in a designated, isolated parking position to reduce disruption to airport operations and minimise impact of any disaster.

7.2 PROCEDURES

7.2.1 When controlling an aircraft that is known or suspected to be unlawfully interfered with, controllers should exercise extreme care in communicating. In particular, controllers should:

- not necessarily expect normal communication responses from the flight crew;
- exercise discretion in communicating with the flight crew, bearing in mind the possibility of transmissions being monitored by the perpetrators;
- unless and until there is positive indication that nothing is to be gained by constraining communication, not make overt reference to a suspected or known act of unlawful interference.
7.2.2 Controllers should record the last observed or reported position, level, track and speed of the subject aircraft and maintain a close watch over its progress.

7.2.3 In conducting hand-off procedures, controllers should not require responses from the crew unless the crew has established already apparently normal two way communications.

7.2.4 Controllers should consider alerting other aircraft in the vicinity of the subject aircraft and using them as sources of information about the subject flight’s progress.

7.2.5 If military aircraft are dispatched to intercept and escort the subject aircraft, controllers should provide all required assistance to position the intercepting aircraft behind and below the subject aircraft.

7.2.6 If the subject aircraft passes outside radar coverage, controllers should consider increasing its ADS report rate to 5 minutes.

7.2.7 If the subject aircraft is airborne, controllers should, at the request of the pilot-in-command, clear the aircraft to land or otherwise facilitate its landing. Controllers should be alert to the possible need for aircraft subject to unlawful interference to enter an airport traffic circuit and land without proper authorization. Controllers should facilitate the safe movement of the subject aircraft and clear airspace and the affected runway(s). If, on the other hand, the pilot-in-command makes a decision to continue flight, or is compelled to do so, action should be taken to ensure separation of the aircraft from all other traffic. To that end, coordination should be effected with adjoining air traffic services units.

7.2.8 If the aircraft is on the ground prior to an intended departure, controllers should deny any request for take-off clearance until and unless the aircraft is positively known, on advice from responsible authorities, to be no longer subject to unlawful interference.

7.2.9 If the aircraft is on the ground after a recent arrival, controllers should clear appropriate taxiways and runways and clear the aircraft to taxi or be towed to the designated, isolated parking position, or facilitate it doing so.

7.2.10 Controllers should expect that flight crew in aircraft suitably equipped may notify an act of unlawful interference by transmitting transponder code 7500, thus alerting all secondary radar stations within range. Controllers may consider responding to their observation of code 7500 by requesting that flight crew “confirm squawking assigned code”.

7.2.10.1 Failing access to transponder equipment, flight crew may communicate in plain language but will not necessarily do so, depending on the in-flight situation.
7.2.10.2 Where transmission of a transponder code is not an option, flight crews may append the phrase “channel 7500” to voice transmissions immediately after transmitting the aircraft’s call sign as a means of signifying the status of the flight.

7.2.11 In being alert to various means by which flight crew may communicate an act of unlawful interference, controllers should be aware of the possibility of false alerts and be prepared to exercise caution and discretion in determining consequential action.

7.2.12 To the extent possible, controllers should provide a flight information service to the subject aircraft and other affected aircraft in accordance with Annex 11 – Air Traffic Services and PANS-ATM.

7.2.13 Controllers should provide an alerting service in accordance with Annex 11 – Air Traffic Services, Annex 12 – Search and Rescue and PANS-ATM.

7.2.14 To the extent appropriate and possible, controllers should implement procedures relating to emergencies and radio communication failure in accordance with PANS-ATM.

Note: In consideration of its particular airspace environments, facilities and resources, Air Traffic Service units shall publish their own plans for response to acts of unlawful interference that include specific instructions for air traffic controllers for application within the airspace of their jurisdiction. It is of prime importance that a comprehensive system of notification be developed and maintained that will ensure effective coordination between all responsible authorities. This system may incorporate transponder codes, CPDLC, ADS(B), voice communications and/or visual codes.

7.3 COORDINATION

7.3.1 It is likely that air traffic controllers will be the first point of contact with flight crews whose aircraft are subject to acts of unlawful interference. It is critical, therefore, that controllers provide an accurate, timely and complete coordination service with all designated responsible authorities. Upon becoming aware of an apparent act of unlawful interference, ATS Providers shall immediately notify:

- the GCAA Duty Officer;
- the UAE ACC supervisor (Declare appropriate SAR Phase);
- Unit Management (As per local procedures);
- Adjacent ATC Units which may be affected by the unlawful interference.
- the UAE RCC (Declared SAR Phase forwarded from ACC Supervisor to RCC)

Chapter 8 Helicopter Emergencies
NOTE - PENDING

Content currently being source through Helicopter Operators.

Comments welcome from industry.
Chapter 9  DANGEROUS GOODS

9.1 COMMON DANGEROUS GOODS IN AIR CARGO — (CLASSES, DIVISIONS AND EXAMPLES)

Common dangerous goods include the following goods listed by UN Class and Division:

Class 1 Explosives - rifle ammunition, fireworks, flares, blasting explosives and toy caps.

Class 2.1 Flammable Gases - disposable cigarette lighters and refills for gas lighters, acetylene (for oxy-acetylene welding and brazing), ethylene (for ripening fruit) and hydrogen (for university and some industry use).

Class 2.2 Non-Flammable Non-Toxic Gases - carbon dioxide (found in soft drink dispensing machines), oxygen (for hospitals and oxy-acetylene welding), compressed air, freons (for refrigeration, air conditioning and polyurethane manufacture), compressed nitrogen and argon (for welding) also, liquid oxygen and liquid nitrogen (for industrial applications).

Class 2.3 Toxic Gases - methyl bromide and ethylene oxide (for fumigation), chlorine (for commercial swimming pool water sanitation) and ammonia (for industrial freezing works). Aerosols - fly sprays, room fresheners, aerosol deodorants and some oven cleaners etc are assigned to Division 2.1 or 2.2 depending on their properties.

Class 3 Flammable Liquids - petrol, mineral turpentine, kerosene, methylated spirits, enamel paints, car lacquers, polyurethane varnish, two-pot polyurethanes and their solvents, most varnishes and some dry-cleaning fluids, methanol, methyl ethyl ketone and polyester resin kits.

Class 4.1 Flammable Solids - fire lighters, matches, sulphur powder, synthetic camphor and naphthalene (moth balls).

Class 4.2 Substances Liable to Spontaneous Combustion - white or yellow phosphorous, copra and unstabilised fish meal.

