IS-BAO

IMPLEMENTATION GUIDE (IG)

January 1, 2016

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Foreword

The guidance material provided in this IS-BAO Implementation Guide (IG) was developed to assist the operator in implementing the standards and recommended practices indicated in the IS-BAO. The information in this document links to specific standards or recommended practices utilizing a common numbering system. For example, guidance material for IS-BAO Standard 3.2 can be found in section 3.2 of the IG.

NOTE: While the terms “shall” and “must” are used in the IG that is presented as examples of text that operators may use, it must be understood that this is advisory material only.
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IG 3.0 Safety Management Systems

3.1 General

In addition to the SMS Toolkit which is provided with the IS-BAO, operators are encouraged to review a number of the many valuable references cited in this guidance material.

The goal of a safety management system is to manage safety risks to a level as low as reasonably practicable (ALARP). Safety management must be proactive and purposeful. It must also be appropriate. The nature and degree of safety management necessary (i.e. the safety requirement) should be determined by assessing the nature of the safety risks to which the flight operation is exposed. In other words, the safety-risks of an operation should be profiled to determine the appropriate level and focus of safety management. The safety management system is then tailored to proactively address the risks specific to an organization’s flight operation.

3.2 Safety Management System Requirements

The SMS Toolkit provides details on a safety management system and contains information on how a safety management system could be implemented and matured. The SMS Toolkit contains additional guidance material, forms, and other documents. Operators are encouraged to review the material on the stages of maturity of an SMS that is contained in the safety assurance and SMS evaluation material in the SMS Toolkit and in the IS-BAO Internal Audit Manual that is also provided with the IS-BAO.

3.2.1 Safety Policy and Objectives

a. Develop a Safety Policy that encompasses all eight items listed in the Standard.
   i. Reference: IS-BAO SMS Tool Kit; "ICAO Safety Policy Example" and "Safety Policy Examples".

b. Document safety responsibilities, accountabilities and authorities for everyone in the organization. Define the levels of management with authority to make decisions regarding safety risk tolerability.
   i. Reference: IS-BAO GCOM Chapter 1 "Organizational Structure" "Responsibilities and Accountabilities".

c. Appoint a Safety Manager.
   i. Reference: IS-BAO SMS Tool Kit; "Sample Safety Manager Appointment Letter".

d. Develop an Emergency Response Plan (ERP) with integration of those organizations it must interface with during an emergency situation.
   i. Reference: IS-BAO SMS Tool Kit; Emergency Response Plan Tool" and "IS-BAO GCOM Chapter 5.4".
   ii. It is important to ensure that the ERP provides for the orderly and efficient transition from normal to emergency operations, and the return to normal operations.
   iii. An operator should have a plan detailing the procedures to be followed in the event of an accident, incident or other emergency. The operator should comply with the plan in the
case of accidents involving substantial damage to aircraft or injury to passengers, crew members or persons on the ground. In the case of other accidents, incidents or emergencies, compliance will be at the discretion of the operator, subject to any requirements imposed by law by the State of Registry or the law of State in which the accident or incident occurred.

iv. The emergency response plan should address in-flight incidents involving injuries to, or serious medical problems suffered by, passengers or crew members.

v. The emergency response plan should also address accidents and incidents not involving aircraft flight operations, such as those occurring during aircraft maintenance activities.

vi. The emergency response plan should include, as applicable:

1. depending on the nature and location of the accident, procedures for the flight crew or organization to notify the appropriate authority in the State where the accident occurred and to seek medical assistance, as required;
2. procedures for the operator’s personnel to notify organization officials of the accident, incident or other event;
3. procedures for the operator to notify State agencies of the accident, as may be required by law;
4. procedures for notification of next of kin;
5. on-site procedures to be taken by the flight and cabin crew to assist passengers, prepare visual distress signals (if in a remote area), and preserve the integrity of the accident site;
6. procedures for dealing with questions from and providing assistance to the families of passengers and crew members;
7. procedures for dealing with questions from the media;
8. procedures for participating or co-operating with State agencies and police authorities who may be investigating the accident; and
9. considerations for dealing with the effects of the accident on the organization’s operations and on employees (i.e. trauma counselling services and other crises intervention support for persons involved or affected by the event).

vii. Personnel who have a role in the emergency response plan shall be trained in their role and the plan shall be exercised in order to test its integrity.

**Note 1:** The NBAA has provided the following information and guidance for company management and public affairs personnel to help them respond to press and public inquiries in the event of an accident involving company-operated aircraft. A list of specific press concerns is also provided to help company personnel effectively prepare for and respond to inquiries. For details see: [http://www.nbaa.org/ops/safety/response/](http://www.nbaa.org/ops/safety/response/)


e. Develop an Implementation Plan for your SMS that includes all processes and procedures endorsed by senior management.

i. Reference: IS-BAO SMS Tool Kit; "SMS Implementation Plan Example"
3.2.2 Safety Risk Management

a. Develop a formal process to identify hazards using reactive, proactive and predictive methods.

i. Reactive methods of data capturing include:
   1. Mandatory Occurrence Reports - This does not include only those required by law, but can be established internally such as a requirement to report an unstable approach.
   2. Incident reports, i.e. near misses or minor occurrences. Remember, an accident is often considered “one incident too many”.
   3. Accident reports. The organization needs a sound accident investigation procedure to determine cause(s) to prevent future occurrences.

ii. Proactive Methods of data capturing include:
   1. Surveys – Both Safety Culture Surveys and Post Training Surveys are essential to effectively managing safety risks.
   2. Audits – Audit findings provide the operator with a snapshot of opportunities for improvement. The audit should be conducted by a trained IS-BAO auditor. Internal audits do not have to be conducted by someone within the organization. In fact, someone from outside the organization can often provide a more objective assessment.
   3. Voluntary Reporting – This is a critical element to proactive safety risk management.

iii. Predictive Methods of data capturing include:
   1. Flight Data Analysis Programs
   2. Direct Observation - Supervisors and managers should document these observations and include any findings from their observations. These observation events should be part of a program to validate effectiveness of processes and procedures.
   3. Debriefings – These can be accomplished after an activity (maintenance procedure, flight, etc.) or at the end of the day for each functional area and ask the following questions:
      A. Did we commit any errors or did we exceed any policies or procedures today?
      B. Determine cause - see ICAO Human Factors Digest and Dirty Dozen.
      C. What can we do to improve policies or procedures with regard to human factors?

Note – Predictive data capturing allows the organization to identify risky behaviours and see trends in organizational behaviour before they result in incidents or accidents.

b. Develop a Company Safety Risk Profile of Operations and Maintenance and review it annually for changes to the operation that might drive changes to the FRAT or MRAT

i. Reference: IS-BAO SMS Tool Kit; "Safety Risk Profile Tool"

ii. Reference: SMS Guidance Manual, Section 9.2 (Safety Risk Profile) in the SMS Toolkit

c. Establish a Hazard Identification and Tracking System;

i. Reference: IS-BAO SMS Tool Kit; "HITS Tool".
d. Develop an analysis, assessment and control method of your operational safety risks and record them to update your Company Safety Risk Profile or analyse the data for further risk determination.

e. Develop a Flight & Maintenance Risk Analysis Tool (FRAT & MRAT);
   i. Reference: IS-BAO SMS Tool Kit; "Operational Risk Analysis Tool" and "Technical Services Risk Assessment Tool".

NOTE: For identifying reactive hazards the operator should have a root cause analysis procedure.

### 3.2.3 Safety Assurance

a. Develop Safety Performance Indicators (SPIs). For information on SPIs go to this link: http://www.ibac.org/Files/is-bao/SPI.pdf

b. For information regarding change management see the IS-BAO GCOM. Conduct a risk analysis of change events which may impact your safety risk mitigation strategies.

   *Note 1: ICAO Doc 9859 defines change management as, “A formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes.”*

c. To ensure continuous SMS improvement:
   i. Establish an Internal Evaluation Program (IEP) utilizing the Audit Procedures Manual
   ii. Reference. IS-BAO GCOM - "Continuous Improvement Opportunity Form”.

### 3.2.4 Safety Promotion

a. Develop and maintain a safety training program.
   i. Ensure all employees have been trained in SMS and receive re-current training annually.

b. Develop a means to formally communicate safety issues to all employees.
   i. Establish a Safety Committee and hold meetings with agendas
   ii. Record meeting minutes with action items and decisions made relative to agenda items

### 3.3 Compliance Monitoring

a. Establish a means for identifying applicable regulations, standards, approvals, exemptions and show compliance with them.
1. Update your Operations Manual annually with the updated IS-BAO standards and recommended practices.

2. Ensure your protocol references to your Operations Manual are updated appropriately.

3. Perform an annual or progressive (quarterly) compliance assessment and share results with all personnel. Techniques:
   i. Develop a compliance matrix which includes regulatory requirements and the references in your manuals that address each of the following requirements:
      A. Pilot Qualifications (both PIC and SIC)
      B. Pilot Currency Requirements (both PIC and SIC)
      C. Pilot Proficiency Check Requirements (both PIC and SIC)
      D. Maintenance Technician Qualifications
      E. Maintenance Technician Currency Requirements
      F. Aircraft Cabin Crew Requirements
      G. Cabin Crew Qualifications
   ii. Develop a compliance matrix which includes CAA approvals (Letters of Authorization) and Operational Specifications with references in your manuals to address each.
   iii. Develop a compliance matrix for each aircraft to show compliance with:
      A. Airworthiness Directives;
      B. Service/Safety Bulletins (as applicable);
      C. Inspections; and
      D. MEL (as applicable).
   iv. Develop a notification system and process all new applicable CAA regulations, IS-BAO standards, CAA approvals.

Note: An auditor should ask the operator to see a list of all the following changes and/or updates since the last audit:
   A. Applicable CAA regulations, especially those related to Pilot, Cabin Crew, and Maintenance Technician qualifications and currency requirements;
   B. Applicable Standards (i.e. IS-BAO);
   C. Airworthiness Directives and Service/Safety Bulletins related to each aircraft;
   D. Changes to the MEL of each aircraft;
   E. Changes to CAA approvals and exemptions.

Other noteworthy web sites where SMS guidance material can be found include:


c. ICAO Flight Safety Information Exchange  
   http://www.icao.int/safety/ism/_layouts/viewlst.aspx?BaseType=1

d. The Australian Civil Aviation Safety Authority web site  

e. The Transport Canada Civil Aviation web site at  

f. The UK Civil Aviation Authority web site at http://www.caa.co.uk/Safety-initiatives-and-resources/Working-with-industry/Safety-management-systems/Safety-management-systems/


h. The FAA Safety Management System information at:  
   http://www.faa.gov/about/initiatives/sms/specifcs_by_aviation_industry_type/

i. The International Helicopter Safety Team (IHST) SMS Toolkit at:  


IG 4.0 Organization and Personnel Requirements

4.1 Organization Structure

A recommended organization structure is as follows:

4.1.1 Management Duties and Qualifications

It is important that the authorities and accountabilities, of the people within the organization be clearly defined. The following are the recommended accountabilities, duties and qualifications of the management and operating personnel. Operators should apply the structure, titles and terminology as appropriate to the size and nature of the operations and convention within their segment of the industry.

4.1.2 Owner, CEO or Accountable Executive

The owner, CEO or Accountable Executive is accountable for providing the resources required to conduct a safe operation and to implement and maintain the safety management system.

Reference: See “Selection of the AEX” in the SMS Toolkit
4.2 Aircraft Crew Member Duties and Responsibilities

4.2.1 Aviation Manager/Director

a. Responsibilities

The Aviation Manager/Director is accountable for overall operation of the flight operation, for the safety of the operation and that safety management goals are met. The duties of the position include:

1. organizing, staffing and directing:
   i. flight operations,
   ii. cabin safety,
   iii. crew scheduling, and
   iv. training programmes,

2. controlling operations and operational standards of all aircraft operated,
3. managing functions which impact on operational control (e.g. maintenance, crew scheduling, load control, equipment scheduling),
4. developing, implementing and maintaining the safety management systems,
5. developing and maintaining the company operations manual,
6. liaising with the regulatory authority on all matters concerning flight operations,
7. liaising with any external agencies which may affect aircraft operations,
8. ensuring that air operations are conducted in accordance with national and international regulations, standards and organization operating policies,
9. ensuring that crew scheduling complies with flight and duty time limitations,
10. ensuring that all crew members are kept informed of any changes to the regulations and operating standards,
11. receiving and taking action with respect to any aeronautical information affecting the safety of flight,
12. disseminating aircraft safety information, both internal and external,
13. ensuring that flight crew qualifications are current,
14. maintaining a current operations library, and
15. overseeing the welfare of flight operation personnel.

The foregoing can be assigned to other positions in the organization depending on its size and structure.

b. Qualifications

The flight department manager/director, flight operations must:

1. hold or have held an appropriate licence; or has acquired supervisory experience, and
2. demonstrate knowledge with respect to the operation of a flight organization, the content of the company operations manual, and the provision of the regulations and the standards necessary to carry out the duties and responsibilities to ensure safety.
4.2.2 Operations Manager/Chief Pilot

a. Responsibilities

The Chief Pilot/Operations Manager is accountable to the flight department manager/director, flight operations for the professional standards of the flight crews under his/her authority, for implementing and maintaining related aspects of the safety management system and that operations and training safety management goals are met. The duties of the position include:

1. developing aircraft checklists and standard operating procedures,
2. developing and implementing all required approved training programmes for the operator flight crews,
3. issuing directives and notices to the flight crews as required,
4. ensuring that all aerodromes and routes served by the operator are operationally suitable and meet operator requirements,
5. taking action on and distributing accident, incident, and other occurrence reports,
6. processing and taking action on any flight crew reports,
7. supervising aircraft crews,
8. ensuring that all operations processes and procedures to include risk management mitigation specified in the safety management system,
9. ensuring that personnel under his/her authority participate effectively in the safety management system, and
10. assuming any responsibilities delegated by the flight department manager.

b. Qualifications

1. The Chief Pilot/Operations Manager must:
   i. for aeroplanes hold a valid Airline Transport Pilot Licence valid for the category of aircraft operated.
   ii. for helicopters hold a commercial pilot licence valid for the category of aircraft operated.
   iii. if applicable, hold a type rating for at least one of the types of aircraft operated,
   iv. be qualified in accordance with the operator's training programme to act as a pilot-in-command on one of the types to be operated, and
   v. have knowledge of the content of the company operations manual, training manuals, SOPs, operator check pilot manual (if applicable), and the provisions of the State civil aviation regulations and standards necessary to carry out the duties and responsibilities of the position.
4.2.3 Maintenance Manager/Chief of Maintenance

a. Responsibilities

The person responsible for maintenance is accountable for ensuring that all aircraft are maintained in accordance with the regulatory requirements, for implementing and maintaining related aspects of the safety management system and that all maintenance related safety management goals are met. The duties of the position include:

1. planning and controlling all aircraft maintenance,
2. liaising with the national civil aviation authority on maintenance topics,
3. liaising with all persons or approved maintenance organizations (AMOs) performing maintenance on the operator’s aircraft,
4. ensuring that aircraft maintenance records as required by State of Registry regulations, manufacturers and operator policies are established and maintained,
5. ensuring that airworthiness directives and service bulletins that affect operator’s aircraft are complied with appropriately,
6. removing from service any aircraft that are unsafe, or that do not comply with national regulatory requirements,
7. ensuring that all operations processes and procedures include risk management mitigation specified in the safety management system,
8. ensuring that personnel under his/her authority participate effectively in the safety management system, and
9. establishing safety policies and procedures for ground operations.

Note: For operators falling under EASA rules, the duties of the person responsible for the management for continuing airworthiness may be fulfilled by the CAMO. However, the ultimate responsibility for aircraft airworthiness remains with the owner/lessee/operator."

b. Qualifications

1. The person responsible for maintenance must have:
   i. knowledge of the planning, implementation and direction of the maintenance control system for the aircraft operated, and
   ii. knowledge of the national regulations and standards relating to aircraft maintenance.

4.2.4 Safety Manager

a. Responsibilities

The safety manager shall have direct access to the flight department manager/director, flight operations and unfettered access to the Accountable Executive, (owner, CEO or equivalent) in safety matters and shall specifically be responsible for:

1. monitoring and advising on all operator safety activities that may have an impact on flight and ground safety,
2. establishing and managing the operator hazard identification and tracking system;
3. developing and maintaining a safety awareness programme,
4. monitoring industry flight safety concerns which may have an impact on operations,
5. maintaining close liaison with aircraft manufacturers and industry safety associations,
6. developing and maintaining the operator emergency response plan,
7. analysing hazard reports and other identified safety concerns and making recommendations on appropriate mitigation,
8. investigating and reporting on incidents/accidents and making recommendations on mitigation or modifications to the safety management system,
9. making recommendations to the operator senior management on matters pertaining to the safety management system,
10. undertaking safety assurance activities and conducting periodic evaluations of the safety management system and reporting the results to management, and
11. monitoring the response and measuring the results of safety initiatives.

b. Qualifications

The safety manager must have:

1. significant operational experience or equivalent experience in aviation management; and
2. training in the following:
   i. basic concepts of safety and accident causation,
   ii. safety management systems principles and practices,
   iii. the role of the safety manager as advisor to senior management,
   iv. human factors and the decision making process,
   v. accident prevention,
   vi. risk management,
   vii. accident/incident management,
   viii. emergency response planning, and
   ix. accident and incident investigation.

In smaller flight departments, the safety manager duties may be undertaken by the aviation manager or other qualified personnel.