Class 4.3 Dangerous When Wet - sodium and potassium metals and calcium carbide - used to produce acetylene gas.

Class 5.1 Oxidisers – calcium hypochlorite (pool chlorine HTH), some homebleaches, hydrogen peroxide for swimming pool treatment and some fertilisers such as ammonium nitrate. Products used for tripping printed circuit board.

Class 5.2 Organic Peroxides – tert-butyl hydroperoxide and other thermally unstable substances.
Class 6.1 Toxic - some pesticides (e.g. most agricultural insecticides and some weed killers), and industry products such as sodium cyanide for metal treatment. Several metal degreasers are poisons, such as chromium salts in electroplating and copper chrome arsenate mixtures for timber preservatives. There are many, many more examples in this class.

Class 6.2 Infectious – examples are blood samples from people with infectious and/or notifiable diseases, septic tank effluent wastes, cultures containing pathogen(s) which may cause infection, needles and syringes under the ‘needle and syringe programme’.

Class 7 Radioactive materials - used in industrial thickness measuring devices, for the sterilisation of medical products and as a treatment for cancer.

Class 8 Corrosives – car and truck batteries, glacial acetic acid used for peeling processed fruit, caustic soda (sodium hydroxide) and caustic potash (potassium hydroxide), and acids such as hydrochloric, sulphuric and nitric used in many industrial processes. Many dairy sanitisers and industrial cleaners are corrosive.

Class 9 Miscellaneous dangerous goods - a diverse range of substances or articles that have dangerous properties not covered by Classes 1 to 8. Also includes substances transported at elevated temperature and genetically modified organisms.

9.2 HANDLING AND LOADING

9.2.1 Dangerous goods are articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods of IATA Dangerous Goods Regulations.

9.2.2 Some dangerous goods have been identified as being too dangerous to be carried on any aircraft under any circumstances; others are forbidden under normal circumstances but may be carried with specific approvals from the States concerned; some are restricted to carriage on all cargo aircraft; most however, can be safely carried on passenger aircraft as well, provided certain requirements are met.

9.2.3 Packaging is the essential component in the safe transport of dangerous goods by air. The packing instructions normally require the use of UN performance-tested specification packaging, however these are not required when dangerous goods are shipped in Limited Quantities under the provisions of Limited Quantity "Y" Packing Instructions. The quantity of certain dangerous goods permitted is strictly limited by the Regulations so as to minimize the risk should an incident occur.

9.2.4 The proper declaration of dangerous goods by the shipper ensures that all in the transportation chain know what dangerous goods they are transporting, how to properly load and handle them and what to do if an incident or accident occurs either
in-flight or on the ground. The pilot-in-command must know what is on board the aircraft in order to properly deal with the emergencies, which may occur.

9.2.5 Dangerous goods can be transported safely by air transport provided certain principles are strictly followed.

9.2.6 Last in the chain of handling dangerous goods is the person responsible for loading the aircraft, whether it is a handling agent or one of the pilots. Distributing the load in the aircraft may require some thought and planning, particularly if there are other special loads involved such as live animals or foodstuffs. Certain dangerous goods must be kept apart from each other but we must also consider other special loads. There are various ways of separating different forms of cargo depending on if the aircraft is ULD-loaded or bulk-loaded, or a combination of the two. Some things must be loaded in separate compartments while others only need to be kept well apart.

9.2.7 Dry ice emits carbon dioxide, which is suffocating so it must not be loaded in the same compartment as live animals or they may not reach the destination alive. Radioactive materials may be loaded in the same compartment as live animals as long as there is sufficient distance separating them to prevent the animal from being contaminated. Another situation is live animals and infectious substances. These may not be loaded in the same compartment or on adjacent pallets but may be loaded in adjacent, enclosed containers.

9.2.8 Before accepting a package of dangerous goods for loading, the person supervising the loading must inspect the goods to make sure the packages or labels are not damaged. He must also make sure all the documentation is in order and that the goods are loaded and secured safely. His signature on the NOTOC must be a trustworthy guarantee for the crew who are taking the hazard with them into the air.

9.2.9 Emergency and contamination.

9.2.9.1 If a package of dangerous goods has been damaged to the extent that it spills its contents, the situation must be handled promptly and correctly. Regardless of the nature of hazard everyone not immediately required in the vicinity must be kept well away. Anyone who may have been affected (harmed or contaminated) must be taken care of and their names and addresses noted.

9.2.9.2 The person supervising the situation must consult a suitable “Dangerous Goods Emergency Chart” (ICAO Doc. 9481) to see what immediate remedial action may be required. The wrong action may make the situation worse. As soon as possible expert help must be acquired. There are seldom any established official channels for this; the local telephone directory is usually the best way of getting expert help. In the case of leaking toxins, for instance, one could simply call the nearest hospital and get help from their toxicologists.
9.2.9.3 All handling agents (GHAs) should have an emergency chart be readily available, together with types of procedures and kits to handle these type of emergencies.
Chapter 10  CHECKLISTS

The following generic checklists, serve as guidance only for ATC Units on the format and content needed to assist controllers in providing a thorough, standard level of service to pilots who are subjected to specific emergencies. The GCAA requires that an ATS Providers shall be provided with and use appropriate IFER Checklists to support his IFER service. ATC Units are however expected to review and tailor these checklists to best suit their type of operations and to conform with their operational procedures and management requirements.

10.1 CRITICAL INITIAL ACTIONS

ACKNOWLEDGE
• acknowledge the emergency
• cancel any SSR or ADS alarm
• confirm aircraft’s identity and location
• record time

ASSESS
• nature of the problem
• pilot’s intentions
• pilot’s requirement for assistance
• time available for response

SEPARATE
• resolve immediate separation/conflict problems
• provide safety alerts on traffic, terrain or other hazards

COORDINATE
• complete immediate coordination requirements

PHASE
• declare the appropriate phase
• notify UAE ACC Supervisor
10.2 UNLAWFUL INTERFERENCE

10.2.1 BOMB WARNING
The following guidance applies to aircraft that are airborne or on the ground at an aerodrome where either air traffic services are not available or are not currently provided.

Record
- the last observed/known position, altitude, track and speed of the subject aircraft.

Notify
- GCAA Duty Officer;
- Unit Management (As per local procedure);
- adjacent ATS units;
- the ACC supervisor, who should notify:
  - the RCC, JRCC, RSC or military authority, as appropriate.

Consider
- if the aircraft is outside radar coverage but FANS-1 equipped, increasing the ADS contract reporting rate to every 5 minutes;
- initiating scheduled reports (SKEDS);
- reassessing the situation after an appropriate elapsed time (30 minutes is common);
- treating the threat as genuine if no official assessment from the operator or representative is available;
- upgrading from alert phase to distress phase.

Notify any reassessment to:
- GCAA Duty Officer;
- Unit Management (As per local procedure);
- adjacent ATS units;
- the ACC supervisor, who should notify:
  - the RCC, JRCC, RSC or military authority, as appropriate.

Relay
- appropriate messages between the subject aircraft and local authorities.
10.2.2 HIJACK

Communication

Be cautious, particularly if it is not known whether communication is monitored by perpetrators.

Be careful not to aggravate the situation.

- avoid overt reference to the nature of the emergency and maintain normal transmissions;
- do not expect normal responses from the subject aircraft;
- be alert to covert messages including transponder code 7500;
- consider responding with “confirm squawking assigned code”.

Record

- last observed or known position, altitude, track and speed of the subject aircraft.

Maintain

- surveillance of subject aircraft;
- separation with other aircraft.

Consider

- increasing separation between aircraft subject to unlawful interference and other aircraft;
- increasing the ADS report rate to 5 minutes if aircraft outside radar range;
- using an alternative radio frequency.

Remember

- to facilitate unauthorised movement of the aircraft including circuit operation and landing if necessary;
- to leave negotiation with perpetrators to skilled and trained personnel;
- that the safest place for aircraft is on the ground;
- to deny take-off clearance (as directed by senior personnel);
- to leave open all airport manoeuvring and movement areas en-route to the designated parking area;
- to leave operative all communication and navigation facilities.
Declare Appropriate Phase

- **Declare Alert Phase (ALERFA) when:**
  An aircraft is known or believed to be the subject of unlawful interference. An aircraft is considered to be in grave or imminent danger and require immediate assistance.

- **Declare Distress Phase (DETRESFA) when:**
  - Fuel on board is considered to be exhausted, or to be insufficient to enable the aircraft to reach safety, or
  - information is received which indicates that the operating efficiency of the aircraft has been impaired to the extent that a forced landing is likely, or
  - information is received or it is reasonably certain that the aircraft is about to make or has made a forced landing,

**Notify**

- GCAA Duty Officer;
- Unit Management (As per local procedure);
- adjacent ATS units;
- the ACC supervisor, who should notify:
- the RCC, JRCC, RSC or military authority, as appropriate.
10.3 GENERAL AIRCRAFT EMERGENCIES

10.3.1 AIRCRAFT MALFUNCTION

Obtain

- POB;
- fuel endurance, if appropriate;
- position of any dangerous goods;
- operational implications of the malfunction.

Note. - ICAO Doc 9481 Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods, contains information on the handling of dangerous goods

Record

- last observed/known position, altitude, track and speed of the subject aircraft.

If malfunctioning aircraft is able to continue to destination with only limited impairment to operating systems:

- provide traffic priority to destination and/or diversion/alternate aerodrome (PANS-ATM, Doc 4444, Chapter 15, 15.1.2)

Consider

- use of other aircraft for
  - sightings or intercept and escort;
  - meteorological reports;
  - communications relay;
  - handling advice, if same type as malfunctioning aircraft;
  - possible SAR action.

- contacting an aircraft-type specialist for advice to the pilot with respect to;
  - any requirement for a long final approach;
  - any requirement for a straight-in approach;
  - any special military approach and landing requirements.

If there is prospect of emergency landing at destination or alternate aerodrome:

go to AERODROME EMERGENCY LANDING at Checklist 10.4.1

If malfunctioning aircraft is unable to continue to destination:
Advise
- MEA, MSA or MDA/MDH as appropriate

Consider
- possible landing areas
  - lighting;
  - dimensions;
  - operational status (NOTAM);
  - availability of emergency services;
- meteorological conditions;
- terrain;
- providing navigational assistance;
- tracking the malfunctioning aircraft clear of populous areas;
- using other aircraft in the vicinity for
  - possible sighting or intercept/sighting and escort,
  - meteorological reports/observations,
  - communications relay,
  - handling advice if same type as malfunctioning aircraft,
  - possible SAR action;
- contacting an aircraft-type specialist for advice to the pilot.

Declare Appropriate Phase

- Declare Alert Phase (ALERFA) when:
  - information has been received which indicates that the operating efficiency of the aircraft has been impaired, but not to the extent that a forced landing is likely;
  - Except when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants

- Declare Distress Phase (DETRESFA) when:
  - the fuel on board is considered to be exhausted, or to be insufficient to enable the aircraft to reach safety, or information is received which indicates that the operating efficiency of the aircraft has been impaired to the extent that a forced landing is likely, information is received or it is reasonably certain that the aircraft is about to make or has made a forced landing, Except when there is reasonable certainty that the aircraft and its occupants are not threatened by grave and imminent danger and do not require immediate assistance.
**Notify**
- GCAA Duty Officer;
- Unit Management (As per local procedure);
- adjacent ATS units;
- the ACC supervisor, who should notify:
- the RCC, JRCC, RSC or military authority, as appropriate.

**Further Action**
- for hypoxia (from smoke and fumes)
  - go to HYPOXIA at Checklist 10.5.1
- for emergency landing at an aerodrome
  - go to AERODROME EMERGENCY LANDING at Checklist 10.4.1
- for crash or landing at an unsuitable, unknown or unprepared area
  - go to FORCED LANDING or DITCHING at Checklist 10.4.2
10.3.2 INSTRUMENT FAILURE OR MALFUNCTION

**Obtain**
- POB;
- fuel endurance, if appropriate;
- position of any dangerous cargo;
- operational implications of the malfunction.

**Record**
- last observed/known position, altitude, track and speed of the subject aircraft.

**Consider**
- providing meteorological information;
- providing navigational assistance to establish VMC;
- obtaining assistance from other pilots;
- using aircraft in the vicinity for advice or intercept and escort;
- monitoring height and heading on ATS Surveillance System;
- amending the ADS periodic contract to increase the periodicity of reports,
- amending the ADS agreement in terms of the event;
- implementing no-compass ATS surveillance system vectoring.