4.2.5 Scheduler/Dispatcher

All organizations have someone responsible for scheduling the flights. In a small operation, these duties may be accomplished by the manager or assigned as collateral duties to the pilot or administrative personnel.

a. Some duties and responsibilities of this position could include:

1. scheduling travel for executives on operator aircraft or other lift alternatives such as charter,
2. providing the flight crew with the flight plan and weather information,
3. maintaining and updating aircraft and crew schedules to ensure compliance with operator and regulatory requirements,
4. obtaining international permits and visas and coordinating with outside aircraft service
   handlers for international flights, if applicable,
5. maintaining department records,
6. maintaining inventories of charts and related flight crew materials,
7. coordinating aircraft handling and fuelling with fixed base operators,
8. maintaining a flight following system,
9. coordinating maintenance on the aircraft,
10. developing and maintaining security policies or procedures and communicating these
    procedures as needed to passengers,
11. interfacing with flight crews, management, maintenance, and passengers,
12. scheduling ground transportation and accommodations,
13. arranging catering, and
14. participating in the safety management system.

b. Qualifications

The person responsible for scheduling the aircraft should have knowledge of the company operations
manual and procedures, national and international (if applicable) regulations and standards, and the
operator’s aircraft. The person should also have effective communication skills and defined methods to
communicate to crewmembers, maintenance personnel and operator personnel. The position generally
requires knowledge and skill with computer software.

4.3 Aircraft Crew Members

See the GCOM for example duties, responsibilities, and qualifications for aircraft crew members.

Note: The NBAA Management Guide provides extensive information on qualifications and duties of
other flight department personnel.

4.4 Maintenance and Line Service Personnel

See the GCOM for example duties, responsibilities, and qualifications for maintenance personnel.

Note: The NBAA Management Guide provides extensive information on qualifications and duties of
maintenance department personnel.

4.5 Other Personnel

See the GCOM for example duties, responsibilities, and qualifications for other personnel.

Note: The NBAA Management Guide provides extensive information on qualifications and duties of
other flight department personnel.

4.6 Use of Psychoactive Substances

See the GCOM for further guidance on the use of alcohol and other psychoactive substances.
IG 5.0 Training and Proficiency

5.1 Training Programmes

This IG provides guidance on complying with the requirements of section 5.1. All of the relevant items should be covered in initial training. The recurrent training programme should be designed so that key items are covered periodically. All of the items that are relative to the conditions of a particular operation may be covered over a specific period of time if provided for in the State regulatory requirements.

NOTE: As the guidance provided in this IG is of a general nature, helicopter operators involved in specialized missions should incorporate the training requirements included in the applicable HAI Mission Specific Standards into their training programs.

5.1.1 Outsourced Training

The operator may contract crew member training to another organization where the following are met:

a. the training organization should use the manuals, publications, check lists, SOPs and other relevant documents used by the operator receiving the training;

b. aircraft training should be given on the same type and model as that used by the operator;

c. where there are differences between the aircraft and the simulator configuration, performance, systems or avionics, they should be covered by differences training;

d. the operator is responsible to ensure that the contracted training is conducted in accordance with their training programme; and

e. the operator should ensure that the State licensing requirements are met.

5.1.2 Flight Crew Aircraft Ground Training

This training is to ensure that each flight crew member has knowledge of aircraft systems and all normal, abnormal, and emergency procedures. The following subjects should be included:

a. aircraft systems operation and limitations as contained in the aircraft flight manual and aircraft operating manual and standard operating procedures;

b. operation of all the aircraft equipment;

c. differences in equipment, operation, and layout between aircraft of the same type, if applicable;

d. normal, abnormal and emergency procedures for the aircraft;

e. aircraft performance and limitations;

f. weight/mass and balance system procedures;

g. MEL training (when a MEL has been established); and

h. aircraft servicing and ground handling.
5.1.3 Simulator Training Programme for Pilots

For all aircraft, the use of an approved flight simulator and training devices in the training programme is highly recommended, where such devices are available. An operator with a programme that uses an approved Level C or higher simulator is normally permitted to conduct initial and upgrade training in the simulator. This level of simulator usually meets the requirements for recurrent and six month take-off and landing day/night currency requirements to carry passengers. Operators should confirm this with their State authority.

Content of Flight Simulator Training Programme

Flight simulator programmes should cover the following subjects as contained in the Aircraft Flight Manual and the aircraft operating manual used by the operator:

a. Procedures for normal, abnormal and emergency operation of the aircraft systems and components including:

1. use of aircraft checklists;
2. flight and cabin crew resource management training;
3. aircraft fire on the ground and while airborne;
4. engine fire or failure;
5. effects of engine icing and anti-ice operation;
6. take-off, landing and when applicable, flight with critical engine inoperative including driftdown and engine inoperative performance capabilities;
7. loss of pressurization and emergency descent (as applicable);
8. flight control failures and degraded states of operation;
9. hydraulic, electrical and other system failures;
10. failure of navigation and communication equipment;
11. pilot incapacitation;
12. approach to the stall (ground contact imminent and ground contact not a factor) (as applicable);
13. normal and abnormal flight characteristics applicable to the aircraft category and type. These may include such items as: dutch roll, buffet boundary onset, jet upset, steep turns, static & dynamic rollovers, loss of tail rotor effectiveness, vortex ring, etc. (as applicable to the category, class and type of aircraft);
14. aircraft performance for climb, cruise, holding, descent, landing and diversion;
15. normal, noise abatement and maximum performance take-off;
16. aircraft performance calculations, including take-off and landing speeds, weight and balance, height velocity curve, hover out of ground effect, settling with power, and centre of gravity (as applicable);
17. rejected take-off procedures and rejected landings;
18. passenger and crew evacuation; and
19. FMS, GPWS/TAWS, TCAS, ACAS and other specialized equipment installed in the aircraft, as applicable.
20. Upset Training for unusual attitudes.
b. Flight planning and instrument flight procedures:
   1. departure, en-route, holding, arrival and in-flight diversion;
   2. precision, non-precision and missed approaches in minimum visibility conditions;
   3. precision, non-precision and missed approaches using automatic, flight director and degraded states of operation;
   4. Category II and Category III approaches, as applicable; and
   5. testing and reviews.

   Note: Operators should ensure that the training programme meets State flight crew licensing requirements.

5.1.3.1 Differences Training

Where the flight simulator has differences in performance, systems, avionics or cockpit layout and configuration from the operator's aircraft, such differences are to be listed in the training course outline and additional training on these differences may be required on the operator's specific aircraft configuration.

5.1.3.2 Level C Flight Simulators

When using an approved Level C flight simulator some States permit zero flight time training for candidates with previous experience on a similar aircraft type. “Similar aircraft type” refers to an aircraft possessing similar engine and complexity configuration such as the following relationship:

- Aeroplanes – turbo-jet to turbo-jet, turbo-prop to turbo-prop, or reciprocating engine to reciprocating engine.
- Helicopters – turbine to turbine engine.

All training and checking may be completed in a Level C flight simulator that duplicates the aircraft type and model flown by the operator. Operators should confirm this with their national civil aviation authority. Where the operator flies different models of the same type, provided the differences are limited and adequate differences training is provided, one type of flight simulator will normally be acceptable for training and checking on all the models.

In addition to the training required in section 6, the items specified below should also be included.

a. manoeuvring of the aircraft on the ground;

b. crosswind take-off and landings to 100% of the certificated crosswind component;

c. contaminated runway and crosswind take-off and landings to published demonstrated crosswind component (as applicable); and

d. a mix of no electronic aids, day, night and dusk visual circuits, approaches and landings. A visual flight training programme in the flight simulator is required to ensure visual flight skills are developed in the aircraft type. The training should cover the following using both day and night scenarios where the flight simulator capability permits:

   1. normal and crosswind take-offs, visual circuits and landings with variable winds, runway/heliport illusion and surface conditions;
   2. engine inoperative approaches and landings;
   3. engine failure procedures during take-off and missed approach;
4. no electronic aids approaches and landings;
5. approach and landings with degraded flight controls (as applicable)
6. slope take-off and landing (helicopters), and
7. elevated heliports (helicopters).

5.1.3.3 Level D Flight Simulators

When using an approved Level D flight simulator, some States permit zero flight time training for candidates without previous aircraft experience in a similar type aircraft. To qualify, a pilot must hold a type endorsement for an aircraft requiring two pilots and have 1,000 hours pilot flight time. Operators should confirm this and its applicability for helicopters, with their State civil aviation authority.

For flight simulators that have minor differences in performance, systems, avionics or cockpit layout and configuration from the operator's aircraft, additional training on these differences should be provided in the aircraft.

5.1.3.4 Aircraft only Flight Training Programme

Where training has not been conducted in an approved simulator, the following flight training should be covered, as applicable.

Procedures for normal, abnormal and emergency operation of aircraft systems and components including:

a. use of aircraft checklists;
b. manoeuvring of the aircraft on the ground;
c. crew resource management;
d. simulated aircraft fire on the ground and while airborne;
e. simulated engine fire or failure;
f. briefings on effects of airframe and engine icing and anti-ice operation;
g. take-off, landing and simulated flight with critical and two engine inoperative flight (3 or more engine aircraft as permitted by the aircraft flight manual) including driftdown and engine(s) inoperative performance capabilities (as applicable);
h. simulated loss of pressurization and emergency descent (as applicable);
i. simulated flight control failures and degraded states of operation, while in-flight, and during take-off and landing (as applicable);
j. simulated hydraulic, electrical and other system failures;
k. operation and simulated failure of navigation and communication equipment;
l. pilot incapacitation;
m. briefing for recognition and recovery from turbulence and windshear on approach, landing and take-off;
n. normal and abnormal flight characteristics applicable to the aircraft type. These may include such items as: dutch roll, buffet boundary onset, jet upset, dynamic roll over (helicopters), steep turns, etc. (as applicable);
o. aircraft performance for climb, cruise, descent, landing and diversion;
p. normal, noise abatement and maximum performance take-off and landing;
q. crosswind take-off and landings, and briefing on simulated contaminated runway take-off and landings;

r. slope, confined area and pinnacle take-off and landings and elevated heliport operations as applicable for helicopters;

s. aircraft performance calculations, including take-off and landing speeds, weight and balance and centre of gravity;

t. simulated rejected take-offs and landings;

u. passenger and crew emergency evacuation; and

v. FMS, GPWS/TAWS, TCAS, ACAS and other specialized equipment installed in the aircraft equipment, as applicable.

5.1.3.5 Area Navigation Systems (RNAV) Training

To qualify for use of RNAV systems on IFR operations, flight crew should undergo training in the following areas and have a proficiency check by, or the person designated by, the Chief Pilot/Operations Manager:

a. pre-flight;

b. normal operation of the system;

c. procedures for manually updating system;

d. methods of monitoring and cross checking system;

f. malfunction procedures;

g. terminal procedures;

h. waypoint symbology, plotting procedures, record keeping duties/practices;

i. time keeping procedures; and

j. post-flight.

5.1.3.6 Minimum Navigation Performance Specifications (MNPS) Training

To qualify for operations in MNPS airspace, flight crew must have completed training for the appropriate MNPS airspace and have satisfactorily completed any proving flights or in flight checks, required by the State of Registry civil aviation authority.

The training normally required includes:

a. normal operating procedures, including navigation system pre-flight data entry and periodic cross-checking of system position display against aircraft position;

b. method of monitoring and cross-checking the system that is coupled to the auto-pilot;

c. action in the event of discrepancy between systems, method of determining which is the most accurate or reliable system;

d. radio communication procedures;

e. MNPS contingency procedures;

f. action in the event of single or multiple systems failure;

g. procedure for manual updating of systems;

h. airborne emergency procedures, including re-alignment (if applicable);

i. procedure for regaining track after deliberate or inadvertent deviation from cleared track;

j. RNAV training; and

k. RVSM training, if applicable.
5.1.3.7 Reduced Vertical Separation Minima (RVSM) Training

To qualify for operations in RVSM airspace, flight crew must have completed the appropriate training and have satisfactorily completed any proving flights or in flight checks, required by the State of Registry civil aviation authority. The training normally required includes:

a. Floor, ceiling and horizontal boundaries of the RVSM airspace to be operated in;
b. Policy on exclusion of aircraft not RVSM approved;
c. Pilot procedures:
   i. pre-flight and in-flight altimeter checks;
   ii. use of the automatic altitude control system;
   iii. Minimum Equipment List (MEL) for RVSM operations;
   iv. special procedures for in-flight contingencies;
   v. updated weather deviation procedures;
   vi. track offset procedures for wake turbulence and nuisance aircraft systems alerts;
   and
   vii. pilot level-off call.
d. Procedures for flight of non-RVSM compliant aircraft for maintenance, humanitarian and delivery flights; and
e. Use of ACAS/TCAS

Note: Reference material is contained in UK CAA AIC 80/2000 – RVSM Operations – Flight Crew Training and Operational Considerations

5.1.3.8 Required Navigation Performance (RNP) Training

To qualify for operations in RNP airspace, flight crew must have completed training for the particular RNP airspace and have satisfactorily completed any proving flights or in flight checks, required by the State of Registry civil aviation authority. The training normally required includes:

a. flight planning considerations for that RNP airspace;
b. navigation performance requirements for that RNP airspace;
c. enroute procedures for that RNP airspace; and
d. contingency procedures for that RNP airspace.

5.1.3.9 Category II/III Operations

The operator must meet the training and currency specified by the State of Registry civil aviation authority. In the absence of specific national rules, the operator should meet the requirements of:

- FAA Circular AC 91-16 - Category II Operations - General Aviation Airplanes for Category II,
- FAA Circular - AC 120-28D - Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout for Category III operations,
- JAR- OPS 1 - Commercial Air Transportation (Aeroplanes) Subpart E – All Weather Operations, and
5.1.3.10 Low Visibility Take-off Weather Minima

a. Ground Training:
   1. take-off alternate requirements,
   2. pilot-in-command minimum experience,
   3. pilot-in-command responsibility for visibility and obstacle clearance requirements, and
   4. minimum aircraft and runway equipment requirements.

b. Flight Simulator Training (RVR 600 ft./200 m only):
   1. one completed take-off at RVR 600 ft./200 m, and
   2. one rejected take-off at RVR 600 ft./200 m that will include an engine failure.

The above training is required for the pilot-in-command only, except if the operator authorizes a co-pilot to conduct take-offs in lower-than-standard weather minima, the co-pilot shall undergo the same training as the pilot-in-command.

5.1.3.11 Upgrade Training for Pilots

Upgrade training to pilot-in-command for pilots who have qualified and served as a co-pilot on that aircraft type should include the following:

a. Crew Resource Management;

b. training in and demonstration of proficiency as a pilot-in-command from both left and right seats (if PIC flies in both seats) in all areas of aircraft handling and operation as outlined in the initial course; and

c. special authorization qualification (e.g. lower take-off limits, etc.).

5.1.3.12 Engine-out Take-off and Ferry

Where an operator wishes to obtain authority for engine-out ferry, the training as specified in the manufacturer’s aircraft operating manual shall be completed in the simulator prior to making application for a special flight authority.

5.1.3.13 Transportability of Pilot Proficiency Check - Training

Transportability of pilot training and proficiency checks from one operator to another is normally permitted subject to the new operator providing the following training, which shall be specified in the company operations manual:

a. company operations manual;

b. normal, abnormal and emergency procedures on each type of aircraft the pilot is assigned to fly; and

c. pilot ground training on each type of aircraft the pilot is assigned to fly, sufficient to cover the operator procedures, equipment differences and special authorizations.

5.1.3.14 Aircraft Surface Contamination Training

Operating personnel should receive training in the following areas:

a. aircraft crew initial de-icing/anti-icing training;
   1. the effect of contamination on a critical surface;
   2. aircraft de-icing/anti-icing procedures; and
3. aircraft inspection procedures;
b. aircraft crew recurrent de-icing/anti-icing operational procedures training every two years;
c. initial de-icing/anti-icing, ground/maintenance personnel training; including:
   1. the effect of contamination on critical surfaces;
   2. aircraft de-icing/anti-icing procedures; and
   3. aircraft inspection procedures; and
d. recurrent de-icing/anti-icing ground maintenance procedures training every two years.

5.1.3.15 MEL Training (as applicable)

Where an operator uses an MEL, flight crew should receive training such as:

a. MEL Origin and Philosophy:
   1. difference between a MMEL and a MEL, and
   2. MEL Background and development.

b. General MEL Content:
   1. approval letter,
   2. list of effective pages,
   3. table of contents,
   4. preamble,
   5. definitions, and
   6. ATA Chapters, Page format, Page numbering, System and item titles, categorization, columns, remarks and exceptions, placarding, (O) and (M) procedures.

c. Specific Use of the MEL:
   1. a review of items from a variety of systems including those with no procedures, (O), (M), (M#), (O) and (M), as applicable,
   2. practical demonstration of MEL use versus hypothetical situations at and away from a maintenance base, and
   3. supervised 'hands on' use of a MEL, until familiar with the location, contents and procedures, including those at or away from a maintenance base.

5.1.3.16 Carriage of Dangerous Goods and Magnetized Material Training (if applicable)

If the operator is engaged in the carriage of cargo pursuant to national or IATA Transportation of Dangerous Goods Regulations, the required training programme must cover at least:

a. general philosophy of dangerous goods;

b. (State) Transportation of Dangerous Goods regulations;

c. the current edition of the ICAO Technical Instructions;

d. limitations;

e. general requirements for shippers;

f. classes and lists of dangerous goods;

g. packing requirements;

h. labelling and marking;

i. dangerous goods documentation, including shipper’s declaration, pilot notification and acceptance checklist forms;

j. operator acceptance, rejection, handling and storage procedures;
k. recognition of undeclared dangerous goods;

l. storage and handling procedures including loading and unloading procedures and segregation
   requirements;

m. provisions for passengers and crew; and

n. operator emergency procedures.

If an operator does not carry dangerous goods, crewmembers shall receive training on the
following subjects initially and every two years thereafter:

a. dangerous goods recognition

b. procedures for advising passengers on what constitutes dangerous goods

c. what and how certain dangerous goods can be carried onboard the aircraft.

5.1.3.17 Other Persons Assigned Onboard Duties

Where an operator has assigned onboard duties to those other than flight crew or cabin crew
member, that person must be given adequate initial and annual training to perform the procedures
relevant to the duties with which the person is to be involved including:

a. authority of the pilot-in-command;

b. means of communication;

c. a general description of the aircraft and systems which the person may use;

d. procedures for normal, abnormal, and emergency situations;

e. location, operation and use of emergency, life saving and survival equipment carried; and

f. the relationship of their duties to those of the other crew members.

5.1.3.18 Helicopter Operational Ground Support Personnel

Personnel involved in ground support of helicopter operations should receive training
commensurate with their assigned duties and responsibilities. The duties may vary depending on
the type of operation but the training should generally include:

a. Passenger and landing zone management;

b. Load preparation and handling;

c. Hazardous materials;

d. Operation of doors, cargo hatches, cargo securing, etc.;

e. Helipad and drop zones housekeeping;

f. Marshalling and other communications with flight crew;

g. Training of standard phraseology for radio communications (remote base ops);

h. Managing static electricity;

i. Correct hook-up procedures and use of external cargo equipment;

j. Aviation hazards, e.g. electrical lines, trees, foreign obstacles, etc.;

k. Requirement for control under the aircraft:

   1. Actions in the event of an aircraft emergency,

   2. Procedures for positioning a load suspended on a long line,

   3. Use absolute minimum number of people,

l. Required personnel protective equipment and proper use;

m. First aid and fire fighting (not to exceed 2 years between training);

n. Refuelling Procedures to include procedures for hot refuelling;
5.1.3.19 VNAV Approaches

The VNAV training programme should provide sufficient training (e.g. simulator, training device, or aircraft) on the aircraft’s VNAV capability to the extent that the pilots are not just task-oriented, including:

a. the basic principles of VNAV;
b. the meaning and proper use of aircraft systems;
c. procedure characteristics, as determined from chart depiction and textual description:
   1. depiction of waypoint types (flyover and fly-by) and path terminators and any other types used by the operator) as well as associated aircraft flight paths;
   2. RNAV system-specific information;
   3. levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation;
   4. functional integration with other aircraft systems;
   5. the meaning and appropriateness of vertical path discontinuities as well as related flight crew procedures;
   6. monitoring procedures for each phase of flight (e.g. monitor “PROGRESS” or “LEGS” page);
   7. turn anticipation with consideration to speed and altitude effects; and
   8. interpretation of electronic displays and symbols.

d. VNAV equipment operating procedures, as applicable, including how to perform the following actions:
   1. adhere to speed and/or altitude constraints associated with an approach procedure;
   2. verify waypoints and flight plan programming;
   3. fly direct to a waypoint;
   4. determine vertical-track error/deviation;
   5. insert and delete route discontinuity;
   6. change arrival airport and alternate airport; and
   7. contingency procedures for VNAV failures;

e. there should be a clear understanding of crew requirements for:
   1. comparisons to primary altimeter information;
   2. altitude cross-checks (e.g. altimetry comparisons of 30 m (100 ft);
   3. temperature limitations for instrument procedures using VNAV; and
   4. procedures for altimeter settings for approach; and

f. discontinuation of a procedure based upon loss of systems or performance and flight conditions, e.g. inability to maintain required path tracking, loss of required guidance, etc.
5.1.3.20 Training Staff

The recommended standard for training programmes, training facilities and for instructors of ground training programmes follows.

a. Training Facilities - Training facilities should have an environment conducive to learning and take into consideration, privacy, furnishings, audio-visual requirements and current training aids.

b. Instructional Staff - The competence of instructional personnel should be in accordance with procedures and to a level acceptable to the Licensing Authority. Flight instructors must hold the licence and ratings appropriate to the aircraft type and ground training instructor should have relevant technical expertise.

c. All instructional personnel should receive initial and continuation training appropriate to their assigned tasks and responsibilities. Their training programme should include:
   1. the teaching/learning process,
   2. instructional technique,
   3. student/instructor relationship training in knowledge and
   4. skills related to human performance.

5.1.3.21 Scheduler/Dispatcher Personnel Training Program

The operator should establish and maintain training programs that are designed to ensure all scheduling and dispatching personnel have the competencies appropriate to the level of scheduling performed.

The operator should ensure that the training programs have been established, either through or a combination of an internal program, training service provider, NBAA PDP and/or CAM accredited curriculum or international equivalent.

The training program should include initial and recurrent training appropriate to the operations.

The training program should include subjects such as:

a. Operator policy and procedures;

b. Computer skills and scheduling software application;

c. Aircraft performance and weather;

d. Fatigue management/Human factors;

e. Safety Management Systems;

f. Emergency Response;

g. Leadership and team work;

h. Federal Aviation Regulations (FARs) and International Regulations;

i. Interpersonal skills and effective communication; and

j. CPR and hangar safety.
5.2 Human Factors (HF) and Crew Resource Management (CRM) Training

5.2.1 The Dirty Dozen

The Dirty Dozen is a list of human factor precursors that can lead to accidents or incidents. See the Australian Government Civil Aviation Safety Authority publication, War on Error (FSA Mar-Apr 2009) at the following link: [http://www.casa.gov.au/wcmswr/_assets/main/lib91122/10-17.pdf](http://www.casa.gov.au/wcmswr/_assets/main/lib91122/10-17.pdf)

5.2.2 Human Factors Awareness Training

The FAA provides an online Human Factors Awareness Course at [https://www.hf.faa.gov/Webtraining/Intro/Intro1.htm](https://www.hf.faa.gov/Webtraining/Intro/Intro1.htm)

5.2.3 Human Factors Digest


5.2.4 CRM Training


5.3 Emergency Procedures Training

Emergency procedures training is required for all aircraft crew members and shall include instruction on the location and operation of all emergency equipment. During initial training and every 24 months thereafter, aircraft crew members must perform the function or action, or obtain a suitable demonstration by other means e.g. audio-visual, for the following:

- fire in the air and on the ground;
- use of fire extinguishers;
- operation and use of emergency exits;
- passenger preparation for an emergency landing/ditching;
- emergency evacuation procedures;
- donning and inflation of life preservers (when equipped);
- removal from stowage, deployment, inflation and boarding of life rafts (when equipped);
- pilot incapacitation;
- unlawful interference, bomb threat and other security procedures;
- special emergency procedures should the aircraft have to be used for MEDEVAC operations including transportation of ill or injured passengers in emergency situations; and
- passenger health emergencies.
IG 6.0 Flight Operations

6.1 Standard Operating Procedures

The Standard Operating Procedures (SOP) should contain the following information for each type of aircraft operated. Where there are significant differences in equipment and procedures between aircraft of the same type operated, the SOP should show the registration mark of the aircraft, it is applicable to. The SOP may be a stand-alone document or may be incorporated into the company operations manual.

Recommended Contents of a SOP
1. table of contents;
2. list of effective pages;
3. amending procedure;
4. communications;
5. crew coordination;
6. use of check lists;
7. standard briefings;
8. standard calls;
9. radio procedures;
10. Normal procedures:
   a. battery/APU engine starts,
   b. taxi,
   c. power check (helicopters),
   d. take-off and climb,
   e. cruise,
   f. descent,
   g. calculations of landing performance at increased altitudes (helicopters),
   h. instrument approach procedures and circling, arrival and departure procedures at controlled and uncontrolled airports,
   i. landing,
   j. refuelling with passengers onboard (if permitted), and
   k. use of onboard navigation and alerting aids;
11. Abnormal procedures:
   a. rejected take-off,
   b. missed approaches and balked landing procedures,
   c. stall recovery (aeroplanes),
   d. loss of tail rotor effectiveness (helicopters),
   e. tail rotor drive failure and stuck pedals (helicopters),
   f. dynamic rollover (helicopters), and
   g. autorotation (helicopters);
12. Emergencies:
   a. pilot incapacitation; (2 pilot crew),
   b. bomb threat and hijacking,
   c. engine fire/failure/shutdown,
   d. fire, internal/external,
   e. smoke removal,
   f. rapid decompression (aeroplanes as applicable,
   g. flapless approach and landing (aeroplanes); and
   h. check lists;
13. Other operating considerations:
   a. cold weather operations,
   b. helicopter vertical reference (helicopters),
   c. remote landing sites (helicopters),
   d. night operations (helicopters),
   e. slope landings and take-offs (helicopters),
   f. passenger loading and unloading on slopes,
   g. flight into degraded visual environments; and
   h. ACAS procedures.

14. Mission specific requirements (helicopters as applicable):
   a. offshore platform,
   b. general boat/ship,
   c. volcanic / seismic,
   d. utilities patrol and construction,
   e. emergency medical services,
   f. search and rescue,
   g. law enforcement support,
   h. heli skiing,
   i. aerial fire fighting,
   j. aerial application,
   k. electronic news gathering, and
   l. other.

The NBAA PROTOTYPICAL Business Aviation Safety Program Manual that can be found at http://www.nbaa.org/ops/safety/manual/ contains extensive guidance material that may be of assistance to operators in developing either fixed wing or rotary wing standard operating procedures manuals.


The Multi Crew Aircraft Standard Operating Procedures that can be found on the Transport Canada web site at http://www.tc.gc.ca/eng/civilaviation/standards/commerce-manuals-multicrewsop-menu-1796.htm is a very comprehensive SOP model.

Also, aircraft manufacturers and flight training organizations may be a source of assistance in developing a SOP manual.

The Helicopter Association International (HAI) has produced mission specific standards. Information on these standards can be found at http://hai-aps.rotor.org/index.php/mission-standards/.
6.2.5 Fuel Planning Requirements

An aeroplane shall carry a sufficient amount of usable fuel to complete the planned flight safely and to allow for deviations from the planned operation.

The amount of usable fuel to be carried shall, as a minimum, be based on:

a. fuel consumption data:
   1. provided by the aeroplane manufacturer; or
   2. if available, current aeroplane-specific data derived from a fuel consumption monitoring system; and

b. the operating conditions for the planned flight including:
   1. anticipated aeroplane mass;
   2. Notices to Airmen;
   3. current meteorological reports or a combination of current reports and forecasts;
   4. air traffic services procedures, restrictions and anticipated delays; and
   5. the effects of deferred maintenance items and/or configuration deviations.

Note: Where no specific fuel consumption data exists for the precise conditions of the flight, the aircraft may be operated in accordance with estimated fuel consumption data.

The pre-flight calculation of usable fuel required shall include:

a. taxi fuel, which shall be the amount of fuel expected to be consumed before take-off taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;

b. trip fuel, which shall be the amount of fuel required to enable the aeroplane to fly from take-off until landing at the destination aerodrome taking into account the operating conditions of 6.2.5b;

c. contingency fuel, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be not less than five per cent of the planned trip fuel;

Note: Unforeseen factors are those which could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended delays and deviations from planned routings and/or cruising levels.

d. destination alternate fuel, which shall be:
   1. where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to:
      i. perform a missed approach at the destination aerodrome;
      ii. climb to the expected cruising altitude;
      iii. fly the expected routing;
      iv. descend to the point where the expected approach is initiated; and
      v. conduct the approach and landing at the destination alternate aerodrome; or
   2. where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 450 m (1 500 ft) above destination aerodrome elevation in standard conditions; or
3. where the aerodrome of intended landing is an isolated aerodrome:
   i. for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 per cent of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or
   ii. for a turbine-engined aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

e. **final reserve fuel**, which shall be the amount of fuel on arrival at the destination alternate aerodrome, or the destination aerodrome when no destination alternate aerodrome is required:
   1. for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 min; or
   2. for a turbine-engined aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m (1500 ft) above aerodrome elevation in standard conditions;

f. **additional fuel**, which shall be the supplementary amount of fuel required to enable the aircraft to descend as necessary and proceed to land at an alternate aerodrome in the event of engine failure or loss of pressurization based on the assumption that such a failure occurs at the most critical point along the route;

g. **discretionary fuel**, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.

Operators should determine one final reserve fuel value for each aeroplane type and variant in their fleet rounded up to an easily recalled figure.

The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

**Note:** Nothing in this guidance precludes the in-flight amendment of a flight plan to re-plan that flight to another aerodrome, provided that the requirements of 6.2.5 can be complied with from the point where the flight is re-planned.

**Note:** The protection of final reserve fuel is intended to ensure a safe landing at any aerodrome when unforeseen occurrences may not permit safe completion of an operation as originally planned. Guidance on flight planning including the circumstances that may require re-analysis, adjustment and/or replanning of the planned operation before take-off or en-route, is contained in the *Flight Planning and Fuel Management Manual (Doc 9976).*

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**6.2.5.1** The pilot-in-command shall request delay information from ATC when unanticipated circumstances may result in landing at the destination aerodrome with less than the final reserve fuel plus any fuel required to proceed to an alternate aerodrome or the fuel required to operate to an isolate aerodrome.

**Note:** The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

**Note:** The words “MAYDAY FUEL” describe the nature of the distress conditions as required in *ICAO Annex 10, Volume II, 5.3.2.1, b) 3.*
When conducting operations beyond 60 minutes from a point on a route to an enroute alternate aerodrome operators should ensure that:

a. en-route alternate aerodromes are identified; and
b. the pilot-in-command has access to current information on the identified en-route alternate aerodromes, including operational status and meteorological conditions.

6.2.8.3A Aircraft Performance (Aeroplanes)

**ICAO Annex 6 Part 1 Attachment C** provides extensive guidance related to aircraft performance requirements for commercial operations. The purpose of the attachment is to provide guidance as to the level of performance as applicable to aeroplanes having two, three or four engines.

The operator should ensure the aircraft performance meets the requirements for the following:

a. Accelerate Stop Distance
b. Take-off distance
c. Take-off climb
d. Take-off obstacle clearance
e. Enroute obstacle clearance
f. Approach climb
g. Landing climb
h. Landing distance

6.3.3 Search and Rescue Information can be found in **ICAO Annex 12**. Information for pilots can be found at: [http://www.faraim.org/aim/aim-4-03-14-408.html](http://www.faraim.org/aim/aim-4-03-14-408.html)

6.4.3 Head-Up Display (HUD), Equivalent Displays and Vision Systems

**Introduction**

This section provides guidance for certified HUD and vision systems intended for operational use in aircraft engaged in international air navigation. A HUD, vision systems and hybrid systems may be installed and operated to provide guidance, enhance situational awareness and/or to obtain an operational credit by establishing minima below the aerodrome operating minima, for approach ban purposes, or reducing the visibility requirements or requiring fewer ground facilities as compensated for by airborne capabilities. HUD and vision systems may be installed separately or together as part of a hybrid system. Any operational credit to be obtained from their use requires approval from the State of Registry.

Note 1: “Vision systems” is a generic term referring to the existing systems designed to provide images, i.e. enhanced vision systems (EVS), synthetic vision systems (SVS) and combined vision systems (CVS).

Note 2: Operational credit can be granted only within the limits of the design approval.

Note 3: Currently, operational credit has been given only to vision systems containing an image sensor providing a real-time image of the actual external scene on the HUD.
6.4.3.1 HUD and Equivalent Displays

General

A HUD presents flight information into the pilot’s forward external field of view without significantly restricting that external view.

A variety of flight information may be presented on a HUD depending on the intended flight operation, flight conditions, systems capabilities and operational approval. A HUD may include, but is not limited to, the following:

a. airspeed;
b. altitude;
c. heading;
d. vertical speed;
e. angle of attack;
f. flight path or velocity vector;
g. attitude with bank and pitch references;
h. course and glide path with deviation indications;
i. status indications (e.g. navigation sensor, autopilot, flight director); and
j. alerts and warning displays (e.g. ACAS, wind shear, ground proximity warning).

6.4.3.2 Operational Applications

Flight operations with a HUD can improve situational awareness by combining flight information located on head-down displays with the external view to provide pilots with more immediate awareness of relevant flight parameters and situation information while they continuously view the external scene. This improved situational awareness can also reduce errors in flight operations and improve the pilot’s ability to transition between instrument and visual references as meteorological conditions change. Flight operations applications may include the following:

a. enhanced situational awareness during all flight operations, but especially during taxi, take-off, approach and landing;
b. reduced flight technical error during take-off, approach and landing; and
c. improvements in performance due to precise prediction of touchdown area, tail strike awareness/warning and rapid recognition of and recovery from unusual attitudes.

A HUD may be used for the following purposes:

a. to supplement conventional flight deck instrumentation in the performance of a particular task or operation. The primary cockpit instruments remain the primary means for manually controlling or manoeuvring the aircraft; and
b. as a primary flight display;
   i. information presented by the HUD may be used by the pilot in lieu of scanning head-down displays. Operational approval of a HUD for such use allows the pilot to control the aircraft by reference to the HUD for approved ground or flight operations; and
   ii. information presented by the HUD may be used as a means to achieve additional navigation or control performance. The required information is displayed on the HUD. Operational credit, in the form of lower minima, for a HUD used for this purpose may be
approved for a particular aircraft or automatic flight control system. Additional credit may also be allowed when conducting HUD operations in situations where automated systems are otherwise used.

A HUD, as a stand-alone system, may qualify for operations with reduced visibility or RVR or replace some parts of the ground facilities such as touchdown zone and/or centre line lights.

Examples and references to publications in this regard can be found in the Manual of All-Weather Operations (Doc 9365).

A HUD equivalent display is one that has at least the following characteristics; a head-up presentation not requiring transition of visual attention from head down to head up; displays sensor-derived imagery conformal with the pilots external view; permits simultaneous view of the EVS sensor imagery, required aircraft flight symbology, and the external view; and display characteristics and dynamics are suitable for manual control of the aircraft. Before such systems can be used, the appropriate airworthiness and operational approvals should be obtained.

6.4.3.3 HUD training

Training requirements should be established, monitored and approved by the State of the Operator or the State of Registry for general aviation. Training requirements should include requirements for recent experience if the State determines that these requirements are significantly different than the current requirements for the use of conventional head-down instrumentation.