**Declare Phase**
- Consider declaring appropriate phase.

**Notify**
- Unit Management (As per local procedure);
- adjacent ATS units (If subject aircraft may enter their airspace);

If the incident is escalating and there is apprehension for the safety of the flight or the incident may become more serious in nature then the following should be notified.

- GCAA Duty Officer;
- the ACC supervisor, who should notify:
- the RCC, JRCC, RSC or military authority, if SAR action is likely.
10.3.3 RADIO COMMUNICATIONS FAILURE

ATCs should first check their own radio equipment – the problem may be with a ground failure not an aircraft failure.

Determine

- last known contact by radio and/or ATS surveillance system.

Attempt to contact the aircraft on alternative frequencies

- request ground stations and other aircraft to call on:
  - current, previous and next planned frequency,
  - the aircraft’s company frequency or military ATS frequency as appropriate
  - the distress frequencies 121.5 MHz and 243.0 MHz (if available),
  - other local ATS frequencies within range,
  - ground stations by modulating transmissions of radio navigation aids, e.g. NDB, where such facilities exists,
  - request the operating company, or if a military aircraft, the appropriate military service, to check their radio networks for possible contact,
  - SELCAL/HF radio, (consider the possibility of ionospheric disturbance to HF radio propagation);
  - Skyphone, mobile/cell phone, or pager on board, (Voice Over Internet Protocol)

Assessment of the problem

- determine if the aircraft receiver is functioning by:
  - instructing the aircraft to “Squawk Ident”, or
  - instructing the aircraft to change mode or code, or
  - instructing the aircraft to make an identifying turn

Note: If an unmodulated reply is received the microphone may be unserviceable.

If the aircraft can be observed from a control tower, determine if the aircraft receiver is functioning by

- instructing the pilot to manoeuvre the aircraft in such a manner as to alternately raise and lower the wings in a rocking motion;
- if observed from a control tower by night, by instructing the pilot to flash the landing and navigation lights twice.

If the receiver is functioning

- continue to pass information and instructions as appropriate;
- repeat instructions to the aircraft;
- obtain pilot acknowledgement by:
• requesting unmodulated transmission from the aircraft;
• requesting “Squawk Ident” if complete transmitter(s) failure.

**If sufficient time is available, try to determine**
- malfunctioning of any other systems;
- additional requirements of the pilot.

**If the receiver is not functioning**
- respond on the basis that the pilot will conform to the radio communication failure procedures at PANS-ATM, Chapter 15, section 15.2;
- separate other traffic from the aircraft suffering radio communication failure based on the pilot’s expected action as above and taking into account:
  • any additional requirements made known by the pilot;
  • malfunctioning of any other systems.

**Within air traffic services surveillance system coverage**
- monitor flight progress to determine the pilot’s intentions;
- if the aircraft is leaving surveillance system coverage, record the last observed position, altitude, track and speed;
- alert other units if the aircraft is likely to enter their coverage.

**Outside air traffic services surveillance system coverage**
- determine the aircraft’s last known or reported position;
- check the flight plan for consistency with position estimates.

**Provide assistance**
- continue transmitting information and instructions even if no acknowledgement is received;
- broadcast the following information on appropriate frequencies at H (hour), +10, H+25, H+40 and H+55:
  - control instructions to continue the flight as planned,
  - options available, e.g. return to departure aerodrome or divert to nearest suitable aerodrome,
  - appropriate navigational advice,
  - meteorological conditions ahead of the aircraft, nearby and at flight planned destination and alternate aerodrome(s),
  - minimum altitude to maintain surveillance coverage,
  - position advice.
Calculate
- latest time of arrival and fuel expiry time from flight plan or other notification of remaining endurance.
- if no flight plan or flight notification has been filed, obtain the information from the owner, operating company or military service to determine the fuel expiry time and latest time of arrival

Reserve airspace
- maintain separation between the aircraft having the communications failure and other traffic en-route and at destination for descent and approach; en-route from flight planned destination to alternate aerodrome until ETA or EAT (whichever is the later), plus 30 minutes (unless GCAA local procedures differ from PANS-ATM, Chapter 15, Section 15.2, in which case, reserve airspace in conformity with the AIP procedures).

Advise
- other aircraft likely to be affected by the circumstances;
- the operating company or military service if a military aircraft.

Consider
- the possibility of other compounding difficulties in the emergency situation;
- the possibility of hypoxia affecting the pilot(s) go to Checklist 10.5.1 “HYPOXIA”
- the use of other aircraft to sight the subject aircraft or to intercept and escort it.

Check
- for aircraft arrival at destination aerodrome or at nominated alternate.

Declare Phase
- Consider declaring appropriate phase.

Notify
- the ACC supervisor, who should notify:
  - the appropriate JRCC, RSC or if a military service aircraft, the appropriate military authority, when communication checks have failed to determine the location of the aircraft and SAR action seems likely.

Further action
- for other related system failures
  - go to AIRCRAFT MALFUNCTION at Checklist 10.3.1

- for emergency situation if pilot indicates only one approach is possible due to fuel state or other reason
  - go to AERODROME EMERGENCY LANDING at Checklist 10.4.1
10.3.4 FUEL SHORTAGE

Obtain
- POB;
- endurance;
- location of any dangerous goods;
- in-flight meteorological conditions.

Record
- last observed or known position, altitude, track and speed of the subject aircraft.

Consider
- if aircraft limited to flight in VMC and flight is encountering IMC, take action to achieve and maintain;
  - possible landing areas
  - pilot’s local knowledge,
  - lighting, if available and appropriate,
  - dimensions of the landing area and suitability,
  - NOTAM,
  - availability of emergency and other services
  - meteorological conditions including
    - en route winds, head or tailwind component,
    - areas where VMC likely,
    - destination actual and forecast conditions,
  - the terrain en route and at destination,
  - providing navigational assistance
    - to track the aircraft clear of populous areas;
  - using other aircraft in the vicinity for
    - intercept and escort,
    - meteorological reports,
    - local knowledge,
    - communications relay.

- obtaining aircraft handling advice including optimal use of remaining fuel;
- straight in approach requirement particularly for military jet aircraft

Further action
- for emergency landing at aerodromes
  - go to AERODROME EMERGENCY LANDING at Checklist 10.4.1

- for ditching
- go to FORCED LANDING OR DITCHING at Checklist 10.4.2
  - for crash or landing at an unsuitable, unknown or unprepared area
- go to FORCED LANDING OR DITCHING at Checklist 10.4.2

Declare Phase

- Consider declaring appropriate phase.