HUD training should address all flight operations for which the HUD is designed and operationally approved. Some training elements may require adjustments based on whether the aeroplane has a single or dual HUD installation. Training should include contingency procedures required in the event of head-up display degradation or failure. HUD training should include the following elements as applicable to the intended use:

a. an understanding of the HUD, its flight path, energy management concepts and symbology. This should include operations during critical flight events (e.g. ACAS Traffic Advisory/Resolution Advisory upset and wind shear recovery, engine or system failure);

b. HUD limitations and normal procedures, including maintenance and operational checks performed to ensure normal system function prior to use. These checks include pilot seat adjustment to attain and maintain appropriate viewing angles and verification of HUD operating modes;

c. HUD use during low visibility operations, including taxi, take-off, instrument approach and landing in both day and night conditions. This training should include the transition from head-down to head-up and head-up to head-down operations;

d. failure modes of the HUD and the impact of the failure modes or limitations on crew performance;

e. crew coordination, monitoring and verbal call-out procedures for single HUD installations with head-down monitoring for the pilot not equipped with a HUD and head-up monitoring for the pilot equipped with a HUD;
f. crew coordination, monitoring and verbal call-out procedures for dual HUD installations with use of a HUD by the pilot flying the aircraft and either head-up or head-down monitoring by the other pilot;

g. consideration of the potential for loss of situational awareness due to "tunnel vision" (also known as cognitive tunneling or attention tunneling);

h. any effects that weather, such as low ceilings and visibilities, may have on the performance of a HUD; and

i. HUD airworthiness requirements.

6.4.3.4 Vision Systems

General

Vision systems can display electronic real-time images of the actual external scene achieved through the use of image sensors (EVS) or display synthetic images, which are derived from the on-board avionic systems (SVS). Vision systems can also consist of a combination of these two systems or combined vision systems (CVS). Such a system may display electronic real-time images of the external scene using the EVS component of the system. However, the merging of EVS and SVS into a CVS is dependent on the intended function (e.g. whether or not there is intent to achieve operational credit).

The information from vision systems may be displayed on a head-up or head-down display. When enhanced vision imagery is displayed on a HUD, it should be presented to the pilot’s forward external field of view without significantly restricting that external view.

The enhanced position fixing and guidance provided by SVS may provide additional safety for all phases of flight especially low visibility taxi, take-off, approach and landing operations.

Light emitting diode (LED) lights may not be visible to infrared-based vision systems due to the fact that LED lights are not incandescent and they do not have a significant heat signature. Operators of such vision systems will need to acquire information about the LED implementation programmes at aerodromes where they operate.

6.4.3.5 Operational Applications

Flight operations with enhanced vision image sensors allow the pilot to view an image of the external scene obscured by darkness or other visibility restrictions. When the external scene is partially obscured, enhanced vision imaging may allow the pilot to acquire an image of the external scene earlier than with natural or unaided vision. The improved acquisition of an image of the external scene may improve situational awareness.

Vision system imagery may also allow pilots to detect terrain or obstructions on the runway or taxiways. A vision system image can also provide visual cues to enable earlier runway alignment and a more stabilized approach.

The combined display of aircraft performance, guidance and imagery may allow the pilot to maintain a more stabilized approach and smoothly transition from enhanced visual references to natural visual references.
6.4.3.6 Vision Systems Training

Training requirements should be established, monitored and approved by the State of the Operator. Training requirements should include recency of experience requirements if the State of the Operator determines that these requirements are significantly different than the current requirements for the use of a HUD without enhanced vision imagery or conventional head-down instrumentation.

Training should address all flight operations for which the vision system is approved.

This training should include contingency procedures required in the event of system degradation or failure. Training for situational awareness should not interfere with other required operations. Training for operational credit should also require training on the applicable HUD used to present the enhanced visual imagery. Training should include the following elements as applicable:

a. an understanding of the system characteristics and operational constraints;
b. normal procedures, controls, modes and system adjustments (e.g. sensor theory including radiant versus thermal energy and resulting images);
c. operational constraints, normal procedures, controls, modes and system adjustments;
d. limitations;
e. airworthiness requirements;
f. vision system display during low visibility operations, including taxi, take-off, instrument approach and landing; system use for instrument approach procedures in both day and night conditions;
g. failure modes and the impact of failure modes or limitations upon crew performance, in particular, for two-pilot operations;
h. crew coordination and monitoring procedures and pilot call-out responsibilities;
i. transition from enhanced imagery to visual conditions during runway visual acquisition;
j. rejected landing: with the loss of visual cues of the landing area, touchdown zone or rollout area;
k. any effects that weather, such as low ceilings and visibilities, may have on the performance of the vision system; and
l. effects of aerodrome lighting using LED lights.

6.4.3.7 Operational Concepts

Instrument approach operations that involve the use of vision systems include the instrument phase and the visual phase. The instrument phase ends at the published MDA/H or DA/H unless a missed approach is initiated. The continued approach to landing from MDA/H or DA/H will be conducted using visual references. The visual references will be acquired by use of an EVS or CVS, natural vision or a combination of the two.

Down to a defined height, typically 30 m (100 ft), the visual references will be acquired by means of the vision system. Below this height the visual references should be solely based on natural vision. In the most advanced applications, the vision system is expected to be able to be used down to touchdown without the requirement for natural vision acquisition of visual references. Using the EVS or CVS does not change the classification of an instrument approach procedure,
since the published DA/H remains unchanged and manoeuvring below DA/H is conducted by visual references acquired by means of an EVS or CVS.

In addition to the operational credit that EVS/CVS is able to provide, these systems may also provide an operational and safety advantage through improved situational awareness, earlier acquisition of visual references and smoother transition to references by natural vision. These advantages are more pronounced for Type A approach operations than for Type B approach operations.

6.4.3.8 Visual References

The required visual references do not change due to the use of an EVS or CVS, but those references are allowed to be acquired by means of either vision system until a certain height during the approach.

6.4.3.9 Hybrid Systems

A hybrid system generically means that two or more systems are combined. The hybrid system typically has improved performance compared to each of the component systems, which in turn may qualify for operational credit. Vision systems are normally part of a hybrid system, e.g. EVS is typically combined with a HUD. Including more components in the hybrid system normally enhances the performance of the system.

6.4.3.10 Operational Credits

Aerodrome operating minima are expressed in terms of minimum visibility/RVR and MDA/H or DA/H. With respect to operational credit this means that the visibility/RVR requirements, established in the instrument approach procedure, may be reduced or satisfied for aircraft equipped with appropriately approved vision systems such as EVS. Reasons for granting operational credit may be when aircraft are better equipped than what was originally considered when designing the instrument approach procedure or when runway visual aids considered in the design of the procedure are not available but can be compensated by on-board equipment.

Credits related to visibility/RVR can be given using at least three concepts. The first concept is to reduce the required RVR which will allow the aircraft to continue the approach beyond the approach ban point with a reported RVR lower than what was established for the approach procedure. Where a minimum visibility is prescribed, a second concept to grant operational credit may be used. In this case, the required minimum visibility is kept unchanged, but it is satisfied by means of the on-board equipment, typically an EVS. The result of both these concepts is that operations are allowed in meteorological conditions where otherwise they would not be possible.

A third concept is to give operational credit by allowing operations in visibility/RVR which are not lower than those established for the approach procedure, but the approach operation is conducted with less facilities on the ground. One example of the latter is to allow category II operations without touchdown and/or centre line lights, compensated by additional on-board equipment, e.g. a HUD.

Granting operational credits does not affect the classification of an instrument approach procedure since, as described in Standard 4.2.8.3, instrument approach procedures are designed to
support a given instrument approach operation (i.e. Type, Category). However, the design of those procedures may not take into consideration on-board equipment that may compensate for facilities on the ground.

In order to provide optimum service, the ATS may have to be informed about the capabilities of the better-equipped aircraft, e.g. which is the minimum RVR required.

In addition to the operational credit that HUD, vision systems and hybrid systems are able to provide, these systems will also provide an operational and safety advantage through improved situational awareness, earlier acquisition of visual references and smoother transition to references by natural vision. These advantages are more pronounced for 3D Type A approach operations than for Type B approach operations.

6.4.3.11 Operational Procedures

It is not prohibited to use vision systems in connection with circling. However, due to the system layout of a vision system and the nature of a circling procedure, key visual references can be obtained only by natural vision, and operational credit is not feasible for existing vision systems. The vision system may provide additional situational awareness.

The operational procedures associated with the use of a HUD, vision systems and hybrid systems should be included in the operations manual. The instructions in the operations manual should include:

a. any limitation that is imposed by the airworthiness or operational approvals;

b. how operational credit affects:
   1. flight planning with respect to destination and alternate aerodromes;
   2. ground operations;
   3. flight execution, e.g. approach ban and minimum visibility;
   4. crew resource management that takes into account the equipment configuration, e.g. the pilots may have different presentation equipment;
   5. standard operating procedures, e.g. use of autoflight systems, call-outs that may be particular to the vision system or hybrid system, criteria for stabilized approach;
   6. ATS flight plans and radio communication.

6.4.3.12 Approvals

General

An operator that wishes to conduct operations with a HUD or equivalent display, vision system or hybrid system will need to obtain certain approvals (see Annex 6, Part I, 4.2.8.1.1 and 6.23, and the corresponding requirements in Annex 6, Parts II and III). The extent of the approvals will depend on the intended operation and the complexity of the equipment.

Enhanced vision imagery may be used to improve situational awareness without a specific operational approval. However, the standard operating procedures for these types of operations need to be specified in the operations manual. An example of this type of operation may include an EVS or an SVS on a head-down display that is used only for situational awareness of the
surrounding area of the aircraft during ground operations where the display is not in the pilot’s primary field of view. For enhanced situational awareness, the installation and operational procedures need to ensure that the operation of the vision system does not interfere with normal procedures or the operation or use of other aircraft systems. In some cases, modifications to these normal procedures for other aircraft systems or equipment may be necessary to ensure compatibility.

When a vision system or a hybrid system with vision systems imagery is used for operational credit, operational approvals will typically require that the imagery be combined with flight guidance and presented on a HUD. Operational approvals may require that this information also be presented on a head-down display. Operational credit may be applied for any flight operation, but credit for instrument approach and take-off operations is most common.

When the application for approval relates to operational credits for systems not including a vision system, the guidance in this attachment may be used to the extent applicable as determined by the State of the Operator or the State of Registry for general aviation.

Operators should be aware that some States may require some information about the operational credit(s) which has been granted by the State of the Operator or the State of Registry for general aviation. Typically the approval from that State will have to be presented, and in some cases the State of the Aerodrome may wish to issue an approval or to validate the original approval.

6.12.3 For information related to checklist design and human factors see:
   a. Human Performance Considerations in the Use and Design of Aircraft Checklists (FAA, 1995)

6.14 Travel Health Issues

See the following links for travel health guidance.

U.S. State Department:  http://travel.state.gov/travel/tips/tips_1232.html#health
U.S. Center for Disease Control:  http://wwwnc.cdc.gov/travel/

6.21 Runway Incursion Prevention Best Practices

(Based on material from ICAO Doc 9870 Manual for Preventing Runway Incursions)

The taxi phase should be treated as a “critical phase of flight”.

The important elements of runway incursions prevention are:
   a. It is essential to adhere strictly to all relevant ICAO Standards and Recommended Practices, Procedures and guidance material, including phraseologies;
   b. Flight crews need to ensure that they follow the clearance or instructions that are actually received, and not those that the flight crew is expecting to receive;
   c. Good planning of ground operations can decrease the workload during taxi. The flight and its associated risks starts during the preparation;
   d. Good situational awareness is the top priority during taxi. All crewmembers should be involved;
e. Application of “Crew Resource Management” principles during taxi is as important as during other phases of flight;

f. Even the most professional and experienced people make mistakes. By being defensive and letting the built-in safety nets do their work, a single mistake should not lead to a serious incident or accident;

g. For helicopters, runway incursions can also occur both during air or ground taxiing and when operating in close proximity to runway environments. Close proximity also relates to in flight when transiting an airport’s runway environment. Uncontrolled airports pose just as serious threats to incursions as do controlled airports; and

h. Never take anything for granted.


Excerpts of ICAO Doc 9870, Manual for Preventing Runway Incursions are available through the IBAC website at the following link: http://ibac.org/Files/Safety/preventing_runway_incursions.pdf.

Additional guidance material is available at the FAA website at http://www.faa.gov/airports/runway_safety/.

6.22 Stabilized Approaches

A stabilized approach is one of the most critical elements of a safe approach and landing operation. An approach is considered stabilized when all of the following conditions are met:

a. The landing gear is down, landing flaps set, trim set, and fuel balanced per the AFM or POH, as applicable.

b. The aircraft is established on the inbound course and only small changes in heading are required to maintain the correct path and within one dot of course centreline when utilizing instrument guidance.

c. The aircraft is established on glideslope and only small changes in pitch are required to maintain the correct glide path and within one dot of glideslope when utilizing instrument guidance.

d. The descent rate not greater than 1,000 fpm. Approaches that would require a descent rate greater than 1,000 fpm require a special briefing.

e. Indicated airspeed is between Vref and Vref + 20, or acceptable ranges specified in the AFM or POH, as applicable.

f. The engine speed is at a setting that allows adequate response when and if a rapid power increase is needed.

The operator should determine specific criteria for when a go-around will be required.

NOTE: For more information see:

IG 7.0 International Operations

7.1 Sovereign and International Airspace

The rules in force relating to flight and manoeuvre of aircraft when operating outside the airspace of any sovereign state, i.e. oceanic or high seas, must be in accordance with ICAO Annex 2, Rules of the Air.

7.2 Compliance

ICAO Contracting States have agreed that the flight rules that apply in international airspace will be those established by ICAO. However, responsibility for enforcement of these rules rests with the State of Registry of the aircraft or State of the Operator. The flight rules are contained in ICAO Annex 2, (Rules of the Air), and procedural aspects are covered in:

- ICAO Procedures for Air Navigation - Air Traffic Management (PANS – ATM), (Doc.4444);
- ICAO Regional Supplementary Procedures, (Doc.7030); and
- individual State Aeronautical Information Publications (AIPs).

Other useful links and documents:

- [https://www.nbaa.org/ops/intl/](https://www.nbaa.org/ops/intl/)

7.5. Standard Operating Procedures

7.5.1 The following sample International Airspace SOP may be modified as required to reflect your operating procedures, and included as a chapter in your COM. If your fleet includes more than one type of aircraft and there are specific procedures for each aircraft type, you may elect to develop an individual International Airspace SOP supplement for each type. In that case you may reference the supplement here and issue each under separate cover.

When operating in international, MNPS, RNAV, RNP or RVSM airspace flight crew shall operate in accordance with the organization’s International Airspace Standard Operating Procedures (International Airspace SOP).

The PIC is to report any anomalies to both the relevant ATS unit and the operator’s management as soon as practicable.

Company crews are to follow the procedures in this SOP. The PIC must check that current copies of the SOP and related documents are on board the aircraft prior to commencing operations in international, MNPS, RNAV, RNP or RVSM airspace.

7.5.2 RVSM
Aircraft intending to operate in RVSM (including D-RVSM) airspace must be approved by the State of Registry or the State of the operator, the operator must have an approved RVSM operations manual and the aircraft must be maintained in accordance with an approved RVSM maintenance program. A verification flight is required as a part of the approval process to operate in any RVSM airspace. Prior to flight into RVSM airspace the PIC must confirm that all of these requirements are met.

The following equipment must be installed and fully operational for flight in radar controlled RVSM airspace:

a. two independent height measuring systems;
b. an automatic altitude control system;
c. an altitude alerter; and
d. one SSR altitude reporting transponder. If only one installed it must be selectable to either air data computer.

To be able to enter North Atlantic and Pacific RVSM non-radar controlled airspace the following equipment must be operating:

a. two independent height measuring systems;
b. an automatic altitude control system; and
c. an altitude alerter.


### 7.5.3 MNPS, RNAV and RNP Procedures

The flight crew will conduct operations in MNPS, RNAV and RNP airspace, in accordance with the approved regional supplement. The pertinent operating and contingency procedure information must be available to the crew for in flight reference. Documents to be carried and available (depending on the airspace in which the operation is being conducted) are:

a. A guidance manual containing operating and contingency procedures such as the Jeppesen manuals or the North Atlantic MNPS Airspace Operations Manual - Current Edition or other manual appropriate to the airspace within which the operation will be conducted;
b. Approved aircraft Minimum Equipment List incorporating MNPS, RNAV and RNP requirements;
c. An approved document tabulating track and distance between oceanic waypoints (Note: The FMS database is NOT sufficient for this purpose);
d. Appropriate chart and flight guide coverage with regard to the route to be flown;
e. In the NAT MNPS, a copy of the current NAT Track Message;
f. A master copy of the flight plan/log, hereafter referred to as the Master Document; and
g. In the NAT MNPS, a plotting chart of a scale appropriate to the route to be flown.

### 7.5.4 Route Monitoring and Cross-Check Procedures

The aircraft navigation systems necessary for flying in the MNPS, RNAV and RNP airspace are capable of a high standard of performance. In order to complement these, it is essential to have stringent routines of navigational cross-checking procedures. Adoption of the following
procedures will assist in maintaining a high standard of navigation performance, and thus safety, in MNPS, RNAV and RNP airspace.

7.5.5 In-flight Procedures

While on Airways

If the initial part of the flight is conducted along airways, the airways facilities should be used as the primary navigational aids and the aircraft long range navigation systems monitored, to verify that the latter are performing within the prescribed limits.

ATC Oceanic Clearance

Where practical, two flight crew members should listen to and record every ATC clearance. Both should agree that the record is correct. Any doubts should be resolved by requesting clarification from ATC. However, cockpit management should be such that one pilot is designated to be responsible for flying the aircraft, while any amendments to the cockpit documentation and/or reprogramming of the navigation systems are being carried out.

Oceanic Track Changes

If there is a change to the flight planned OTS track or random track, the coordinates of the new track must be plotted on the plotting chart and tracks and distances extracted from the ‘Track and Distance Tables’ and recorded on a revised Master Document. It is these tracks and distances that should be compared with the CDU information and the necessary checks carried out if there are differences greater than 1 NM. Remember to compare like with like, i.e., compare true tracks on the Master Document with true tracks from the CDU; remember, also, the CDU gives initial great circle tracks.

Approaching MNPS/RNAV/RNP Airspace

In the event of significant impairment of navigational capability, the aircraft should not enter the MNPS/RNAV/RNP airspace if it is no longer able to meet the navigational requirements.

Prior to entering the MNPS/RNAV/RNP airspace, the aircraft’s position should be checked as accurately as possible by means of external navigational aids, in order to ascertain the preferred aircraft navigation system to be used thereafter. In the event of a significant discrepancy, the question of whether the affected navigation system should be updated may be given cautious consideration. If it is decided to update the system, the proper procedures should be carried out strictly in accordance with a prepared checklist.

Under no circumstances will the PIC allow the aircraft to enter international airspace unless he is absolutely sure that the clearance has been fully understood, the Flight Plan in the FMS is fully compliant with that clearance and that the required LRN systems are performing accurately.

Crossing each waypoint in-flight

Approaching the waypoint confirm navigation system/FMS position agree with the master document;

a. at the waypoint:
   1. confirm navigation system/FMS switches to next waypoint;
   2. compare the distance to next waypoint on the navigation system/FMS to master document for agreement; and
   3. compare the track on the navigation system/FMS to the magnetic course on the master document for agreement;

b. ten minutes past the waypoint:
1. record the navigation system/FMS position on the plotting chart; and
2. plot the position on the plotting chart to determine if the navigation system/FMS is operating on the correct course.

System Monitoring
The importance of constantly monitoring the performance and integrity of the FMS and navigation systems cannot be overstated.

It is important to remember that the auto-pilot may unobtrusively become disconnected from the command mode, therefore regular checks of correct engagement should be made.

Approaching Landfall
When the aircraft is approaching the first landfall navaid, it should acquire the appropriate inbound radial as soon as the flight crew is confident that the landfall navaid is providing reliable navigation information. The aircraft should then be flown using the radio navigation information as a cross check of the long range navigation systems. Where a discrepancy between the aircraft position determined by the LRN systems and the land based navaids is confirmed, ATC must be informed immediately.

Post Flight Procedures

Navigation System Accuracy Check
At the end of each flight, an evaluation of the accuracy of the aircraft's navigation systems should be carried out, in order to facilitate corrective action for out-of-tolerance performance. Errors in excess of tolerances published in the equipment manual are to be recorded in the Technical Log as a defect. Records should be kept of the aircraft navigation systems performance.

7.5.6 Reduced Vertical Separation Minima (RVSM) Procedures

Flight Planning

a. Verify that the aircraft is approved for RVSM operations;
b. Annotate the flight plan to be filed with the air traffic service provider to show that the aircraft and operator are approved for RVSM operations. When filing an ICAO flight plan insure that item 10 (Equipment) of the ICAO flight plan is annotated with the letter “W” to show RVSM approval);
c. Check reported and forecast weather conditions on the route of flight;
d. Check minimum equipment requirements pertaining to height-keeping systems; and
e. if required for the specific aircraft group, account for any aircraft operating restrictions related to RVSM airworthiness approval.

Pre-flight Procedures at the Aircraft for Each Flight

The following actions should be accomplished during pre-flight:
a. Review maintenance logs and forms to ascertain the condition of equipment required for flight in the RVSM airspace. Ensure that maintenance action has been taken to correct defects to required equipment;
b. During the external inspection of aircraft, particular attention should be paid to the condition of static sources and the condition of the fuselage skin in the vicinity of each static source and any
other component that affects altimetry system accuracy (this check may be accomplished by a qualified and authorized person other than the pilot, e.g. a flight engineer or maintenance personnel);

c. Before takeoff, the aircraft altimeters should be set to the local altimeter (QNH) setting and should display a known elevation (e.g., field elevation) within the limits specified in aircraft operating manuals. The difference between the known elevation and the elevation displayed on the altimeters should be within the limits specified in the aircraft flight manual and must not exceed 75 ft. The two primary altimeters should also agree within limits specified by the aircraft-operating manual. An alternative procedure using QFE may also be used; and

d. Before take-off, equipment required for flight in RVSM airspace should be operational, and indications of malfunction should be resolved.

Procedures prior to RVSM airspace entry

The following equipment should be operating normally at entry into RVSM airspace:

a. two primary altitude measurement systems;

b. one automatic altitude-control system;

c. one altitude-alerting device; and

d. should any of the required equipment fail prior to the aircraft entering RVSM airspace, the pilot should request a new clearance so as to avoid flight in this airspace.

NOTE: In the case of transponder failure, the PIC should ascertain the requirement for an operational transponder in each RVSM area where operations are intended. The PIC should also ascertain the transponder requirements for transition areas adjacent to RVSM airspace.

In-flight Procedures:

a. Flight crews should comply with aircraft operating restrictions (if required for the specific aircraft group) related to RVSM airworthiness approval;

b. Emphasis should be placed on promptly setting the sub-scale on all primary and standby altimeters to 29.92 in. Hg/1013.2 (hPa) when passing the transition altitude and rechecking for proper altimeter setting when reaching the initial cleared flight level (CFL);

c. In cruise flight it is essential that the aircraft be flown at the cleared flight level. This requires that particular care be taken to ensure that ATS clearances are fully understood and followed. Except in contingency or emergency situations, the aircraft should not intentionally depart from the cleared flight level without a positive clearance from ATS;

d. During cleared transition between levels, the aircraft should not be allowed to overshoot or undershoot the cleared flight level by more than 150 ft (45 m);

e. An automatic altitude-control system should be operative and engaged during level cruise, except when circumstances such as the need to retrim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters;

f. The altitude-alerting system should be operational;

g. At intervals of approximately one hour, crosschecks between the primary altimeters and the stand-by altimeter should be made. A minimum of two primary altimeters should agree within 200 ft (60 m) or a lesser value if specified in the aircraft-operating manual. Failure to meet this condition will require that the altimetry system be reported as defective and ATC notified. The difference between the primary and stand-by altimeters should be noted for use in contingency situations:
1. the normal pilot scan of cockpit instruments should suffice for altimeter cross-checking on most flights, and
2. at least the initial altimeter crosscheck in the vicinity of the point where Class II navigation has begun should be recorded (e.g., on coast out). The readings of the primary and standby altimeters should be recorded and available for use in contingency situations;
3. normally, the altimetry system being used to control the aircraft should be selected to provide the input to the altitude-reporting transponder that is transmitting information to ATC;
4. if the pilot is notified by ATC of an Actual Aircraft Deviation error which exceeds 300 ft (90 m) then the pilot should take action to return to the cleared flight level as quickly as possible.

Post Flight

In making maintenance log book entries against malfunctions in height-keeping systems, the pilot should provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system. The pilot should detail the actual defect and the crew action taken to try to isolate and rectify the fault. The following information should be noted when appropriate:

a. primary and standby altimeter readings;
b. altitude selector setting;
c. sub-scale setting on altimeter;
d. autopilot used to control the aircraft and any differences when the alternate system as selected;
e. differences in altimeter readings if alternate static ports selected;
f. use of air data computer selector for fault diagnosis procedure; and
g. transponder selected to provide altitude information to ATS and any difference if alternate transponder or altitude source is manually selected.

7.6 International Publications Library

The following is a list of documents that may be considered for inclusion in the Aviation library:
1. Convention On International Civil Aviation (Document 7300);
2. ICAO Annex 2 (Rules of the Air);
3. ICAO Annex 5 (Units of Measurement to be Used in Air and Ground Operations);
4. ICAO Annex 6 (Operation of Aircraft);
5. ICAO Annex 11 (Air Traffic Services)
6. ICAO PANS/OPS (Document 8168 Vol. I);
7. ICAO PANS/ATM (Document 4444);
8. ICAO Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Document 9574)
10. Consolidated Guidance Material North Atlantic Region (NAT Doc 001);
12. Guidance and Information Material concerning Air Navigation in the North Atlantic Region;

Flight crew members should be familiar with their contents and make use of the appropriate documents when planning and conducting operations in international, MNPS, RNP or RVSM airspace.
IG 8.0 Aircraft Equipment Requirements

In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following checklist should be installed or carried, as appropriate, in aircraft according to their intended use and to the circumstances under which the flight is to be conducted. The prescribed instruments and equipment, including their installation, shall be acceptable to the State of Registry.

<table>
<thead>
<tr>
<th>Element</th>
<th>8 Aircraft Equipment Requirements</th>
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<tbody>
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<td><strong>8.1 General Requirements</strong></td>
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<tr>
<td>8.1.1</td>
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<tr>
<td>a. Does the operator have a process to ensure that all aircraft are equipped in accordance with the applicable requirements specified in ICAO Annex 6 Part II or Annex 6 Part III?</td>
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<tr>
<td>b. Does the operator have a process to ensure that all aircraft are equipped in accordance with the applicable requirements specified by the State of Registry?</td>
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<tr>
<td>c. Does the operator have a process to ensure that all aircraft are equipped in accordance with the applicable requirements specified by the State and/or airspace where operations are conducted?</td>
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<td>8.1.2</td>
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<tr>
<td>Does the operator have a process to ensure that equipment required meets the technical specifications prescribed by the State of Registry?</td>
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**8.2.A Instruments and Associated Equipment - Aeroplanes**

| 8.2.1A   |
| Are all aeroplanes equipped with the instruments and associated equipment for VFR operations? |
| (ICAO Annex 6 Part II, 2.4.3) |
| 8.2.2A   |
| Are all aeroplanes equipped with the instruments and associated equipment for IFR operations? |
| (ICAO Annex 6 Part II, 2.4.7, 3.6.5) |
| 8.2.3A   |
| Are all aeroplanes equipped with the instruments and associated equipment for Night operations? |
| (ICAO Annex 6 Part II, 2.4.8) |
| 8.2.4A   |
| Are all aeroplanes equipped with proper emergency power supply? |
| (ICAO Annex 6 Part II, 3.6.5.2) |
## 8.2.H Instruments and Associated Equipment - Helicopters

<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.2.1H</td>
<td>Are all helicopters equipped with the instruments and associated equipment for VFR operations?</td>
<td>(ICAO Annex 6 Part III, 4.4)</td>
</tr>
<tr>
<td>8.2.2H</td>
<td>Are all helicopters equipped with the instruments and associated equipment for Night or IMC operations?</td>
<td>(ICAO Annex 6 Part III, 3.4)</td>
</tr>
<tr>
<td>8.2.3H</td>
<td>Are all helicopters equipped with the instruments and associated equipment for IFR operations?</td>
<td>(ICAO Annex 6 Part III, 4.2)</td>
</tr>
<tr>
<td>8.2.4H</td>
<td>Are all helicopters equipped with the adequate interior lighting?</td>
<td></td>
</tr>
<tr>
<td>8.2.5H</td>
<td>Are all helicopters equipped with a trainable landing light?</td>
<td>(ICAO Annex 6 Part III, 4.4.2.1)</td>
</tr>
</tbody>
</table>

### 8.3 Operational Information and Documents

<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1</td>
<td>Is the following documentation and information (in written or electronic form) carried on board the aircraft and is the operational information accessible on the flight deck (with the exception of 8.2.1 (m) for helicopters):</td>
<td>(with the exception of 8.2.1 (m) for helicopters):</td>
</tr>
<tr>
<td></td>
<td>a. pertinent aeronautical charts;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. pertinent enroute, terminal area, and instrument approach procedure charts;</td>
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<td></td>
<td>c. aircraft performance data;</td>
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<td></td>
<td>d. aircraft checklists;</td>
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<td></td>
<td>e. the operator’s operations manual;</td>
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<td></td>
<td>f. SOP manual (where established)</td>
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<td></td>
<td>g. the aircraft flight manual;</td>
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<td></td>
<td>h. the aircraft minimum equipment list (MEL) if aircraft is being operated in accordance with a MEL;</td>
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<tr>
<td></td>
<td>i. aircraft C of A or other flight authority and C of R;</td>
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<td></td>
<td>j. aircraft radio licence;</td>
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<td></td>
<td>k. insurance certificate;</td>
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<td></td>
<td>l. documentation required for the area of operation;</td>
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<tr>
<td></td>
<td>m. interception procedures; and</td>
<td></td>
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<tr>
<td></td>
<td>n. for international commercial air transport operations, a certified true copy of the air operator certificate?</td>
<td>(ICAO Annex 6 Part III, 4.4.2.1)</td>
</tr>
</tbody>
</table>
### 8.4 Seats, Safety Belts and Shoulder Harnesses

**8.4.1** Except as provided in 8.4.2.H below, are all aircraft equipped with:

a. a seat for each occupant of the aircraft, except for infants under an age specified by the State of Registry;

b. a safety belt, having a metal-to-metal latching device, for each passenger (other than infants);

c. a shoulder harness for each flight crew member and any other person occupying a flight deck seat or sideways facing seat; and

d. a shoulder harness for each flight attendant seat that is not a regular passenger seat?

**8.4.2.H** For helicopter operations where in-flight transfer of personnel or door-open operations is required and approved, involving operations without a crew seat, is a secure safety harness fitted and used?

### 8.5 Emergency Equipment - General

**8.5.1** Are all aircraft equipped with at least:

a. first aid kit;

b. fire extinguishers for use in the crew, passenger and cargo compartments; and

c. a crash axe (aircraft with a seating capacity of more than 19 passengers only, if installed IAW State of Registry requirements).

**8.5.2** For pressurized aeroplanes is there portable breathing equipment suitable for use when combating fires on board the aircraft? *(Recommended Practice)*

**8.5.3** Are there placards that identify the location of aircraft emergency equipment? *(Recommended Practice)*

**8.5.4** Are aircraft equipped with means of ensuring that the following information and instructions are conveyed to passengers:

a. when seat belts are to be fastened;

b. when and how oxygen equipment is to be used if the carriage of oxygen is required;

c. restrictions on smoking;
<table>
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<tr>
<th><strong>d.</strong> location and use of life jackets or equivalent individual flotation devices where their carriage is required;</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>e.</strong> location of emergency equipment; and</td>
<td></td>
</tr>
<tr>
<td><strong>f.</strong> location and method of opening emergency exits?</td>
<td></td>
</tr>
</tbody>
</table>

### 8.5.5

<table>
<thead>
<tr>
<th>a. Does the operator have available for immediate communication to rescue coordination centres, lists containing information on the emergency and survival equipment carried on board the aeroplane?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Does the information include the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment?</td>
<td></td>
</tr>
</tbody>
</table>

### 8.6.A Flight Over Water - Aeroplanes

#### 8.6.1

If aeroplanes are operated on extended flights over water are they equipped with a life preserver or flotation device for each occupant of the aircraft?

#### 8.6.2

Does the operator of aeroplanes have a process to determine survival risks involved in extended flights over water and based on the risk assessment ensure the aircraft is equipped with:

- Life rafts available in sufficient numbers to carry all persons on board carried in the aeroplane?

- Are these life rafts provided with distress signalling devices and life-saving equipment, including a means of sustaining life, appropriate to the area of operation?

### 8.6.H Flights Over Water - Helicopters

#### 8.6.1

Are helicopters fitted with a permanent, or rapidly deployable, means of flotation so as to ensure a safe ditching when engaged in any overwater operations where it is likely that a forced ditching manoeuvre would be executed in the case of a power-plant failure?

#### 8.6.2

Are helicopters operating in accordance with 8.6.1 equipped with:

- Life jackets with illumination for each person on board,
| **b. life rafts in sufficient number to carry all persons on board the helicopter,** |
| **c. with the life raft equipment providing means of sustaining life as appropriate to the operations being undertaken,** |
| **d. pyrotechnical distress signals equipment?** |

| **8.6.3** Does the operator have procedures for helicopter occupants to wear either survival suits or life jackets when offshore operations are being conducted? |
| **Does the operator have procedures for survival suits to be worn by all occupants when the sea temperature is less than 10°C or when the estimated rescue time exceeds the calculated survival time, except when temperature conditions on the flight deck make the wearing of survival suits a hazard?** |
| **(Recommended Practice)** |

| **8.6.5** Does the operator have a procedure to ensure that life jackets are available to all on-board when helicopters are taking off or landing over water and there is a risk of ditching? |

| **8.6.6** Are the life rafts required in 8.6.2.b deployable by remote control? |
| **(Recommended Practice)** |

| **8.6.7** If the life rafts referred to above are not deployable by remote control and have a mass of 40 kg or more is there a means of mechanical assist deployment? |

| **8.7** If aircraft are operated across land areas which have been designated as areas in which search and rescue would be especially difficult, are they equipped with signalling devices and life-saving equipment (including means of sustaining life) as is appropriate to the area overflown? |
### 8.8 High Altitude Flights – Oxygen Requirements

| 8.8.1.A | Are aeroplanes that are intended to be operated at high altitudes equipped with sufficient oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required under section 6.2.6? |
| 8.8.1.H | Do helicopters when intended to be operated at altitudes where the use of oxygen has been prescribed, carry equipment for storing and dispensing the oxygen supplies required in 6.2.6? |

### 8.9 Icing Protection and Weather Detection Equipment

| 8.9.1 | Has the operator ensured that only aircraft that are certified and equipped to cope with such conditions are operated into known or forecast icing conditions? |
| 8.9.2.A | Are pressurized aeroplanes equipped with operative weather detection equipment, when appropriate? |
| 8.9.2.H | Are helicopters which are involved in passenger carrying operations at night or under IFR in areas where thunderstorms may be expected, equipped with weather-detecting equipment capable of detecting thunderstorms? *(Recommended Practice)* |

### 8.10.A ELT - Aeroplanes

| 8.10.1 | Are the operator’s aeroplanes equipped with ELTs except as provided in 8.10.2, with at least one ELT of any type? |
| 8.10.2 | Are all aeroplanes for which the individual Certificate of Airworthiness was first issued after 1 July 2008 shall be equipped with at least one automatic ELT? |
| 8.10.3 | *It is recommended that all aircraft carry an automatic ELT.* *(Recommended Practice)* |
| 8.10.4 | Are ELTs carried to satisfy the requirements of 8.10.1 and 8.10.2 capable of operation on both 406 MHz and 121.5 MHz simultaneously in accordance with the relevant provisions of Annex 10, Volume III? |

### 8.10.H ELT - Helicopters

| 8.10.1 | Are the operator’s helicopters equipped with at least one automatic ELT? |
### Appendix B: Implementation Guide (IG)

#### 8.10.2
Are all helicopters operating over water in accordance with 8.6.1 a. or b. equipped with at least one ELT(S) in a raft or life jacket?