Notify

- the ACC supervisor, who should notify:
- the appropriate JRCC or RSC.
10.4 LANDING

10.4.1 AERODROME EMERGENCY LANDING

Obtain
- scope of service appropriate and as requested by the pilot
  • if no Airport Rescue and Fire Fighting (ARFF) services are available, advise the pilot and request what services are required, e.g. “Full Emergency” or “Local Standby”.

Note.— The classification of Emergencies for Rescue and Fire Fighting purposes are listed in the Airport Services Manual, Doc 9137, Part I.

- Estimated time of arrival (ETA);
- POB;
- location of any dangerous goods on board;
- fuel on board;
- operating company or owner.

Notify
- ATC at destination aerodromes [where they are on duty at the time of activation of Airport Emergency Plan (AEP)], or,
- at aerodromes where ATCs are not on duty
  • police or the appropriate authority responsible for activating AEP,
  • aircraft operating company or owner if possible,
  • military services (if landing at a military aerodrome), for activation of AEP

Note.— Planning for Aerodrome Emergency Procedures is detailed in Airport Services Manual, Doc 9137, Part 7

On approach
If pilot elects to continue past minimum descent altitude/height (MDA/MDH) or decision height (DH) until in visual contact on a ground based navigation aid approach, emphasize that any heading and/or altitude information advised after MDA/MDH or DH is advisory only and should be used at the pilot’s discretion.

Consider
- runway suitability
  • dimensions;
  • surface wind for landing and, in the event of a fire, after landing;
  • approach path and relationship of flight to populous areas;
- the possible requirement to divert other aircraft after the emergency aircraft has landed;
- possibility of cable engagement or JBar for military aircraft.

**Declare Phase**
- Consider declaring appropriate phase if the emergency cannot or may not be handled within the scope of the aerodrome emergency plan. For example if a pilot near an aerodrome indicates he may not reach the aerodrome and may need to make a forced landing, a Distress Phase shall be declared as well as the aerodrome emergency.

**Advise**
- If a SAR Phase is declared advice the ACC supervisor, who should notify:
  - the appropriate RCC, JRCC, RSC that there is doubt that the subject aircraft will safely reach the aerodrome of intended landing.
10.4.2 FORCED LANDING OR DITCHING

Obtain (if time permits)
- POB;
- dangerous goods on board;
- position (or description) of area in which landing or ditching is to be made;
- in-flight conditions;
- survival equipment carried, (may be available from flight plan);

Advise
- the pilot to activate the aircraft emergency locator transmitter (ELT) before
  the forced landing or ditching, if the aircraft installation allows;
- a frequency or telephone number for the pilot to call after landing.

Record
- the last known or observed position of the aircraft and its altitude, track and speed.

Declare Phase

- Declare Distress Phase (DETRESFA) when:
  the fuel on board is considered to be exhausted, or to be insufficient to enable
  the aircraft to reach safety, or
  information is received which indicates that the operating efficiency of the
  aircraft has been impaired to the extent that a forced landing is likely,
  information is received or it is reasonably certain that the aircraft is about to
  make or has made a forced landing,
  Except when there is reasonable certainty that the aircraft and its occupants are
  not threatened by grave and imminent danger and do not require immediate assistance.

Notify
- the ACC supervisor, who should notify:
  - the RCC, JRCC or RSC; and
  - the meteorological service provider for a ditching forecast

Consider
- obtaining and advising known meteorological conditions for the area;
- providing information on possible landing sites;
- advising aircraft in the vicinity that may be suitable for
  - intercept and escort,
  - SAR assistance,
• communications relay.

**When radio contact is achieved on the ground**

**Coordinate**
- with the RCC, JRCC or RSC (or military authority), and

**Obtain**
- number of survivors
- injuries
- damage
- any assistance required until rescue, and
- arrange for scheduled reports.
10.5 PILOT MEDICAL EMERGENCIES

10.5.1 HYPOXIA

Expect
- pilot speech to become slower or slurred;
- pilot to become increasingly relaxed or euphoric;
- pilot to be slow in reaction to instructions;
- pilot to increasingly show poor decision-making ability.

Advise
- pilot to check aircraft pressurization system;
- pilot to check oxygen system and connectors (if appropriate to aircraft type).
Once pressurization/oxygen checked and confirmed and there is either no change or worsening of the pilot’s condition:
- pilot to “descend immediately”.

**Note.** - Sample transmission: “Oxygen, oxygen, oxygen - suggest descend to flight level one zero zero (or “one zero thousand” if below transition altitude)

- repeat the action listed above if considered necessary
- consider taking action to maintain or enter the aircraft into surveillance coverage

**Note.** - The symptoms of Hyperventilation, (rapid shallow breathing), sometimes induced by stress, are almost identical to those of Hypoxia. However, the breathing of 100% oxygen is not appropriate in the case of hyperventilation.

Record
- the last known or observed position, altitude, track and speed

**Pilot unconscious or communication lost**
- be prepared for an emergency or uncontrolled descent;
- plot position if identified on ATS surveillance system;
- pass all information to the JRCC or RSC;
  - report when the aircraft commences descent, when the fuel is exhausted or if pilot loses control.

Obtain
- from aircraft operator or other available source
  - POB;
  - fuel endurance;
  - dangerous goods, type and location on board.

Consider
- the possibility of an emergency or uncontrolled descent;
- the possibility of continuous flight on autopilot until fuel exhaustion;
- aircraft in the vicinity that may be suitable for intercept and escort;
- SAR assistance;
- communications relay;
- visual check of pilot condition if communications have been lost;
- seeking advice from aircraft in vicinity on position and level of subject aircraft (if not available from ATS Surveillance system sensors).

**Hypoxia may result in**
- loss of radio communications
  - go to RADIO COMMUNICATION FAILURE at Checklist 10.3.3
- emergency landing at an aerodrome
- go to AERODROME EMERGENCY LANDING at Checklist 10.4.1
- ditching, crashing or landing at an unsuitable, unprepared or unknown area
  - go to FORCED LANDING OR DITCHING at Checklist 10.4.2
10.6 UNCERTAIN OF POSITION

Obtain
- last known positive fix;
- headings and times flown on each heading since that fix;
- true airspeed and altitudes for each heading since the fix;
- fuel endurance remaining;
- serviceable and usable on-board navigation aids;
- in-flight conditions;
  - for VFR category flights, any flight conditions affecting the ability to proceed in any direction

Advise
- the pilot to report any changes to heading, airspeed and altitude;
- for VFR aircraft, the pilot to remain in VMC when following ATS guidance;
- en-route MSA and or highest terrain in areas where the pilot may not be able to remain visual.