#### 8.10.3
Are ELTs carried to satisfy the requirements of 8.10.1 and 8.10.2 capable of operation on both 406 MHz and 121.5 MHz simultaneously in accordance with the relevant provisions of Annex 10, Volume III?

#### 8.11.A GPWS - Aeroplanes

##### 8.11.1
Are the operator’s aeroplanes with a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers equipped with a ground proximity warning system which has a forward-looking terrain avoidance function?

##### 8.11.2
Does the ground proximity warning system provide automatic timely and distinctive warning to the flight crew when the aeroplane is in potentially hazardous proximity to the earth’s surface?

##### 8.11.3
Does the ground proximity warning system provide, as a minimum, warnings of at least the following circumstances:

- a. Excessive descent rate;
- b. Excessive altitude loss after take-off or go-around; and
- c. Unsafe terrain clearance?

##### 8.11.4
a. Does the operator have a process to ensure that the data base for the GPWS is current?

b. Are the pilots trained in use of the system?

#### 8.11.H GPWS - Helicopters

##### 8.11.1
For helicopters that are equipped with a GPWS, does the GPWS provide:

- a. Automatic, timely and distinctive warning to the flight crew when the aircraft is in potentially hazardous proximity to the earth’s surface, and

- i. As a minimum, warnings of at least the following circumstances:
  - A. Excessive descent rate,
  - B. Excessive altitude loss after take-off or go-around, and
  - C. Unsafe terrain clearance?

- b. Does the operator have a process to ensure that the data base for the GPWS is current?

- c. Are the pilots trained in use of the system?
### 8.12 ACAS II (TCAS II)

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.12.1</td>
<td>Are all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15,000 kg or authorized to carry more than 30 passengers, for which the individual airworthiness certificate is first issued after 1 January 2007, equipped with an ACAS II?</td>
</tr>
<tr>
<td>8.12.2</td>
<td>Are aircraft as described above but with and individual C of A first issued after 1 Jan 2005 equipped with an ACAS II? <em>(Recommended Practice)</em></td>
</tr>
<tr>
<td>8.12.3</td>
<td>Are all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5,700 kg, or authorized to carry more than 19 passengers, for which the individual airworthiness certificate is first issued after 1 January 2008, equipped with an ACAS II? <em>(Recommended Practice)</em></td>
</tr>
</tbody>
</table>

### 8.13 Transponder and Altitude Reporting System

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.13.1.A</td>
<td>Are all aeroplanes equipped with a pressure altitude reporting transponder? <em>(Exception - VFR only operations that have been exempted by the appropriate civil aviation authorities)</em></td>
</tr>
<tr>
<td>8.13.1.H</td>
<td>Are all helicopters equipped with a pressure altitude reporting transponder, unless exempted by the appropriate civil aviation authorities?</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.14.1A</td>
<td>Are aeroplanes equipped with FDR and/or CVR <em>(See IS-BAO for details)</em> TO Mass &gt; 27,000 kg – Type I FDR</td>
</tr>
<tr>
<td>8.14.2A</td>
<td>TO Mass &gt; 5,700 kg – Type I A FDR</td>
</tr>
<tr>
<td>8.14.3A</td>
<td>TO Mass &gt; 5,700 kg – Type II FDR <em>(Recommended Practice)</em></td>
</tr>
<tr>
<td>8.14.4A</td>
<td>TO Mass &gt; 27,000 kg - CVR</td>
</tr>
<tr>
<td>8.14.5A</td>
<td>TO Mass &gt; 5,700 kg – CVR <em>(Recommended Practice)</em></td>
</tr>
<tr>
<td>8.14.6A</td>
<td>Does the operator have procedures to ensure, in the event an aircraft becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition in accordance with ICAO Annex 13?</td>
</tr>
</tbody>
</table>
### 8.14.7A
Does the operator have procedures to ensure flight data and cockpit voice recorders shall not be switched off during flight time?

### 8.14.8A
Does the operator have procedures to protect CVR and FDR data from inappropriate use? (See Note in IS-BAO 8.5.3)

### 8.14.H FDR and CVR - Helicopters

#### 8.14.1H
Are helicopters equipped with FDR and/or CVR equipped as required? (See IS-BAO for details)
- TO Mass > 7000kg - Type IV FDR

#### 8.14.2H
TO Mass > 3180kg – Type IVA FDR

#### 8.14.3H
TO Mass > 3180kg – Type V FDR *(Recommended Practice)*

#### 8.14.4H
TO Mass > 7000kg - CVR

#### 8.14.5H
TO Mass > 3180kg – CVR *(Recommended Practice)*

#### 8.14.6H
Does the operator have procedures to ensure, in the event an aircraft becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition in accordance with ICAO Annex 13?

#### 8.14.7H
Does the operator have procedures to ensure flight data and cockpit voice recorders shall not be switched off during flight time?

#### 8.14.8H
Does the operator have procedures to protect CVR and FDR data from inappropriate use? (See Note in IS-BAO 8.5.3)

### 8.15 MEL

#### 8.15.1
Where a master minimum equipment list is established for the aircraft used, has the operator devised an MEL approved by the State of Registry?

#### 8.15.2
a. Are flight crews and maintenance personnel trained in its use?

b. Is a copy of the MEL carried on board the aircraft?

### 8.16 Comm and Nav Equipment

#### 8.16.1
Are all aircraft equipped with radio communication equipment to permit the pilot to conduct two-way communications on the appropriate aeronautical frequencies?
<p>| | |</p>
<table>
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<tr>
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<tbody>
<tr>
<td>8.16.2</td>
<td>Are all aircraft equipped with sufficient radio navigation equipment to receive radio signals from the transmitting facilities to be used and to permit the aircraft to navigate in the event of the failure of one navigation unit?</td>
</tr>
<tr>
<td>8.16.3</td>
<td>Does the operator have procedures to ensure that electronic data bases are compatible with the intended function of the equipment and are current?</td>
</tr>
<tr>
<td>8.16.4.A</td>
<td>Are large and turbojet aircraft equipped with boom mikes at all flight crew stations?</td>
</tr>
<tr>
<td>8.16.5.H</td>
<td>Are helicopters equipped with headset with boom microphone and a transmit button on the flight controls for each required pilot and crew member at his working station?</td>
</tr>
</tbody>
</table>
IG 9.0 Aircraft Maintenance Requirements

9.1 Maintenance Control System

9.1.1 The Maintenance Control System should be described in sufficient detail in the operator’s manual(s).

9.1.4 Items that are included in the Maintenance Control System

a. Where maintenance functions have been assigned:
   1. The Position or Title of the Person Responsible for Maintenance
   2. The duties and responsibilities of the Person Responsible for Maintenance.
   3. If different from the Operations Manual Organizational Chart, the distribution of functions and lines of authority.

b. For Elementary work or Preventive Maintenance and aircraft servicing:

   Note: Elementary work/preventative maintenance, as defined in State of Registry aircraft maintenance regulation, may be performed by pilots at or away from base provided they have received training to conduct the authorized elementary work/preventative maintenance and demonstrated competency at each task to be performed. Those who perform elementary work/preventative maintenance should receive initial and recurrent training in the work to be performed from a qualified aircraft maintenance person or person designated by the AMO to provide such training and have that training recorded in their Training Record.

c. Identification of the State approved Inspection Schedule or Maintenance Program:

   Note: It is not intended that the complete inspection schedule or maintenance program be included in the operations manual section that details the maintenance control system. Although an operator may append a maintenance inspection schedule/program to their manual, the maintenance inspection schedule/program must be controlled and updated.

d. A detailed description of the procedure used to ensure that any maintenance tasks required by the maintenance schedule/program, an airworthiness directive, or any task required for the rectification of a defect is completed within the time constraints specified in national regulations.

   Example: Technical dispatch of aircraft shall be by means of the aircraft log. The Maintenance Manager shall ensure that all items of deferred maintenance other than those recorded in the current page of the aircraft log are entered on an approved serialized list attached to the front page of the log. Immediately following completion of any item of scheduled maintenance specified by a maintenance schedule, airworthiness directive or other mandatory requirement, the Maintenance Manager shall review the aircraft technical records to determine the date, air time, or operating cycles when the next scheduled maintenance activity will become due, and make an entry to that effect in the log. The Maintenance Manager shall control such the due dates of the next maintenance activities to be performed in the aircraft and plan ahead to ensure that all required maintenance tasks required by the maintenance schedule/programme,
an airworthiness directive, or any task required for the rectification of a defect is completed within the time constraints specified in national regulations.

Before each flight of an aircraft, the PIC shall consult the aircraft log and take note of the next scheduled maintenance requirement and the current list of outstanding defects, to decide whether the flight may take place. If in doubt as to the time remaining to maintenance tasks, or the acceptability of defects, the PIC must contact the Maintenance Manager.

e. A description of the assessment program for Airworthiness Directives (AD) and Service Bulletins (SB). *Note: A form that may be used for this purpose is attached as Attachment A.*

**Example:** The Person Responsible for Maintenance shall review all new and revised Airworthiness Directives and Service Bulletins upon receipt, to determine if they are applicable. He/she shall enter details of all applicable airworthiness directives and Service Bulletins pertaining to the aircraft make and model, in the appropriate airframe, engine, propeller or component technical record. He/she shall determine the date, air time or operating cycles, when the actions specified in the directive must be taken. If the required actions are due before the next scheduled maintenance activity he or she shall make the necessary entries in the aircraft log.

f. Procedures for using only approved parts and materials: *Note: This is intended to include any stores procedures that may be used by the operator, including those procedures used for the control of petroleum, oil and other lubricants, as required by State regulation.*

**Example:** Spare parts and materials will be procured from original equipment manufacturers, authorized distributors and other approved sources. Fuels, oils, lubricants and cleaning materials shall be kept in closed containers, clearly marked with the contents, date opened and handle in accordance with applicable industry recommendations. No fluids shall be dispensed from any unmarked container. Suspected Un-approved Parts will be quarantined and inspected further by the Person Responsible for Maintenance. Shelf life item control is also in place to preclude the issue of a unit that has exceeded a scheduled maintenance interval or a consumable part has expired while in storage.

g. Procedures for Calibrated Tooling used in maintenance:

**Example:** The Person Responsible for Maintenance is responsible to ensure maintenance personnel are trained in the proper use and care of precision tools, measuring devices, and test equipment. Technicians are responsible for inspecting calibrated tools or equipment for currency and serviceability before each use. They are also responsible for immediately removing from service, quarantining and reporting any equipment found to be out of calibration or damaged.

h. a description of the procedure used to ensure that the empty weight and balance of an aircraft is recorded in accordance with the regulatory requirements and related operational data is amended;

i. the identification of any person eligible to apply for a Special Flight Permit or Special Flight Authorization in respect of the operators aircraft;

j. Procedures for a tool control program designed to ensure tools and test equipment are accounted for following maintenance. Positive tool control processes can reduce aircraft accidents and incidents. Tools and maintenance materials left inside or on aircraft can also result in foreign object damage (FOD). To reduce the potential for incidents, accidents and damage related to leaving such items in or on the aircraft, a dedicated process should provide
for the inspection and or accountability of all tools and maintenance materials prior to releasing the aircraft from maintenance.

The process should be documented or accounted for within maintenance forms and checklist, such as final inspection checklist or pre-closing inspections of sealed areas and maintenance access areas. The tool control program (TCP) may provide a means of rapidly accounting for all tools after completing a maintenance task on an aircraft or its related equipment with a tool inventory process. For elementary or line maintenance organizations it may be facilitated by a documented pre-inspection requirement of areas where maintenance was performed which is not obvious to the operating crew. This inspection may be conducted by any assigned personnel, providing there are no regulatory inspection requirements to be met.

Consider these items before implementing a TCP.

1. How extensive will the program be?
2. What materials will be monitored?
3. Who can perform a general inspection of the area?
4. What forms if any should be required?
5. Will all the tools be in the TCP?

These issues must be clearly stated in the TCP and referred to by checklist when a checklist is used for confirmation. Once you have committed to a Tool and Material Control Program, it must be in writing. Additionally, it should be added to the internal audit program.

k. Procedures to manage the risks associated with maintenance personnel working alone. It is recommended these procedures include a risk assessment.

9.1.5 Reserved

9.1.6 An operator shall include in the part of its operations manual that describes its maintenance control system defect recording and rectification control procedures for:
   a. recording aircraft defects as they are encountered and documented in the flight or journey log;
   b. ensuring that defects are rectified in accordance with regulatory requirements and manufacturer’s specifications in a timely manner or deferred through the minimum Equipment List (MEL)
   c. detecting defects that recur and identifying those defects as recurring defects and include a method to highlight defects that recur so that they are readily identifiable by flight crews and by the maintenance personnel at all bases where the aircraft is operated. An operator is responsible for identifying recurring defects, as such, to maintenance personnel in order to avoid the duplication of unsuccessful attempts at rectification.
   d. scheduling, within the permitted period of deferral, the rectification of defects whose repair has been deferred, but in no case later than the times identified in the State of Registry regulatory requirements, including any repair time category intervals established in the operator’s MEL.

9.1.7 An operator should include in the part of its operations manual that describes its maintenance control system technical dispatch instructions that:
   a. ensure that aircraft are;
i. in a condition for safe operation,

ii. appropriately equipped, configured and maintained for the intended use, and

iii. maintained in accordance with the approved/accepted maintenance program;

b. ensure that all MEL procedures are followed and requirements are met. Where an approved MEL is in use, the technical instructions shall make reference to the MEL procedures and defect control system. Where no approved MEL is in use, the operator shall include procedures and instructions to ensure that the flight crew and/or authorized certifying staff can assess effective aircraft equipment against regulatory requirements. These may be directed to other personnel involved in dispatch of the aircraft, provided the duties and responsibilities of those persons are described in the section of the operations manual.

c. meet the requirements of the State of Registry civil aviation regulations and standards; and.

d. ensure that a maintenance release is completed and signed, as prescribed by the State of Registry, to certify that the maintenance work has been performed in accordance with the maintenance programme or other data and procedures acceptable to the State of Registry.

e. Where an operator deploys an aircraft to a remote location that is outside of its main area of operation, the operator must ensure that the technical dispatch instructions remain effective.

Note: The purpose of the technical dispatch instructions is to form the basis upon which the pilot-in-command will determine aircraft serviceability in respect of airworthiness directives, maintenance, and operational or operator requirements.

9.1.8 An operator may deviate from the procedures required by its maintenance control system where the deviation conforms to national regulations and is substantiated by a risk analysis.

9.1.9 Reserved

9.1.10 An operator’s maintenance control system should include procedures to ensure that safety of flight defects detected during aircraft operation or during the performance of maintenance, elementary work/preventative maintenance or servicing are recorded. Some States have a Service Difficulty Reporting (SDR) system that enables an operator to submit reports of aircraft components or parts that do not meet their intended life or function.

9.1.11 Maintenance tasks and intervals that have been specified as mandatory in approval of the type design, or approved changes to the maintenance programme, shall be identified as such.

9.2. Maintenance Agreements

9.2.1 No operator should permit a person to perform maintenance on an aircraft unless the person is an employee of the operator or has been authorized to perform the work under the terms of a written maintenance agreement. Every maintenance agreement should specify the maintenance required and clearly define the tasks to be performed and the conditions under which they must be performed. The operator is responsible for defining the tasks to be performed by any external agent and for ensuring the completion of those tasks.

9.2.2 The operator’s maintenance control system should contain provisions for the performance of defect rectification or maintenance when it is necessary to do so at locations where the operator does not have prearranged maintenance agreements. These provisions should include guidance to flight crewmembers to ensure that the work is done by competent organizations.
Note: For prearranged agreements, the general concept of maintenance to be performed is known at time of agreement, but the exact tasks are often only forecast. The agreement should identify how the specific requirements will be communicated each time the agreement is activated.

For ad hoc agreements, the total requirement and task list is typically available. The operator needs a method of compliance that provides in writing what is needed to meet the standard, and is practical to use. Some proforma document carried by flight crew and/or faxed by dispatch is a typical method.

9.3 Person Responsible for Maintenance

9.3.1 An operator’s maintenance control system shall be described in the company operations manual or maintenance manual and will:

a. identify the person responsible for the maintenance control system; and
b. authorize the person who is responsible for its maintenance control system to remove aircraft from operation, where the removal is justified because of non-compliance with regulatory requirements or because of a risk to the safety of the aircraft, persons or property.
c. specify the means under which the maintenance is performed and the processes used to control the airworthiness of the company aircraft.
d. All aircraft maintenance operations must be accomplished per the respective manufacturer’s technical documents or other acceptable data. If no technical publications exist, a written non-conformance (discrepancy) will be submitted to the manufacturer requesting disposition for corrective action.

Note: Where the operator is the holder of an Approved Maintenance Organization (AMO) certificate that is appropriate to the aircraft being operated, the person responsible for the maintenance control system should be the person responsible for the maintenance control system of the AMO.

9.3.2 The person who is responsible for a maintenance control system may assign to another person management functions for specific maintenance control activities if the assignment and the assigned functions are described in writing in the part of the operations manual or maintenance manual, that describes the maintenance control system.

The facility to support maintenance activities should include at least:

1. An aircraft hangar with a temperature control system in areas where extreme heat and/or cold can significantly affect human performance;
2. Systems to manage maintenance schedules (i.e. planning bulletin boards, card files, computer systems);
3. Equipment and tools necessary to do complete planned work;
4. A secure, dry storage area to retain aircraft records; and
5. A fire resistant storage container for aircraft records.
Attachment A - Service Bulletin & A. D. Review Form

(Operator Name)

S.B. or A.D. Title ____________________________________________________________ No._____________

Priority:
Mandatory □ Recommended □ Completion Required by __/__/__ or ____ Flt. Hrs.
Optional □

For Aircraft: ____________. S/N__________________ Applicable □ N/A □

Man Hours Req. -_____ Down Time Req.______ In-house Capable Yes □ No □

Date of Receipt __/__/__    Review Completed __/__/__    Location __________

Review Participants & Recommendation: Accept Reject N/A

Maintenance - ____________________________________________________________ □ □ □

Flight Operations - ________________________________ □ □ □

Cabin Crew - _____________________________________________________________ □ □ □

Department Mgr.________________________________________________________ □ □

Decision Rationale -

__________________________________________________________

Final Authorization

Accepted □ Schedule for accomplishment: By date __/__/__ or within ________Flt. Hrs.

Or, At next _____Inspection / shop visit.

Declined / Rejected □ - because_____________________________________________

__________________________________________________________

Signed by: Department Manager or Director of Maintenance _____________________

S/B-AD Review Form
#2013 – Rev. Date __/__/__
**IG 10.0 Operations Manual**

A company operations manual, which may be issued in separate parts corresponding to specific aspects of an operation, should include the instructions and information necessary to enable the personnel concerned to perform their duties safely. Company operations manuals will vary in detail and complexity in accordance with the complexity of the operation and of the type and number of aircraft operated. An operator with several turbine powered aircraft will have a more comprehensive operations manual than will be required by an owner operated single small aircraft operator. Operators who hold an air operator certificate must meet the requirements specified by their civil aviation authority.

The company operations manual should be such that:

a. all parts of the manual are consistent and compatible in form and content;

b. the manual can be readily amended through an amendment process with distribution of the manual to users listed;

c. the manual contains an amendment control page and a list of the pages that are in effect; and

d. the manual has the date of the last amendment of each page specified on that page.

Four versions of generic company operations manuals (GCOMs) are available for aeroplane operators to use as a basis for development of their company operations manual:

- Regular Version;
- Small Operator Version;
- Single Pilot Version; and
- European Version which meets EASA Part NCC requirements.

The generic manuals provide a template; however, the content of the manual will vary among operators based on the size, scope, complexity of operations and the operator’s risk profile and mitigation.

The operator should provide a copy of the appropriate parts of its operations manual, including any amendments to that manual, to each of its crew members and to its ground operations and maintenance personnel.

The operator may place a copy of the appropriate parts of its operations manual in each aircraft that it operates, instead of providing a copy to each crew member. Every person who has been provided with a copy of an operations manual must keep it up to date with the amendments provided and shall ensure that the appropriate parts are accessible when the person is performing assigned duties.

**10.4 Human Factors Design Standards Related to the Design of Manuals**

A properly designed manual will reduce the risk of errors related to written communications. See the following link to learn about recommend design techniques for manuals:

Helicopter Operations Manual

The following recommended content of an operations manual is an extract from *ICAO Annex 6 Part III*. Operators may use it as guidance; however, holders of air operator certificates must meet the requirements specified by their civil aviation authority.

1.0 General

1.1 Instructions outlining the responsibilities of operations personnel pertaining to the conduct of flight operations.

1.2 Rules limiting the flight time and flight duty periods and providing for adequate rest periods for flight crew members and cabin crew.

1.3 A list of the navigation equipment to be carried, including any requirements relating to operations where performance-based navigation is prescribed.

1.4 The circumstances in which a radio listening watch is to be maintained.

1.5 The method for determining minimum flight altitudes.

1.6 The methods for determining heliport operating minima.

1.7 Safety precautions during refuelling with passengers on board.

1.8 Ground handling arrangements and procedures.

1.9 Procedures, as prescribed in Annex 12, for pilots-in-command observing an accident.

1.10 The flight crew for each type of operation including the designation of the succession of command.

1.11 Specific instructions for the computation of the quantities of fuel and oil to be carried, having regard to all circumstances of the operation including the possibility of loss of pressurization and the failure of one or more engines while en route.

1.12 The conditions under which oxygen shall be used and the amount of oxygen determined in accordance with Section II, Chapter 2, 2.3.8.2.

1.13 Instructions for mass and balance control.

1.14 Instructions for the conduct and control of ground de-icing/anti-icing operations.

1.15 The specifications for the operational flight plan.

1.16 Standard operating procedures (SOP) for each phase of flight.

1.17 Instructions on the use of normal checklists and the timing of their use.

1.18 Departure contingency procedures.

1.19 Instructions on the maintenance of altitude awareness.
1.20 Instructions on the clarification and acceptance of ATC clearances, particularly where terrain clearance is involved.

1.21 Departure and approach briefings.

1.22 Route and destination familiarization.

1.23 Conditions required to commence or to continue an instrument approach.

1.24 Instructions for the conduct of precision and non-precision instrument approach procedures.

1.25 Allocation of flight crew duties and procedures for the management of crew workload during night and IMC instrument approach and landing operations.

1.26 Information and instructions relating to the interception of civil aircraft including:
   a. procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft; and
   b. visual signals for use by intercepting and intercepted aircraft, as contained in Annex 2.

1.27 Details of the safety management system (SMS) provided in accordance with Section II, Chapter 1, 1.3.3.

1.28 Information and instructions on the carriage of dangerous goods, including action to be taken in the event of an emergency.

*NOTE: Guidance material on the development of policies and procedures for dealing with dangerous goods incidents on board aircraft is contained in Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481) in the IS-BAO Tool Kit.*

1.29 Security instructions and guidance.

1.30 The search procedure checklist provided in accordance with Section II, Chapter 11, 11.1.

1.31 Instructions and training requirements for the use of head-up displays (HUD) or enhanced vision systems (EVS) equipment as applicable.

2.0 Aircraft Operating Information

2.1 Certification limitations and operating limitations.

2.2 The normal, abnormal and emergency procedures to be used by the flight crew and the checklists relating thereto as required by Section II, Chapter 4, 4.1.4.

2.3 Flight planning data for pre-flight and in-flight planning with different thrust/power and speed settings.

2.4 Instructions and data for mass and balance calculations.

2.5 Instructions for aircraft loading and securing of load.

2.6 Aircraft systems, associated controls and instructions for their use, as required by Section II, Chapter 4, 4.1.4.
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7</td>
<td>The minimum equipment list for the helicopter types operated and specific operations authorized, including any requirements relating to operations where performance-based navigation is prescribed.</td>
</tr>
<tr>
<td>2.8</td>
<td>Checklist of emergency and safety equipment and instructions for its use.</td>
</tr>
<tr>
<td>2.9</td>
<td>Emergency evacuation procedures, including type-specific procedures, crew coordination, assignment of crew’s emergency positions and the emergency duties assigned to each crew member.</td>
</tr>
<tr>
<td>2.10</td>
<td>The normal, abnormal and emergency procedures to be used by the cabin crew, the checklists relating thereto and aircraft systems information as required, including a statement related to the necessary procedures for the coordination between flight and cabin crew.</td>
</tr>
<tr>
<td>2.11</td>
<td>Survival and emergency equipment for different routes and the necessary procedures to verify its normal functioning before take-off, including procedures to determine the required amount of oxygen and the quantity available.</td>
</tr>
<tr>
<td>2.12</td>
<td>The ground-air visual signal code for use by survivors, as contained in Annex 12.</td>
</tr>
<tr>
<td>3.0</td>
<td>Routes, Aerodromes and Heliports</td>
</tr>
<tr>
<td>3.1</td>
<td>A route guide to ensure that the flight crew will have, for each flight, information relating to communication facilities, navigation aids, aerodromes, instrument approaches, instrument arrivals and instrument departures as applicable for the operation, and such other information as the operator may deem necessary for the proper conduct of flight operations.</td>
</tr>
<tr>
<td>3.2</td>
<td>The minimum flight altitudes for each route to be flown.</td>
</tr>
<tr>
<td>3.3</td>
<td>Heliport operating minima for each of the heliports that are likely to be used as heliports of intended landing or as alternate heliports.</td>
</tr>
<tr>
<td>3.4</td>
<td>The increase of heliport operating minima in case of degradation of approach or heliport facilities.</td>
</tr>
<tr>
<td>3.5</td>
<td>Instructions for the use of aerodrome operating minima for instrument approaches applicable to the use of HUD and EVS.</td>
</tr>
<tr>
<td>4.0</td>
<td>Training</td>
</tr>
<tr>
<td>4.1</td>
<td>Details of the flight crew training programme and requirements, as required by Section II, Chapter 7.7.3.</td>
</tr>
<tr>
<td>4.2</td>
<td>Details of the cabin crew duties training programme as required by Section II, Chapter 10.10.3.</td>
</tr>
<tr>
<td>4.3</td>
<td>Details of the flight operations officer/flight dispatcher training programme when employed in conjunction with a method of flight supervision in accordance with Section II, Chapter 2, 2.2.</td>
</tr>
</tbody>
</table>
IG 11.0 Fatigue Management Program

11.1 Fatigue Management Program

Introduction

This IG presents material that operators may use to develop fatigue management programs for operations and maintenance personnel. The principles contained in this material are such that they can be applied to other personnel involved in the operation. Four primary sources were used for this guidance material. For aircraft crew, the Flight Safety Foundation Fatigue Countermeasures Task Force report Principles and Guidelines for Duty and Rest Scheduling in Corporate and Business Aviation, published by the Flight Safety Foundation in February 1997, was used. For aircraft maintenance personnel, the March 2003 UK CAA Paper 2002/06: Work Hours of Aircraft Maintenance Personnel and the Transport Canada report Assessment of Aircraft Maintenance Engineers (AMEs) Hours of Work were used. Training considerations were derived from the foregoing documents plus the NASA Ames publication Crew Factors in Flight Operations XV: Alertness Management in General Aviation Education Module.

Operators are encouraged to obtain these documents to assist them in developing their flight and duty time limitations and fatigue management programme. The documents may be downloaded at:


Global Consideration

Fatigue is related to a variety of operational experiences, for example, physical discomfort after overworking a particular group of muscles, concentration difficulties during a monotonous task, after being exposed to long or irregular work hours encountering slowed reaction time, difficulty appreciating potentially important but subtle indications that an undesirable situation may be developing, or simply difficulty staying awake. Fatigue becomes important when it reduces efficiency or otherwise degrades performance and affects individuals both subjectively and physiologically. Physiological fatigue results from lost sleep and can only be rectified by sleep itself. Subjective fatigue can be affected by motivation or by the amount of stimulation coming from the environment and is often poorly detected by individuals.\(^1\)

Fatigue is a hazard faced by most aviation operations. Research clearly indicates that fatigue is an issue across all segments of aviation, not only in long haul flights that involve significant time zone changes\(^2\). The data shows that different flight operations and work schedules create different physiological disruptions and can engender fatigue in somewhat different ways.

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However, there are four core operational factors that must be considered in fatigue countermeasures programs.

a. Duty period length is related to the continuous hours of wakefulness through a subset. Flight time is a subset of duty period.

b. Rest or off-duty periods are related to sleep opportunity and can affect both acute sleep loss and the creation of a cumulative sleep debt.

c. Circadian factors can affect both alertness and performance during operations as well as the quantity and quality of sleep obtained during rest periods.

d. Cumulative effects can be relevant for continuous and consecutive duty periods and an accumulated sleep debt.

Working conditions, the physical environment and operator workload can also contribute to fatigue. While a limited scientific literature is available, environmental factors such as vibration, noise and temperature may further contribute to operator fatigue in rotorcraft operations.

The risks normally associated with this hazard are mistakes, incidents and accidents. Strategies to manage this hazard and the associated risks should be developed by operators and included in their safety management system. The management strategies should include processes to involve all employees, and include:

a. Scientifically-based training and education for everyone in the organization including scheduling staff on the physiological mechanisms that underlie fatigue (including sleep fundamentals and circadian rhythms), the misconceptions about fatigue, causes of fatigue (including medical conditions that may lead to fatigue), the effects of fatigue on performance, and fatigue countermeasures,

b. Flight and duty time limits based on sound scientific research,

c. Scheduling practices that carefully consider the safety-risks associated with fatigue and its cumulative effects,

d. Mechanisms that ensure that employees report on situations where fatigue became an issue,

e. Processes to empirically analyse all reports considering core physiological factors\(^1\), and provide feedback to employees and effect change to preclude future occurrences (e.g., safety bulletins, lessons learned, recurrent training).

The employee reporting, analysis and feedback mechanisms should be a component of the organization’s safety management system.

**Aeroplane Crew Considerations**

The Flight Safety Foundation guidelines were developed by a task force that worked closely with scientists at the U.S. National Aeronautics and Space Administration’s Ames Research Center. They looked into such issues as circadian physiology, off-duty periods, duty periods and flight time along with education and training issues. The Task force was comprised of 30 representatives of operators, aircraft manufactures, and training suppliers. They relied extensively on research from the Flight Management and Human Factors Division of the NASA-Ames Fatigue Countermeasures Program.

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Tables 1 and 2 presents highlights of the report. Operators are encouraged to obtain and review the full report.

**Relevant Definitions**

**Window of Circadian Low**
- The window of circadian low is best estimated by the hours between 0200 and 0600 for individuals adapted to a usual day-wake/night-sleep schedule. This estimate is calculated from scientific data on the circadian low of performance, alertness, subjective report (i.e., peak fatigue) and body temperature. For duty periods that cross three or fewer time zones, the window of circadian low is estimated to be 0200 to 0600 home-base/domicile time. For duty periods that cross four or more time zones, the window of circadian low is estimated to be 0200 to 0600 home-base/domicile time for the first 48 hours only. After a crew member remains more than 48 hours away from home-base/domicile, the window of circadian low is estimated to be 0200 to 0600 local time at the point of departure. Recommended guidelines related to the window of circadian low should be applied when any of the following operations occur: landing within the window; flight through both sides of the window; or duty period that starts at 0400 or earlier within the window.

**Off Duty**
- is a continuous, predefined period of uninterrupted time during which a crew member is free of all duties.

**Duty**
- is any task a crew member is required to perform by the operator, including flight time, administrative work, managerial duties, training and deadheading.

**Duty period**
- is a continuous period of time during which tasks are performed for the operator; determined from report time until free from all required tasks.

**Flight time**
- is the sum of all flight time, calculated from block to block for each flight segment.

**Standby**
- A flight crew member on “standby” is required to be available to an operator (away from the airport) for assignment to a flight duty period.
### Table 1
Flight Safety Fatigue Countermeasures Task Force
Overview of Guidelines and Recommendations for Corporate and Business Aviation

<table>
<thead>
<tr>
<th>Off Duty</th>
<th>Duty Period</th>
<th>Flight Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per 24-hour Period</td>
<td>Per Week</td>
<td>Other</td>
</tr>
<tr>
<td><strong>Two Pilots</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimum 36 continuous hours, including two consecutive recovery nights, in a seven-day period (calculated on a seven-day or 168-hour rolling basis)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 hours (following extended flight time)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Three Pilots (Augmented)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 hours</td>
<td>Same as above</td>
</tr>
<tr>
<td></td>
<td>12 hours</td>
<td>Same as above</td>
</tr>
</tbody>
</table>

* Extended operations can involve duty/rest cycles longer than 24 hours.

** Each flight crew gets maximum sleep opportunity with minimum four hours total; maximum two consecutive duty periods with 18 hours off duty.

Source: Flight Safety Foundation and U.S. National Aeronautics and Space Administration
Included with the permission the Flight Safety Foundation
The "window of circadian low" is best estimated to be the hours between 0200 and 0600 for individuals adapted to a usual day-wake/night-sleep schedule. Guidelines apply to the following operations within this window of circadian low:

1. Landing
2. Flight through both sides of the window of circadian low
3. Duty period that starts at 0400 or earlier in the window of circadian low

### Table 2

| Flight Safety Fatigue Countermeasures Task Force | Overview of Guidelines and Recommendations for Flight Operations During the Window of Circadian Low |

<table>
<thead>
<tr>
<th>Off Duty</th>
<th>Duty Period</th>
<th>Flight Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per 24-hour Period</td>
<td>Per 24-hour Period</td>
<td>Per 24-hour Period</td>
</tr>
<tr>
<td><strong>Two Pilots</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 hours</td>
<td>48 continuous hours in seven-day period following multiple duty periods in circadian low (calculated on a seven-day or 168-hour rolling basis)</td>
<td>48 continuous hours on return home following duty period across multiple time zones</td>
</tr>
</tbody>
</table>

No two pilot extensions recommended

**Extended**

<table>
<thead>
<tr>
<th>Off Duty</th>
<th>Duty Period</th>
<th>Flight Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Three Pilots (Augmented)</strong></td>
<td>Reclining seat 18 hours</td>
<td>16 hours **</td>
</tr>
<tr>
<td>12 hours</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>12 hours</td>
<td>Same as above</td>
<td>18 hours **</td>
</tr>
</tbody>
</table>

* Extended operations can involve duty/rest cycles longer than 24 hours.
** Each flight crew gets maximum sleep opportunity with minimum four hours total; maximum two consecutive duty periods with 18 hours off duty.

Source: Flight Safety Foundation and U.S. National Aeronautics and Space Administration

Included with the permission the Flight Safety Foundation
Helicopter Crew Consideration

Given the wide variety of helicopter operations and related conditions it has been concluded that it is not appropriate to propose any recommended flight and duty time limits. Such limits may be included in the helicopter mission specific standards where deemed appropriate. Guidance material of a more general nature on helicopter fatigue issues includes:

- Scholarly Paper published by The International Journal of Aviation Psychology, “Flight-Related Musculoskeletal Pain and Discomfort in General Aviation Pilots From the United Kingdom and Ireland”

Aircraft Maintenance Personnel Considerations

The UK CAA Paper 2002/06: Work Hours of Aircraft Maintenance Personnel, was developed by Simon Folkard D.Sc. of the Body Rhythms and Shiftwork Centre, Department of Psychology, University of Wales. In his work Dr Folkard conducted an extensive review of literature on the impact of various aspects of work hours on health, sleep, fatigue and safety, with special emphasis being given to safety considerations. In addition, a large scale survey was undertaken of licensed aircraft maintenance engineers in the UK and parallel surveys of employers and contract employers were also conducted. The paper presents information on hours of work and fatigue related safety and health issues. It also provides data on the increased levels of risk associated with fatigue and hours of work. The paper concludes with guidelines for “Good Practices”. The guidelines were based on the available evidence relating these features to sleep and/or fatigue. The aims have been threefold, namely to:

a. Minimise the build-up of fatigue over periods of work
b. Maximise the dissipation of fatigue over periods of rest
c. Minimise sleep problems and circadian disruption

Operators are encouraged to obtain and review the full report.