Determine position

Within ATS surveillance system coverage:
- request squawk code 7700 or IDENT
- (for identification of non-transponder equipped aircraft, request alteration of heading);
- provide position fix or vectoring as required;
- record last known position, track, speed and altitude if surveillance lost.

Outside surveillance coverage, Consider:
- suggesting to the subject aircraft to enter surveillance coverage;
- ascertaining pilot’s ability to use nav aids on aircraft and providing frequencies of appropriate navigation aids
  - if the pilot is able to satisfactorily interrogate a radio navigation aid, obtain the aircraft’s heading, the relative bearing and the distance from the navigation aid;
- obtaining pilot reports of
  - topographical features (e.g. towns, lakes, river orientation, roads, railways);
  - meteorological phenomena (e.g. thunderstorms);
- advising the pilot to track to and then along a topographical “line” feature, e.g. a coastline, road, railway-tracks, river; Note any changed headings and any new features encountered, e.g. rail/river bridge;
- advising the pilot to circle a prominent feature or town to facilitate identification by ground observers (e.g. local police);
- ascertaining if pilot is able to activate an on-board ELT.

\textbf{Note.}—\textit{Do not instruct pilot to activate the ELT without the concurrence of the JRCC or RSC.}

- requesting JRCC or RSC assistance;
- if available, the use of direction-finding equipment;
- the activation and deactivation of aerodrome beacons, aerodrome or other lights as points of identification;
- the use of another aircraft as an aerial light house by requesting its pilot to orbit with landing lights on;
- the use of an aircraft as an escort/guide for the subject aircraft;
- using VHF/UHF range intelligence;

\textbf{Note.}—VHF range in nautical miles (nms) is approximately $1.2 \times \sqrt{\text{height of the aircraft in feet above the ground-based receiving antenna}}$; UHF range in nms is approximately the square root of the height of the aircraft in feet above the ground-based receiving antenna.

\textbf{Note.}—Annex 11, Chapter 5, 5.4, requires that the position of aircraft in a state of emergency be plotted on a chart.

\textbf{When the aircraft’s position is determined}

- provide navigation assistance to:
  - next prominent feature on track, or
  - return to an earlier known position or departure aerodrome, or
  - land at the nearest suitable aerodrome;

- provide vectors, position, heading and distance information
  - using ATS surveillance system, if available;
- provide advice from company or other pilots;
- provide aerodrome details if required;
  - obtain the details from the Aeronautical Information Publication, NOTAM, the JRCC or RSC or electronic databases, if available

- if there is insufficient fuel to proceed to the nearest suitable aerodrome, or if meteorological conditions preclude flight in VMC for a VFR-only rated pilot, or if there is insufficient daylight remaining for a day-only VFR-rated pilot to proceed to the nearest suitable aerodrome, suggest a precautionary landing on the best
available surface in the vicinity, e.g. a lightly trafficked road, whilst the engine(s) are still able to deliver power.

**Uncertain of position may result in**

- VFR rated pilot on top of cloud
  - go to VFR ON TOP OF CLOUD at Checklist 10.7.2

- Day-VFR rated pilot flying at night
  - go to DAY VFR AT NIGHT at Checklist 10.7.3

- Fuel shortage
  - go to FUEL SHORTAGE at Checklist 10.3.4

- Forced Landing or Ditching
  - go to FORCED LANDING OR DITCHING at Checklist 10.4.2

**Declare Phase**

- Consider declaring appropriate phase.

**If phase is declared notify**

- the ACC supervisor, who should notify:
  - the JRCC or RSC if SAR action is likely.
10.7 VFR EMERGENCIES

10.7.1 VFR IN IMC

Instil confidence, and keep instructions simple and to a minimum, as the pilot may be inexperienced and emotionally distressed.

Advise

the pilot
- to keep wings level;
- to keep speed constant;
- to trust the instruments;
- the en-route MSA;
- to turn on pitot heat and anti-icing if available and appropriate.

Obtain

from the pilot
- the time since encountering IMC;
- type of meteorological conditions encountered;
- instrument flight experience;
- availability of autopilot or wing leveller and pilot competence in its use;
- POB;
- last observed or known position, altitude, track and speed unless it is available from an ATS surveillance system;
- remaining fuel endurance.

Manoeuvring

- no abrupt manoeuvres;
- shallow (low gradient) descents and climbs and gentle turns;
- turn first, re-establish straight and level flight then climb or descend;
- suggest pilot engage the autopilot if the aircraft equipped and pilot is competent in its use.

Options

- turn onto reciprocal track to return to last known area of VMC;
- climb above cloud tops and proceed to known breaks in the cloud;
- descent below the cloud base (consider the MSA);
- track to areas of VMC or an aerodrome or landing area known to be free of cloud and otherwise clear.

Consider

- retaining the services of an experienced pilot if available;
- transferring other aircraft to another frequency;
- pilot’s preferred course of action;
- obtaining reports of areas known to be in VMC from
  • other aircraft,
  • the meteorological service providers,
  • ground observers.
- matching reports of areas of VMC with areas of low terrain or sea/inland waterway.

When established in VMC

- provide further assistance as required for
  • navigation to destination or alternate;
  • avoidance of IMC.

- advise next ATS unit that will provide services to the subject aircraft of the circumstances of the emergency.

VFR in IMC may result in

- aircraft established in VMC but lost
  • go to UNCERTAIN OF POSITION at Checklist 8.12

- aircraft established in VMC but on top of cloud
  • go to VFR ON TOP OF CLOUD at Checklist 8.14

- ditching, crash or landing on an unknown, unsuitable or unprepared area
  • go to FORCED LANDING OR DITCHING at Checklist 8.8

Declare Phase

• Consider declaring appropriate phase.

If phase is declared notify

- the ACC supervisor, who should notify:
  • the JRCC or RSC if SAR action is likely.
10.7.2 VFR ON TOP OF CLOUD

Instil confidence and keep instructions simple and to a minimum, as the pilot may be inexperienced and emotionally distressed.

Obtain

- last observed or known position, altitude, track and speed of the aircraft;
- last time or position at which pilot had visual reference to the ground (or water);
- extent of the cloud cover;
- pilot’s flying experience and/or instrument flight experience;
- pilot’s method of navigation;
- fuel endurance remaining.

Ascertain position

- by ATS surveillance system or pilot report.
- If unable to determine the subject aircraft’s position, go to UNCERTAIN OF POSITION at Checklist 10.6

Consider

- retaining the services of an experienced pilot for assistance if available;
- transferring other aircraft to another frequency;
- pilot’s preferred course of action;
- obtaining reports of areas of known VMC from
  - other aircraft
  - the meteorological service provider
  - ground-based observers
- matching reports of areas of VMC with areas of low terrain or sea/inland waterway;
- the use of other aircraft, preferably with IFR rated pilots for
  - diversion to the subject aircraft’s position to provide escort;
  - communications relay.

Establish ground or water sighting by

- assisting with the selection of and navigation to an area clear or partially clear of cloud;

If visual contact is established

- provide further assistance as required for
  - navigation to destination or alternate aerodrome;
- IMC avoidance;
  - advise the next ATS unit that will provide services to the aircraft of the circumstances of the emergency

**If no visual contact established**

- If descent through cloud breaks is not achievable
  - establish area of thinnest cloud for minimum flight time in IMC;
  - keep pilot informed of the MSA;
  - obtain experienced IFR pilot assistance for briefing prior to cloud entry, if available

- suggest to the pilot
  - operating on autopilot or with wing leveller engaged, if the aircraft is equipped with either and the pilot is competent to use the equipment;
  - practise IMC descents clear of and above cloud;
  - maintain a steady heading on descent;
  - keep wings level;
  - keep speed constant;
  - maintain trust in aircraft instruments;
  - trim the aircraft to establish a shallow and constant rate of descent;
  - turn on the pitot heat and anti-icing if available prior to entering cloud;
  - apply carburettor heat, if appropriate to aircraft type and meteorological conditions, before entering cloud.

**VFR on top of cloud may result in**

- aircraft established in VMC but lost
  - go to UNCERTAIN OF POSITION at Checklist 10.6
- aircraft unable to successfully descend through cloud
  - go to VFR IN IMC at Checklist 10.7.1
- fuel exhaustion while attempting to clear cloud
  - go to FUEL SHORTAGE at Checklist 10.3.4
- ditching, crashing or landing on an unknown, suitable or unprepared area
  - go to FORCED LANDING OR DITCHING at Checklist 10.4.2

**Declare Phase**

- Consider declaring appropriate phase.

**If phase is declared notify**

- the ACC supervisor, who should notify:
  - the JRCC or RSC if SAR action is likely.
10.7.3 DAY VFR AT NIGHT

Instil confidence, and keep instructions simple and to a minimum, as the pilot may be inexperienced and emotionally distressed.

Obtain

- pilot’s ability to perceive the horizon;
- pilot’s experience of instrument and night flying;
- availability of autopilot or wing leveller and pilot competence to use the equipment;
- POB;
- last observed or known position, altitude, track and speed, unless available from ATS surveillance system;
- remaining fuel endurance.

Advise

pilot

- keep wings level;
- keep speed constant;
- maintain a steady heading;
- trust the instruments;
- the MSA;

Manoeuvring

- no abrupt manoeuvres;
- shallow (low gradient) descents and climbs and gentle turns;
- turn first, re-establish straight and level flight, then climb or descend;
- suggest the pilot engage the autopilot if the aircraft is equipped and pilot is competent in its use;

Ascertain position

- by ATS surveillance system or pilot report;
- if unable to determine the aircraft’s position
  - go to UNCERTAIN OF POSITION at Checklist 10.6

Options

- pilot proceeds to flight planned destination or alternate;
  - provide pilot with details of suitable aerodromes;

Consider

- providing navigational assistance
  - by position fixing and vectoring derived from ATS surveillance system,
  - by reference to NAVAIDS,
- MSA en route,
- By information on visual features such as lights, aerodrome beacons/lighthouses, towns and prominent topography,
- by activating permanent or pilot activated aerodrome lighting (PAL) or portable/emergency lighting;
- retaining the services of an experienced pilot for assistance if available;
- transferring other aircraft to another frequency;
- the pilot’s preferred course of action;
- if VMC doubtful en route, at destination or alternate, obtain
  - meteorological conditions from other aircraft and meteorological services provider,
  - ground-based observers,
- matching reports of VMC areas, with areas of low terrain and sea/inland waterways as appropriate;
- the use of other aircraft, for
  - diversion to the position of the aircraft for in-flight assistance/escort duty,
  - communications relay.

**Day VFR at night may result in**

- aircraft established in VMC but lost
  - go to UNCERTAIN OF POSITION at Checklist 10.6

- aircraft entering cloud
  - go to VFR IN IMC at Checklist 10.7.1

- exhaustion of fuel
  - go to FUEL SHORTAGE at Checklist 10.3.4

- emergency landing at an aerodrome
  - go to AERODROME EMERGENCY LANDING at Checklist 10.4.1

- ditching, crash or landing on an unknown, unsuitable or unprepared area
  - go to FORCED LANDING OR DITCHING at Checklist 10.4.2

**Declare Phase**

- Consider declaring appropriate phase.

**If phase is declared notify**

- the ACC supervisor, who should notify:
- the JRCC or RSC if SAR action is likely.
10.8  EMERGENCY DECLARATIONS BY DATA LINK

If a CPDLC “PAN” or “MAYDAY” message is received and the aircraft is located within the FIR of the ATS unit receiving the alert:

- acknowledge by the most efficient means
  • voice contact,
  • send a free text reply, “ROGER MAYDAY” or “ROGER PAN”,

change the ADS-C contract reporting rate to 5 minutes;
- implement the appropriate IFER procedures;

If the aircraft is located outside the FIR of the ATS unit receiving the alert:

- send a free text reply, “ROGER MAYDAY” or “ROGER PAN” to the aircraft;
- do not change (increase) the ADS-C reporting contract;
- coordinate with the adjacent ATS unit to ensure that it is aware of the emergency and accepts responsibility for further action;
- maintain active communication connection until better assistance can be provided by another means;

If an ADS-C emergency indication is received with no CPDLC “PAN PAN” or “MAYDAY” message, and
If the aircraft is located within the FIR of the ATS unit receiving the alert:

- change the ADS-C contract reporting rate to 5 minutes;
- check for covert or inadvertent activation of the ADS emergency contract using the following method:
  • send the pre-formatted CPDLC uplink “REPORT SPEED” with free text “CONFIRM ADS” appended (as element 2).