In developing their fatigue management system for aircraft maintenance personnel operators may wish to consider the following items.

a. Work Schedules
   - The data indicates that the level of risk associated with errors and accidents increases after 8 hours and increases dramatically after working more than 12 hours.
   - The nature of tasks undertaken during the latter portions of work schedules should be considered. Levels of risk may be reduced during such periods by having persons who are in the early portion of their work schedule assist with work and provide quality control.
   - Provisions for eight hours prone rest should be provided. Time between work schedules should take this, travel time and personal time into account, especially when overtime work is involved.
b. Night Shifts

1. Levels of risk increase significantly with successive night shifts. Limits on successive night shifts, their end time and required rest periods at the end of a series of night shifts should be considered.

c. Morning/Day Shifts

1. As early morning starts can disrupt rest periods consideration should be given to reducing the shift duration when early starts are involved. Also the nature of work performed at the end of early start shifts should be considered.

2. Limits on the number of successive early start shifts should also be considered.

d. Weekly Limits

1. As fatigue accumulates over successive work periods weekly work limits should be established.

2. In order to relieve fatigue build-up associated with night shifts or early morning starts, a scheme such as a weekly rest period of two successive recovery nights in a seven day period should be considered.

e. Additional Considerations

1. Educational programmes should be developed to increase the awareness of aircraft maintenance personnel of the issues associated with fatigue. In particular, it is important to draw their attention to the objective trends in risk with a view to increasing their vigilance at points when risk may be high despite the fact that perceived fatigue level may not be. It is also important to provide information on how to plan for night work, and to give guidance on the health risks which seem to be associated with shift work, particularly at night.

2. Aircraft maintenance personnel should be required to report for duty adequately rested.

Scheduling and Dispatch Personnel Considerations

Personnel involved in scheduling and dispatch should be trained in the management of fatigue and the critical role that they can play.

Additional References

Additional material on fatigue management is available from the following sources:

- Alertness Solutions provides fatigue management products, services and tools and has a number of research papers and other educational materials at http://www.alertness-solutions.com/ that would be of use to operators.
• NASA Ames Research Center Human Factors Research and Technology Division has a wealth of flight crew fatigues countermeasure related studies and papers at on their web site at http://human-factors.arc.nasa.gov/


• FAA Maintenance Fatigue info at: http://www.faa.gov/about/initiatives/maintenance_hf/fatigue/
IG 12.0 Environmental Management

NBAA

“NBAA believes that when it comes to general aviation operations, environmental stewardship is an imperative. The Association continually works to develop reasonable and balanced policies that support the industry’s twin goals of promoting the mobility and growth of business aviation while safely minimizing its environmental footprint, in terms of both greenhouse gas and noise emissions.” (http://www.nbaa.org/ops/environment/)

EBAA

“The global Business Aviation operating and manufacturing communities have announced an aggressive strategy to further mitigate the industry’s greenhouse gas (GHG) emissions. Developed jointly by the General Aviation Manufacturers Association (GAMA) and the International Business Aviation Council (IBAC) and its Member Associations, the programme is consistent with the International Civil Aviation Organization’s (ICAO) proposal for global aviation sectoral management of targets and monitoring of emissions.” (http://www.ebaa.org/en/current-issues/environment.aspx)
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IG 13.0 Occupational Health and Safety

OSHwiki has been developed by EU-OSHA, to enable the sharing of occupational safety and health (OSH) knowledge, information and best practices, in order to support government, industry and employee organisations in ensuring safety and health at the workplace.

OSHwiki aims to be an authoritative source of information that is easily updated, edited or translated and reaches beyond the OSH community.

See http://oshwiki.eu/wiki/Main_Page for more information.

See the NBAA Safety Best Practices which includes Occupational Health and Safety checklists at http://www.nbaa.org/admin/sms/safety-best-practices/
IG 14.0 Dangerous Goods

General

For basic guidance on the transportation of dangerous goods, see:

b. IATA Dangerous Goods http://www.iata.org/whatwedo/cargo/dgr/Pages/index.aspx
c. Australian CAA Dangerous Goods  

Lithium Batteries

Lithium batteries can overheat and trigger ignition in equipment. Various origins of overheating have been identified during accident and incident investigations. To learn more about hazards related lithium batteries see:

IG 15.0 Security Programmes

15.1. Overview

A security programme shall be maintained that is proportional to the threat against the operator, its personnel, aircraft and facilities. The security programme should include a threat assessment process, preventive measures designed to deter and prevent the commission of unlawful acts, responsive measures to be taken when an unlawful act has been committed against the operator, and appropriate training and testing of personnel involved.

15.2. Assessing the Threat and Vulnerability

The first step in the development of an effective security programme is to assess the threat against the operator, its personnel, aircraft and facilities and the operator’s vulnerabilities. Threats may relate to the nature of business the organization conducts, where that business is conducted, the nationality of the organization, the nationality of operator aircraft, the profile of passengers carried, and the value of goods carried. Information on the various kinds of threats the operator is subject to will come from a variety of sources. In developing and maintaining a current threat assessment for areas of operations, the manager should use the following resources as appropriate:

a. national and local security officials;
b. national and local law enforcement officials;
c. the organization’s security officer, if applicable;
d. national and international trade associations;
e. air security assessment and intelligence service providers;
f. local and foreign media reports; and
g. organization officials posted in foreign locations, if applicable,

Security professionals can provide assistance in determining and assessing the operator’s vulnerabilities.

15.3. Preventive Measures

The focus of preventive security measures will be to:

a. prevent unauthorized access to operator aircraft and facilities;
b. prevent the unauthorized introduction of weapons or explosives onto company aircraft and into the operator’s facilities; and
c. prevent the use of operator aircraft to commit unlawful acts, such as the transport of illicit drugs.

The security measures implemented by the operator should be proportional to the threat. Procedures and training should be in place to implement enhanced measures when the threat is increased and to implement reduced measures when the threat is reduced.

Preventive security measures will include, as appropriate:

a. Global Considerations
   1. Whenever possible avoid areas where there is an identified security risk;
   2. Have a security program that is specific to your location and operation;
   3. Ensure that all operator personnel receive security program training;
4. Make security an integral part of all aspects of the organization and its operation;
5. Establish a Security Champion role, much like the Safety manager role;
6. Maintain a security information program; and

b. People and Processes
1. Require pre-employment screening of operator personnel;
2. Require that crew members display photo IDs at all times;
3. Limit the publication of aircraft itineraries;
4. Establish security threat alerting procedures, such as a code word for use by persons under duress;
5. Require an accurate and accessible passenger manifest for all trip legs;
6. Ensure that only operator personnel and authorized guests, identified in advance, are allowed to board the operator’s aircraft;
7. Ensure that passengers or operator personnel maintain positive control of luggage; and
8. Positively identify all luggage and match luggage to specific passengers (colour-coded bag tags can be helpful).

c. Aircraft
1. Check lavatories, baggage compartments and all cavities for unauthorized people or objects prior to every departure;
2. Ensure that an operator staff member is present at all times when the aircraft is being serviced (fuelling catering, etc.) at operator facilities;
3. Ensure that an aircraft crewmember is present at all times when the aircraft is being serviced (fuelling, catering, etc.) at locations away from the operator’s aviation facility;
4. Use the aircraft's security system (locks and alarms) whenever it is unattended away from the operator’s facilities;
5. Apply tamper evidence security tape on door, panels, etc.;
6. Post a guard at the aircraft when away from the operator’s facilities at locations where security is a concern; and
7. Consider removing the organization’s identification from the aircraft and facilities.

d. Facilities
1. Ensure operator facility perimeter security with effective fencing, lighting, security patrols (as appropriate), gates and limited access areas;
2. Ensure external gates and doors are closed and locked at all times;
3. Require positive access control for all external gates and doors;
4. Close hangar doors when that area is unattended;
5. Secure all key storage areas (food and liquor, parts and tools, etc.);
6. Have an access control management system for keys and passes;
7. Confirm the identity and authority of each passenger, vendor and visitor prior to allowing access to facilities and aircraft;
8. Accompany all visitors away from secure areas (visitor lounge, etc.);
9. Require a picture ID of any unfamiliar or unaccompanied visitor or vendor;
10. Post emergency numbers prominently around facility;
11. Ensure easy access to phones or "panic buttons" in various facility locations (break room, hangar bay, etc.); and
12. Confirm security of destination facilities.

15.4. Responsive Measures

In the case of a hijacking, the flight crew must attempt to make an assessment of the intent of the hijacker and follow the emergency procedures set out in the company operations manual. These procedures will include the making of distress radio calls and transponder settings, to indicate that the aircraft has been hijacked and for adherence to the procedures that have been established and promulgated in ICAO Doc 7030 – *Regional Supplementary Procedures* in both the cases where the aircraft continues on the assigned track and cruising level or is forced to deviate there from.

In the case of bomb threats, the operator should first determine the legitimacy of the threat or whether it is likely to be a hoax. If considered to be legitimate, law enforcement officials should be notified. If the aircraft is in the air, ATS should be notified and the aircraft should land to be searched. If on the ground, the aircraft should be moved, for searching, to the designated isolated parking.

In the case of other unlawful acts, the operator should contact the responsible law enforcement agencies.

15.5. Training and Testing

The security training program should include initial and periodic recurrent training in:

a. The operator’s procedures for:
   1. Assessment of threats and vulnerabilities,
   2. Preventative measures,
   3. Responsive measures.

b. Related State security requirements.

Additional Guidance:

See the GCOM for additional guidance for developing security checklists.

The NBAA also offers up-to-date guidance at [http://www.nbaa.org/ops/security/](http://www.nbaa.org/ops/security/)

Guidance for Single Pilot Operations

Introduction

This Supplement to the IS-BAO – an International Standard for Business Aircraft Operations has been developed to provide guidance to business aircraft operators whose operation will involve single pilot operations of very light jets (VLJs) and technically advanced aircraft (TAAs) and single pilot helicopters. For the purpose of this Supplement, very light jets are jet aircraft weighing 10,000 pounds or less (a distinction from the traditional definition of large aircraft as more than 12,500 pounds, and light aircraft as 12,500 pounds or less) and are certificated for single pilot operations.

The Supplement provides material to assist such operators to meet the various standards specified in the IS-BAO (which may be referred to as 'the Standard') and to become IS-BAO Registered. It should be used in conjunction with the generic single pilot operations manual (GSPOM) or the Helicopter Association International (HAI) helicopter mission specific standards. The NBAA Light Business Aircraft Operations Manual template at http://www.nbaa.org/admin/policies/iba-flight-ops-manual/ may also be appropriate for some operators.

IS-BAO Standards

3.0 Safety Management Systems

A safety management system (SMS) is the process by which an operator identifies the hazards and associated risks that are inherent in the individual operation, assesses them and develops appropriate mitigation to eliminate the hazards or reduce the associated risk to an acceptable level. The mitigations are then implemented and tracked to ensure that they are appropriate and effective. The risk assessment should take into consideration all aspects of the operation and should be integrated into the programs, systems, and procedures that the operator develops to meet the IS-BAO standards.

The SMS requirements in the IS-BAO reflect the ICAO SMS Framework which has been designed to be applicable to all aircraft operators plus a broad range of other aviation activities. As such, it has inherent flexibility and can be adapted for single pilot operations. Simply, it is a tool to assist the operators to carry out their responsibility for the safety of their operation. A number of operators of single pilot high performance aircraft have used the IS-BAO SMS model and reported that they have found it an effective way to manage the safety of their operation.

In using this model the key is that the operator must ensure that safety management activities are appropriate to the operation. If the pilot is the owner and the only person involved, the SMS will be less complex than the situation where there is more than one pilot involved, but it will still address all of the elements identified in the standard. In this case the safety policy and accountabilities will be principles that the owner/pilots developed on their own, with family and colleagues or with the assistance of additional expertise, through careful thought in the absence of other external pressures. These should then be used to establish safety goals for the operation. Examples are contained in the GSPOM.

The IS-BAO SMS standard calls for the operators to have procedures for involving employees in the establishment and maintenance of their SMS and related procedures. In the case of an owner/pilot where there are no other employees, the involvement of persons such as the aircraft maintenance contractor/person, should be provided for.
For guidance material on the conduct of risk analysis, the collection and analysis of data and the development of risk mitigation activities, please see the SMS Toolkit. In doing a risk analysis those involved in single pilot operations should pay particular attention to the hazards and associated risks inherent in that type of operation. For example, there are a number of risks associated with the hazards of a missed approach during marginal weather at night in a high density traffic area or VFR helicopter operations.

The next step in the process is to develop and implement appropriate mitigation to either eliminate the hazard or reduce the level of risk to an acceptable level. While training is an obvious mitigation process, mitigation may include the use of proven tools such as a Personal Minimums Checklist, the Flight Safety Foundation CFIT Checklist and single pilot resource management (SRM) or threat and error management (TEM) principles. These are all important in single pilot operations because they promote thinking ahead and planning for critical situations where there may be intense pressure and quick action is required. Information on Personal Minimums Checklist can be found at http://www.faa.gov/training_testing/training/fits/guidance/media/personal%20minimums%20checklist.pdf. SRM is discussed in the FAA/Industry Training Standards (FTS) at http://www.faa.gov/training_testing/training/fits and information on the Flight Safety Foundation CFIT Checklist is at https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/risk_management_handbook/media/rmh_appc.pdf.

Once the mitigation is developed and implemented it should be tracked to ensure it is appropriate and effective. The tracking system should also be used to identify emerging hazards and risks. In a single pilot operation this system need not be complex. However, it should include a process for recording of issues and events so that the owner/pilot can periodically review the results of safety management efforts and assess emerging risk.

4.0 Organization and Personnel Requirements

The important consideration with the Organization and Personnel standards for small operations is that one person will be responsible for the duties of the flight department manager, Chief Pilot/Operations Manager and person responsible for maintenance. This situation is already provided for in section 4.1.1 of the standard. The GSPOM has a model for meeting this standard and the HAI helicopter mission specific standards can be helpful.

5.0 Training and Proficiency

Training and Proficiency standards are provided by the FAA via FAA/Industry Training Standards (FTS) at http://www.faa.gov/training_testing/training/fits/ The NBAA also provides guidance at https://www.nbaa.org/ops/safety/vlj/.

As was previously noted, training is often cited as appropriate mitigation for identified safety-risks. In such cases that training should be included in the training section of the GSPOM or training manual.

Standard 5.2 recommends Crew Resource Management training for pilots, dispatchers and maintenance personnel. In the case of single pilot high performance operations, the cockpit resource management/single pilot resource management training that is discussed in the NBAA Training Guidelines – Single Pilot Operations of Very Light Jets and Technically Advanced Aircraft and the single pilot resource management (SRM) training that is discussed in the FAA/Industry Training Standards are two recommended resources. FAA Advisory Circular 120-
51E, Crew Resource Management and UK CAA CAP 737 Crew Resource Management Training, may also be helpful.

While State civil aviation licensing regulations may not require a type rating and PPC for some high performance aircraft, it must be understood that for IS-BAO registration pilot proficiency must be certified at the conclusion of initial training and every 24 calendar months thereafter.

6.0 Flight Operations

Standard 6.1 requires the operator to have standard operating procedures (SOPs) for two crew aircraft as well as for single pilot operations. Guidance material on SOPs in general is available at https://www.nbaa.org/admin/sms/safety-best-practices/ and guidance material specifically for single pilot operations can be found at http://www.tc.gc.ca/eng/civilaviation/standards/commerce-manuals-singlecrewsop-menu-1321.htm as well as the HAI helicopter mission specific standards.

Standard 6.13 Flight and Duty Time needs careful attention for single pilot operations, especially in owner/pilot operations where the aircraft is used as a business tool. In such cases the operator’s fatigue management system should take into account the time spent on other duties (office work, meetings, etc.), as well as flight duties. Fatigue management is also an appropriate application for a personnel minimums checklist. The GSPOM contains a suggested model (one way but not the only way) for meeting the requirements of the standards contained in this chapter. An interesting fatigue training module is available at http://ipp.nasa.gov/innovation/innovation104/5-aerotech1.html

7.0 International Operations

While most single pilot operations will not be conducted in international airspace, some will be conducted in RVSM airspace. RVSM, MNPS and RNP operations are also addressed in standard 6.6.

8.0 Aircraft Equipment

No special considerations have been noted in the chapter.

9.0 Aircraft Maintenance Requirements

In many single pilot operations the owner/pilot will be the person responsible for maintenance. The requirements of this chapter and the guidance material in GM 9.1 Maintenance Control System and 9.3 Operator Maintenance Evaluation Programme are very important in the owner/pilot situation where maintenance is done under contract. While the maintenance contractor may be capable of carrying out all of the maintenance activities, the responsibility still rests with the aircraft owner and special attention should be paid to this chapter.

10.0 Company Operations Manual

A generic single pilot operations manual (GSPOM) has been developed to assist operators develop their company operations manual. Operators using the GSPOM to develop their operations manual must ensure that the end product is appropriate to their individual operation.

11.0 Fatigue Management Program
No special considerations have been noted in the chapter.

12.0 Environmental Management

No special considerations have been noted in the chapter.

13.0 Occupational Health and Safety

In many single pilot operations this chapter will not be applicable. Operators should review the Occupational Health and Safety standard and make a determination.

14.0 Transportation of Dangerous Goods

In most instances dangerous goods will not be transported, so the main consideration will be to ensure that they are not inadvertently carried on the aircraft. This issue is addressed in the para 14.2.

15.0 Security

No additional considerations have been noted in the chapter.