If the pilot response is “ADS reset” to CPDLC uplink:

- wait until the cancellation of the ADS emergency mode is displayed at the next ADS-C periodic report, then
- set the appropriate ADS-C contract reporting rate

If the pilot responds to CPDLC uplink other than with “ADS reset”

- go to the appropriate IFER checklist related to the response.

If there is no pilot response to the CPDLC uplink and the ADS-C emergency mode is still active:
- implement Unlawful Interference procedures
  • go to UNLAWFUL INTERFERENCE at Checklist 8.2

If the aircraft is located outside the FIR of the ATS unit receiving the alert:
- do not change (increase) the ADS-C reporting contract;
- coordinate with the adjacent ATS unit to ensure that it is aware of the emergency and accepts responsibility for further action.
10.9 ELT SIGNAL HEARD

Notify
- the ACC supervisor, who should notify:
  • the appropriate JRCC or RSC to assume responsibility.

On direction from the JRCC or RSC, obtain
- time, position and level when 121.5/243 MHz signal first heard;
- circumstances when the signal was first heard
  • at time of selection of the distress frequency, or
  • while monitoring the distress frequency,
  • gradually increasing signal strength or abrupt reception,
- characteristics of signal received
  • continuous or interrupted,
  • strong or weak.

Instruct the aircraft receiving the 121.5/243 MHz signal
- not to adjust the radio’s ‘squelch’ setting;
- to report when the signal was lost with position, level and time.

Instruct other aircraft
- to listen out on 121.5 MHz or 243 MHz as appropriate;
- if no signal heard, disable the squelch and listen again
  • to report if signal heard, with position, level and time,
  • if signal heard, its characteristics, as listed in “Obtain” above.

Ascertain
- whether there are any aircraft in the vicinity that have VHF direction finding (DF) equipment on board,
  • if so, obtain a bearing on the signal and the position of the DF equipped aircraft.

Relay
- all information to the JRCC or RSC;

Take further action
- as directed by the JRCC or RSC.
10.10 ON-BOARD MEDICAL EMERGENCY

Obtain
- nature of the medical condition;
- whether male or female;
- whether assistance required at aerodrome of intended landing
  - ambulance, doctor, hospital alerted means of disembarking a stretcher/wheelchair patient from a large aircraft if there is no airbridge.

Consider
- taking action to provide professional medical advice;
- diversion advice to aerodrome in close proximity to a hospital;
- meteorological conditions to establish the aircraft in smooth air;
- the need for track shortening/straight in approach;
- making arrangements to expedite taxiing to terminal;
- dispatch of airport’s emergency response medical staff, if available, to the aircraft;

On-Board Medical Emergency may result in
- pilot request for diversion to nearest suitable aerodrome or lower altitude.

Notify
- the ACC supervisor, who should notify:
  - hospital/airport emergency medical response staff;
  - ambulance service;
  - police escort to expedite transfer to hospital if required

Note.— Cabin crew, although trained in first aid, are not permitted to give injections or any medications other than those provided in the approved First Aid Kits on board. Cabin crew are not permitted to open the physician’s kit; this may be opened only by registered medical practitioners.
10.11 ICING

Record
-the observed or reported position of the subject aircraft and level;

Provide assistance
- to minimize delays;
- by offering level or heading change;
- enabling continuous climb after departure;

Consider
- if the pilot is inexperienced, request check, (as appropriate to aircraft type)
  - airframe anti-icing or de-icing system “on”,
  - propeller anti-icing or de-icing system “on”,
  - pitot heat “on”,
  - stall warning heat “on”,
  - windshield heating “on”, and
  - carburetor heat “on”.

Advise
- other aircraft in the vicinity of the icing conditions.

Notify
- the ACC supervisor, who should notify:
- adjacent ATS units;
- the appropriate meteorological service provider.

Icing may result in
- reduced rate of climb or descent;
- request for immediate level and/or heading change;
- need for descent with higher power setting and speed, to increase hot air bleed supply;
- need for higher approach and landing speed due to possible weight increase and impaired laminar airflow.
Chapter 11  IFER TRAINING

11.1 Although only a little empirical evidence has been gathered that verifies the worth of specific training for in-flight emergencies, a consensual view is emerging amongst ATSPs as a result of investigation and analysis of IFER incidents that the following training activities are particularly effective:

- designed simulation exercises that include relevant features of actual accident or incident events,
- table-top role-playing sessions; and
- discussion groups to analyse accidents/incidents and controllers’ responses.

11.2 The exposure of ATCs to exercises in flight simulators is considered beneficial. It provides them with an insight into the challenges confronting flight crew, how malfunctions are displayed on aircraft instrumentation and flight deck response procedures.

11.3 It is worth noting that one State’s ATC training academy has electronically linked its ATC simulator to the flight simulators of its national airline. This enables in-flight emergencies being practiced by flight crews to be integrated into exercises being run on the ATC simulator. These joint simulations provide very realistic training.

11.4 Recurrent training in IFER has, in some States, been integrated into ATSPs’ checking mechanisms and associated rules of assessment.

11.5 Some ATSPs are providing annual training of one half day’s duration in IFER. Typically, this type of training course employs a study of a single IFER case that highlights pertinent aspects of ATC IFE response.

11.5.1 Typically, a short IFER course content could comprise:

- a refresher on the ICAO principles for handling emergencies and unusual incidents in the air and on the ground including the responsibilities of ATCs;
- a brief discussion of ways that controllers can assist and support pilots;
- a case study of an emergency or unusual circumstance during which course participants provide suggested inputs;
- a summary of the discussions with recommendations suited to the local ATC situation; and
- a simulated exercise to practise management of an incident involving an aircraft emergency on the ground or in the air, or the outage of ATS facilities.

11.6 Some ATSPs have found it worthwhile to expose their ATCs to airline flight deck simulator training and familiarisation flights as observers on the flight deck. Benefits are considered to accrue from:

- observing disruptions to flight deck procedures by ATC radio transmissions;
- familiarizing with the flight deck emergency procedures;
- observing the benefit of reduced workload by ATC providing clear airspace to the subject aircraft;
- participation in the decision making process;
- a sense of association by making simulated radio transmissions;
- a sense of more intense involvement by performing some of the simpler flight deck actions on instruction from the captain, e.g. activating landing gear, flaps, landing lights etc.;
- familiarizing with the sequence of actions during missed approach procedures.